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SECTION 274100

COMMON WORK RESULTS FOR AUDIO/VISUAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. General: The General Requirements, Conditions of the Contract, these Specifications, Drawings, Addenda and Contract Modifications (the Contract Documents), and definitions of legal entity (such as Contract, Installer, Engineer, Owner, etc…) shall apply to the work of this specification section.

B. Supplemental: Refer to the specification sections identified below for additional requirements, which are supplemented by this section.

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1.02 SCOPE OF WORK (SOW)

A. General: Refer to the requirements of the related documents identified in Part 1.1 of this specification, for scope of work requirements, which are supplemented by this section. This shall constitute the basis for the “Scope of Work” for this specification.

B. The following are the list of system considered Audio Visual systems:

1. Small classroom audio/visual system, see specification section 274110. This specification includes all open use environment classrooms for less than 60 students.
2. Large classroom audio/visual system, see specification section 274115. This specification includes all open use environment classrooms for more than 60 students.
3. Conference rooms audio/visual system, see specification section 274120. This specification includes all general use conference rooms smaller than 20'x20'.
4. Conference rooms with Video Tele Conference (VTC) audio/visual system, see specification section 274125. This specification includes all general use conference rooms that include videoconference systems, regardless of the size.'
5. Large venue audio/visual system, see specification section 274130. This specification includes all general use auditoriums and large assembly areas with audio visual aids.
6. Public Information Display Systems, see specification section 27429. This specification includes displays providing signage and announcements in a campus wide environment.

C. For designers or consultants: The scope of work for designers or consultants shall include to a minimum the following tasks:
Common Work Results For Audio/visual Systems

1. Define system functionality, configuration and features per user’s requirements.
2. Establish preliminary project budgets based on the user requirements.
3. Establish a responsibility matrix indicating who is providing the different components of the system.
4. Provide architectural considerations related to AV systems for the spaces to the project architect.
5. Provide design drawings and specifications based on the information previously collected for the project.
6. Assist the owner or construction manager in the bid process by checking installer’s qualifications and equipment list provided by the bidders.
7. Establishing the scope of work for the installer and composing the complete set of bid documents (design drawings and specifications).
8. Review shop drawings and answer RFIs
9. Test the system with the installer after completion and verify close-out information.

D. **For installers:** The scope of work for the AVS installer shall include, but not limited to the following tasks:

1. Preparation of shop drawings, submittals, training and as-built information for the system.
2. Procurement, installation and warranty of all AVS hardware like flat panel displays, mounts for displays, signal transceivers, players, switchers, servers, etc.
3. Procurement, installation and warranty of all AVS cabling and wiring, including support system, and fire stopping for all low voltage cabling part of the AVS.
4. Programming labor of the AVS, including initial software set up, software registration, and initial data input, unless otherwise noted in a specific specification section.
5. Attend project plan meetings with the Owner and the Consulting Engineer (A&E) to fine tune data interchange details, network configuration and other user requirements.

E. See additional specification sections for each audio/visual system for additional scope requirements.

1.03 ARCHITECTURAL CONSIDERATIONS

A. General: AVS designers shall provide architectural recommendations for this type of rooms in the project. These recommendations shall include room layout, lighting and acoustics.

B. Screen sizing. Screen height shall be estimated as 1/6 of the distance to the least favored viewer (LFV) or the worst seat in the room. The bottom of the screen reflecting surface shall not be lower than 4’ for non-tiered rooms. The top of the reflecting surface should be at least 2 inches below the lowest device in the ceiling structure (light fixture, sprinkler head, or diffuser). Every effort shall be made to have ceiling heights that allow the screen sizes described above. Rooms where the ratio between the screen height to the LFV is lower than 1/10 are dimmed non usable for teaching purposes.

C. Usable seating area per screen. Usable seating area for a screen shall be defined as the area between two 50º lines on the sides, one line parallel and close to the screen and one circular sector far from the screen. The angle is measured from a perpendicular line to the screen axis from the edge of the screen. The line parallel and close to the screen shall be separated from the screen 0.5 times the screen’s reflecting surface width. The circular sector has a center in the center of the screen and a radius equal to the distance to the LFV
limitation. Any room seats outside of the usable seating area shall be supported with additional display devices.

D. Projector location: AVS designers or installer shall estimate throw distance and locate the optimal projector location that allows having the lens of the projector at midpoint in the zoom adjustment washing out completely the selected screen. The AVS designer or installer shall coordinate with other trades to avoid interference with other building systems at this location. All projectors for shall be ceiling hanged.

E. Lighting levels. Ideally there needs to be a contrast ratio in the screen of at least 10 for good visual presentation. Contrast ratio shall be estimated as the difference between the average light hitting the screen when the projector is displaying a white screen to the average light hitting the screen when the lights in the room are in presentation mode, and the projector is off. Average light hitting the screen when the projector is displaying a white screen shall be estimated as the rated lumen output of the projector divided by the area of the screen in square ft. Architects and lighting designers shall make every effort to comply with the requirements for contrast.

F. Ambient light control. For all rooms with front projection systems, ambient light shall be able to be controlled by using black out shades. Shades can have additional fabrics (25% or 50%) to dim lights, but those fabrics are not required for the AVS. Full blackout shades is the only required fabric for the AVS. Additional fabrics shall be confirmed with the program manager. If the shades are electric they shall be interfaced with the AVS, and all shades in one room shall be able to be controlled as a single unit.

G. Lecterns. Lecterns intended to have AV equipment installed inside shall allow for at least 14 RU of space. Lecterns shall be no less than 24” deep clear inside. Lecterns shall have rear access panels, front doors, ADA shelf, casters and rack rails. Doors and panels shall be lockable. Lecterns shall have ventilation panels to avoid equipment overheating.

H. AV Racks inside the space. Whenever AV racks are required inside a space that does not contain a lectern, it is preferred to mount this equipment in a regular freestanding rack, in a wall mounted rack or in a credenza with racks inside, designed for this purpose. It is not recommended by USF IT department to mount equipment inside case work, but if absolutely required by the program of the project, casework shall be able to hold no less than 14 RU of equipment, be 24” deep inside clear and designed to avoid overheating of equipment by providing ventilation with fans.

I. Floor boxes. Floor box location for teaching lecterns and conference tables shall be carefully selected. Architects and designers shall dimension precisely the location of the boxes to avoid misinterpretation by installers. For all teaching spaces one alternate podium location shall be planned for. Location of floor boxes for conference tables shall be as close as possible to one of the table’s legs to conceal the cables coming up to the interface plate.

1.04 DESIGNER QUALIFICATIONS

A. General: At a minimum the designer or consultants responsible for the audio/visual design shall be company regularly engaged in the design of audio visual system for at least the past five (5) years. Designer or consultants working on USF projects shall have as a minimum a Certified Technology Specialist (CTS) designation by Infocomm International. It is highly recommended the designer or consultants also have a CTS-D certification by Infocomm.
International. Proof of current certification shall be provided to USF IT department for confirmation.

1.05 INSTALLER QUALIFICATIONS

A. Installer Qualifications: The Installer or Installers directly responsible for the work associated with any of the Audio/Visual systems (also references hereinafter as AVS) shall be a licensed and registered contractor who is, and who has been, regularly engaged in providing the installation of audiovisual systems of similar size and complexity for at least the immediate past five (5)-years.

B. Project manager requirements: The project manager for each company participating in the installation of the AVS shall be a Certified Technology Specialist (CTS) by Infocomm International. Proof of current certification shall be provided with the submittal.

C. Programmer-Installer: The AVS installers shall have a factory-trained programmer/installer, for the provided Project products, in full-time employment, as part of the Installer’s staff. The AVS installers needs to provide certificates of completion of training for the staff that will be taking part in the execution of this project.

D. Qualification Documentation: The Installer shall provide the following documentation with their bid package, as evidence that the requirements for the Installer qualifications have been satisfied:

1. A list of not less than five (5) references for jobs of similar size and complexity including:
   a. Project Names
   b. Locations
   c. Contact Names
   d. Contact Telephone Numbers

2. Location (specific street address) of the office from which this installation and warranty work will be performed. It is preferred that the Installer has established and maintains a permanent office within 150 miles of the project site.

3. Copies of Manufacturer certification certificates. It is required that the Installer possess the following certifications, at a minimum:
   a. Crestron certified installer
   b. Crestron DM-E
   c. Extron certified installer
   d. Symetrix certified programmer
   e. Clearone certified installer
   f. Tandberg certified installer

5. Copies of Insurance and Bonding certificates.

1.06 SUBMITTALS
A. General: The AVS installers shall prepare submittals during different stages of the construction process. This is the list of required documentation for each stage:

B. START OF PROJECT SUBMITTALS: A maximum of 60 days after the AVS installers receives a notice to proceed on the project, but no sooner than a year before substantial completion, the following information needs to be submitted:

1. Cut sheets with all specifications of all cables and connectors to be used in the project.
2. One-line diagrams with all devices included in the systems separating power, video, audio and control. Each system in a different sheet.
3. User interface and faceplate color submittal. The AVS installers shall prepare a separate submittal with the shape and color of all user interface plates to be approved by the Architect of the project or the Owner.
4. Proposed construction details for any custom fabricated items or finishes, including speaker rigging, large display mounting, etc. These details shall include dimensions, materials, finishes and colors.
5. List of all IP addresses needed for the AVS.
6. Rack elevations of all AV equipment for all rooms in the project.
7. Conduit rough-in requirements of all wall and ceiling mounted devices for all equipment part of the PS system.
8. Standard service agreement contractor provided by the AVS installer including yearly cost.

C. CONSTRUCTION SUBMITTALS: During the construction process the AVS installers shall submit different information to get approval on continuing with the installation process. The AVS installer shall submittal the following information:

1. Before starting the programming process the AVS installers need to provide the following information:
   a. A schematic presentation of the layout of all the user interfaces in the project and screen shoots. The AVS installers need to get approval of this submittal before starting any programming.
   b. Meeting minutes from all project plans between the Owner and the AVS installers.
2. Any design changes whether originated by the Owner, Designer or by the AVS installers as a VE suggestions need to follow the same submittal process described in the previous paragraph for all equipment involved on the change.
3. Thirty (30) days before starting the training sessions the AVS installers need to provide the following information:
   a. A detailed training chronogram indicating all training sessions requested in this specification.
   b. An outline of the training sessions.
   c. Samples of the training manuals for each session.

D. NO SUBMITTAL: Failure to comply with all the submittals listed above and getting the proper approval from the Owner and the Design Engineer for each submittal will cause the AVS installers to replace installed unapproved equipment at no additional cost to the Owner.
1.07 EQUIPMENT SPECIFIED

A. General: There are two types of equipment specified for the audio visual systems.

B. Specific equipment: When the design drawings indicate a brand and a model number for a piece of equipment part of any audio visual systems, the AVS installers shall to provide the same device as indicated. Substitutions for this type of equipment are not acceptable.

C. Non-specific equipment: When the design drawings do not indicate a brand and a model number for a piece of equipment part of any audio visual systems, the AVS installers are free to pick one equipment that meets the minimum specifications indicated in this section. The AVS installers shall to submit the selected choice as part of the submittal process.

D. Note to designer or consultants: The owner has specific list of equipments that are required for specific projects, like small classrooms. The designer or consultant shall check with USF IT department for the latest current list of equipment. See additional specification sections for specific room types and the current list of equipment.

1.08 PROJECT SPECIFIC SOURCE CODE OWNERSHIP

A. Definition of project specific source code: Project specific source code includes all source code created to generate an executable file to be intended to run in any equipment used in the installation of the AVS. Examples of project specific source code include source code used to generate executable files for control processors, DSP processors and touch panels. Project specific source code does not include source code used to create programming tools and compilers or source code used to generate operating systems or application programs running in PC based workstations.

B. Ownership: Any project specific source code used in this project shall remain the exclusive property of the Owner (University of South Florida). By accepting the contract to perform the work included in this project, the AVS installer or designer and any other companies working creating project specific code during this project relinquish the right of ownership of this source code, and waive any licensing fees or royalties for the use of source code by the Owner or any company authorized by the owner to perform changes in the source code after the project is substantially completed.

PART 2 - PRODUCTS

2.01 SYSTEM FUNCTIONS

A. SYSTEM SIGNALS FOR ALL SYSTEMS

1. General: The completed systems shall be capable of receiving, processing, routing and distributing the associated signals, as indicated in the functionality description for each system.

2. Audio systems will have full range frequency response 100Hz to 18Khz at a level of at least 60db above the ambient noise floor with a Total Harmonic Distortion (THD) of less than .5%.
3. Analog video signals through the system shall be maintained to the minimum quality requirements as follows:
   a. The system shall provide a signal response of 0.7Vpp (nominal) @ 300Mhz RGB, throughout the system channel, for all visual content.

4. Digital video signals through the system shall be capable of delivering 1920X1080 resolutions at 24 fps from end to end.

5. Control signals through the system shall be maintained to the minimum level established by the control equipment manufacturer for the control protocol utilized. This level shall be correct at all connection points in the system.

B. REMOTE ASSET MANAGEMENT SOFTWARE

1. General: The Remote Asset Management Software (RAMS) is another tool that will be provided to the owner to control the AVS system. When referenced in the contract documents within the room functionality, the RAMS shall be able to provide the functionality described in these paragraphs.

2. The RAMS selected by USF for all projects is Crestron RoomView.

3. Programmers of Crestron system using Simpli Windows shall follow the IDs referenced herein for programming:
   a. RoomView ID = 03
   b. Xpanel control = 04
   c. EXE files = 05.

4. At a minimum all AVS with control processors shall have the following monitoring features through the RAMS:
   a. DVD Usage: start time, stop time and cumulative use.
   b. VCR Usage: start time, stop time and cumulative use.
   c. Component video sources usage: start time, stop time and cumulative use.
   d. Laptop connection plate video source usage: start time, stop time and cumulative use.
   e. Document camera usage: start time, stop time and cumulative use.
   f. Projector lamp usage hours.
   g. UPS monitoring, including automatic start, battery test and status, and internal temperature.

5. At a minimum all AVS with control processors shall provide the following alarms:
   a. Projector in video mute for more than 1 hour.
   b. Projector turned off (not on stand-by).
   c. Projector lamp approaching 85% of estimated life time.
   d. Projector lamp bad (if reported by projector)

6. Additional software customization: The AVS installers shall customize the user interface of the RAMS according to the project specific requirements. The AVS
installers shall meet with the Owner and Design engineer during the construction process and agree on the additional features that will be used by the owner on the project. Once this step is done, the AVS installers shall program the RAMS interface based on the conclusions of that meeting.

7. Training: The AVS installers shall provide administration level training for specific RAMS features programmed during a project.

C. COMPUTER BASED USER INTERFACE

1. General: The computer based user interface (CBUI) is another way for the Owner to control the AVS. This interface is in the form of a computer software program with the following requirements:
   a. Needs to be an executable file capable of running in any Windows based PC.
   b. One file per controllable room is required.
   c. Needs to have the same user functions available inside the room in touch screens and keypads.
   d. The “look” and layout of the interface shall be the same as the one in the room.
   e. Programs shall be password protected and have SSL.

2. Delivery: The AVS installers shall provide two (2) DVD disks with all the programs in executable and source code format inside. Each file shall be properly labeled with the room description and the room number.

D. OWNER PROVIDED INPUT SOURCES AND DESTINATION DEVICES

1. General: When indicated in the drawings the AVS installers shall interface with equipment provided by the owner or by third parties. Refer to the design drawings for audio, video and control lines required for owner provided equipment.

2. Scope of work: It is in the scope of work of the AVS installers to run, terminate and connect the audio, video and control lines to owner provided devices as shown in the design drawings. When control lines are indicated in the design drawings, the AVS installers shall program all control features described in each system functions per controllable room, including all features related to owner provided equipment or third party equipment.

2.02 WIRE, CABLE, CONNECTORS, AND ACCESSORIES

A. General: The AVS installers shall provide the system components and materials necessary to properly install, support, and terminate all audiovisual cabling. The AVS installers shall coordinate with the installer of the raceway system final locations of all outlet boxes. The AVS installers shall also provide and attach all required cable connectors.

B. Cable: The AVS installers shall provide all cabling associated with, and required to, provide a complete, operable system in accordance with the Contract Documents. All cable provided by the AVS installers shall be of a manufacture and quality consistent with the design intent, and shall be reviewed by the Engineer prior to installation.
C. Cabling in air handling spaces. The AVS installers shall provide cables with plenum rated jackets for all cables run above ceiling spaces. For all cables run in vertical shafts or conduits, the AVS shall provide riser rated cables.

D. Cabling below grade: When cable part of the AVS have to be run in conduits below slab and grade level, the AVS installers shall use only cables with water-blocking jackets.

E. Cable signals: The following is a list of signal types and the cables to be used for those signals:

1. Line level audio signal cable: Provide one (1) twisted pair cable for mono signals and two (2) twisted pair cables for stereo signals. Twisted pair cables to be 22 AWG stranded (7X30) tinned copper conductors with overall foil shield (100% coverage), with 22 AWG stranded tinned copper drain wire.

2. Microphone level audio signal cable: Provide one (1) twisted pair cable, 20 AWG stranded (7X28) tinned copper conductors, overall foil shield (100% coverage) with a 20 AWG stranded tinned copper drain wire.

3. Composite video signal, serial digital video cable: Provide one (1) RG-59 coaxial cable, 20 AWG solid 0.31” bare copper conductor, gas-injected foam HDPE insulation, Duofoil® + tinned copper braid shield (95% coverage). Characteristic impedance 75Ω.

4. Control cable (i.e. AXLink® Signal): Provide one (1) cable with 1 twisted pair 22 AWG stranded bare copper conductors with overall aluminum/polyester foil (100% coverage) and a 24 AWG tinned copper drain wire, and one (1) unshielded twisted pair, 18 AWG stranded bare copper conductors.

5. Control cable (i.e. RS-232, RS-485 Signal): Provide one (1) cable with 1 or 2 twisted pair 22 AWG stranded bare copper conductors with overall aluminum/polyester foil (100% coverage) and a 24 AWG tinned copper drain wire. Pair count depends on manufacturer’s specifications.

6. Digital video, audio and control over twisted pair. Provide one or two cables UTP or STP as required by transceiver equipment manufacturer to ensure the digital signal is transported properly up to 328 ft, at maximum resolution indicated in part 2.01 of this specification. If equipment manufacturer supports the use of UTP Category (5e, 6 or 6A) for this application, the AVS installers shall provide cables in compliance with specification section 271000 and all cables part of the AVS. Color jacket for these cables shall be blue.

7. UTP Category cables. Provide UTP category cables for all Ethernet connection part of the AVS as indicated in specification section 271000, including horizontal cables, patch cords and station cables. All cables part of the AVS shall be included in the same warranty as all cables provided under specification section 27100. Color jacket for these cables shall be blue.

8. Speaker Cable: Provide two (2) unshielded bare high conductivity ETP copper 16 AWG stranded conductors, with overall jacket.

9. S-Video cable: Provide two (2) coaxial 30 AWG stranded (7x38) .012” tinned copper conductors, foam HDPE insulation, tinned copper serve shield (90% coverage).
shall have inner jacket on each coaxial conductor, outer jacket for all conductors and characteristic impedance of 75Ω on each conductor.

10. RGBHV Video cable: Provide five (5) coaxial 25 AWG solid .018” tinned copper conductors, FPFA insulation, Duobond® foil plus a tinned copper interlocked serve shield (100% coverage). Cable shall have inner jacket on each coaxial conductor, outer jacket for all conductors and characteristic impedance of 75Ω on each conductor.

11. Component video signal cable: Provide three (3) coaxial 25 AWG solid .018” tinned copper conductors, Gas-injected foam HDPE insulation, Duobond® (100% coverage) plus a tinned copper interlocked serve shield (95% coverage). Cable shall have inner jacket on each coaxial conductor, outer jacket for all conductors and characteristic impedance of 75Ω on each conductor.

12. IR control signal cable. Provide one (1) pair, unshielded twisted pair cable with 22 AWG solid copper conductors.

13. Contact closure signal cable. Provide one (1) or more unshielded twisted pair cable with 22 AWG solid conductors. Quantity of pairs as required by the application.

14. HDMI Cables. All HDMI cables longer than 10 meters (32.8 ft.) must include an adaptive cable equalizer capable of providing not less than +40 dB of cable compensation @ 825 MHz. Such device must be capable of operating automatically without the need for human intervention and must include an external AC to DC power converter that can accept 100-240VAC @ 50/60 Hz. Furthermore, such device must also include I2C correction circuitry to mitigate the effects of long cable runs on the DDC clock and DDC data signals. HDMI cables shall have the following requirements:

   a. Support HDMI v1.3 with resolutions up to 1080P with 12-bit color depth
   b. Support HDMI v1.3 Category 2 data rates (3.4 Gbit/sec.) lengths up to 7.5 meters
   c. Support HDMI v1.3 data rates up to 2.25 Gbit/sec. lengths up to 40 meters
   d. Support PC data rates up to 1.65 Gbit/sec. lengths up to 60 meters
   e. Supports PC resolutions up to 1600x1200 / 60 Hz and 1920x1200 / 60 Hz
   f. Made of AWG-22 gauge wires
   g. Triple shield for noise immunity
   h. Cable jacket shall have dual UL Ratings: UL13 (CL2) and UL758 (AWM20276) for non-plenum spaces. In plenum environments cables shall have a CL2P rating or CMP rating.
   i. RoHS compliant.
   j. Gold plated connectors

15. DVI Cables. All cables carrying DVI signals through conduit, floor slabs or longer than 10 ft. shall be HDMI cables as described in previous section with HDMI to DVI adapters in both ends.

F. Connectors and plates: The AVS installers shall provide connector and plates to terminate all wiring part of the AVS, regardless if shown or not in the design drawings. As a general guideline the AVS installers shall follow these recommendations:

1. Only use crimp type connector on BNC cables.
2. When custom panels or plates are required in the project, the AVS installers shall submit detail drawings of all plates for approval by the Design Engineer.
3. Whether shown in the design drawings or not all cables coming out of an outlet box into an equipment shall have a disconnect means at the outlet box with a face plate. Faceplates with grommets are not acceptable as pass-through connections to equipment.

4. All termination of UTP Category (5e, 6 or 6A) cables shall be done in accordance to specification section 271000.

2.03 DEDICATED COMPUTERS FOR AV SYSTEMS

A. General: Any dedicated computers for AV systems to be provided by the AVS installer shall be pre-approved by USF IT department. The designer or AVS installer shall provide to USF IT department the recommended configuration for approval.

2.04 BLU-RAY PLAYER

A. General: The Blu-ray player shall have the following specifications:

1. Capable of up-scaling DVDs to 1080P format
2. DVD formats accepted: DVD+R/+RW/-R/-RW
5. Outputs: (1) HDMI 1.3, analog audio (L/R)
6. HDCP Keys supported: No less than 16 keys for HDCP protected content.

B. HDCP Keys: Since the number of HDCP keys varies from model number to model number and it is usually not disclosed in equipment cut sheets issued by manufacturers, it is the AVS installer’s responsibility to check that the number of keys supported by the unit submitted complies with this specification section. Approval by the A&E of a specific non-compliant unit during the shop drawing review process does not relieve the AVS installer of the responsibility of providing a compliant unit at no additional cost to the project.

C. Accepted manufacturers: Sony, Panasonic, Samsung, Philips or similar

2.05 NETWORKING EQUIPMENT

A. General: All networking equipment required for the AVS shall be provided by the owner unless otherwise note in the design documents.

2.06 CLASSROOM CAPTURE

A. General: Currently USF used the software Panopto Focus for classroom capture. The software is currently set up with two channels, one for a camera inside the classroom, and one for content from any source in the podium. Selection of different sources by the presenter shall follow the channel being recorded by the capture PC.

B. NOTE TO DESIGNERS OR CONSULTANTS: During the program phase of the project the designer or consultant shall clarify with the USF project manager the scope of work for classrooms capture. Clear direction shall be established for the following elements:
1. What items of this system are owner provided and what items will be provided by installer. This clarification shall address at a minimum, the workstations, the capture card, the software licenses, the cameras and the control system for the cameras.

2. Quality of the recording (type of capture card to be used)

3. Location of capture workstation

4. Location and type of capture cameras.

2.07 VIDEOTELECONFERENCE

A. General: Currently USF has standardized in the use of Tandberg video conference systems. All network interfaces for VTC codecs shall be IP interface. ISDN interfaces are not used anywhere in the campus. The preferred codec is the Tandberg C60 system.

B. Displays. Dual displays for the audience and a confidence monitor for the presenter are highly recommended for rooms with VTC. Displays for the audience shall be used for content and far side video separately. Confidence monitor shall be used for far side video.

C. Cameras. High definition cameras are highly recommended for VTC. A two camera set up is ideal, having one camera looking at the presenter and one camera looking at the audience.

D. Microphones. When audience participation is required during VTC, it is highly recommended to have fixed installed microphones. The use of a wireless toss up microphone for audience participation is not recommended. USF prefers the use of array microphones (acoustic magic) for small rooms with VTC, but different solutions shall be presented for larger rooms. Acoustic Echo cancellation (AEC) shall be provided in the DSP processor for all microphones being use for VTC.

E. Control system. Control to the VTC shall be through the use of the touch panel in the room. The touch panel shall be programmed to allow all features of the VTC system to be available at this interface. The use of an infrared control shall only be allowed for rooms with movable VTC systems, not for fixed installation.

F. NOTE TO DESIGNERS OR CONSULTANTS: During the program phase of the project the designer or consultant shall clarify with the USF project manager the scope of work for video teleconference. Clear direction shall be established for the following elements:

1. What items of this system are owner provided and what items will be provided by installer. This clarification shall address at a minimum, the codec, the cameras, the cart, the cameras and the control system for the cameras, and any software applications required to expand the use of the VTC system.

2. Quality of the videoconference. High definition systems are highly recommended for all projects.

3. Fixed installation or movable equipment.

4. Location and type of cameras.

2.08 CONTROL SYSTEMS

A. NOTE TO DESIGNERS OR CONSULTANTS: Because USF has standardized the support platform for all AV systems, the only allowed control system for AVS in USF are Crestron systems. Designers and installer can choose between all available interfaces, touch panels,
and processors, but in order for the system to be able to be monitored and remotely attended by USF IT, the use of the RAMS (Crestron RoomView exclusively) is required.

PART 3 - EXECUTION

3.1 EXECUTION OF THE WORK

A. General: Refer to the requirements of the related documents identified in Part 1.1 of this specification, for execution of work requirements supplemented by this specification section.

B. WORKMANSHIP: The AVS installers shall adhere to, at a minimum, the following installation practices:

1. Securely mount equipment plumb and square in place. Where equipment is installed in cabinets, provide mounting bolts in all equipment rack fastening holes. All rack mount equipment shall be secured with Rackmount Solutions HTX™ security screws (STAR-TYPE or similar) provided with nylon washers between bolt heads and equipment.

2. Where equipment (such as VHS players, monitors, DA’s etc… and other system devices) is packaged by the manufacturer without rack mount ears or braces, as part of a regular manufacture process, the Installer shall provide all required, accessory ears, brackets, and shelves, which are necessary to properly mount the equipment within the designated cabinets and rack locations.

3. Provide appropriate ventilation panels, vents, and/or fans to assure sufficient ventilation for adequate cooling of all equipment. The AVS installer shall provide solutions to avoid overheating when equipment is to be installed in casework or closed lecterns.

4. Confirm the polarity and phasing of system components before installation. Connect to maintain uniform polarity and phasing.

5. Insulate all non-insulated, stranded conductors before making termination when connecting to equipment terminals.

6. “Wire”, “wing” and “twist” NUT type connections are not permissible for any type of signal connection.

7. All wiring is to be free from grounds loops, shorts, opens, and reversals.

8. Neatly tie all cabling within equipment cabinets, housings, and terminal cabinets with nylon cable ties at not more than 8” intervals. Install in accordance with the latest EIA installation standards. Architect & Engineer approved wiring trough may be used in lieu of tie-wraps. Cable routing shall not braid or cross with other wires in parallel more than once.

9. Secure all cables in equipment cabinets and terminal cabinets to provide strain relief at all raceway exits in accordance with NFPA 70 including all supplements. All plugs and receptacles are to be the grounding type.

10. Connect all equipment power to surge/noise suppression outlet strips or UPS. Any control processor or equipment prone to lose programming due to power failure shall be under UPS protection. UPS shall be monitored by the RAMS.

11. Where system cables are extended through an exposed umbilical connection, the Installer shall harness all associated cable within a common, manufactured, flexible, sheath (ex. Snakeskin™).

12. All racks and cabinets shall be bonded to a grounding system as required by NEC.

C. RACEWAYS. All raceways for audio/visual devices shall have the following specifications:

1. Refer to specification section 270528 for all raceways specification.
2. All cables for speaker level signals, regardless of their level shall be run in separate raceways from other low voltage cables.
3. All cables for microphone level signals, regardless of their level shall be run in separate raceways from other low voltage cables.
4. Separation of Raceways: USF does not allow the use of raceways or cable trays design for structured cabling systems to be used for AVS cables with the exception of fiber optic cables. Raceways for CATV system can be used for AVS distribution cables when required. Cable tray supports can be used as supports for hangers for AVS distribution cables.
5. Raceways for AV outlets: Outlets for AV cables shall be composed of electrical boxes (sized for the amount of connectors) and a conduit(s) to the nearest accessible ceiling space. All AV outlet boxes shall be at least 2.5” deep.
6. All indoor rated cables can be supported with j-hooks or cable hangers above accessible ceiling spaces. J-hooks shall be spaced no longer than 4. Ft.

D. LABELING. Any type of write-on labels, hand writing on cable jackets or directly on equipment, labels made with masking tape or any other type of non-approved tape are not acceptable and shall be corrected with approved labeling methods at no additional cost to the owner. The only approved types of labels for cables and devices part of the broadband distribution system are:

1. Non-laminated thermal transfer labels, printed with a high quality thermal transfer printer.
2. Laminated thermal transfer labels printed with a high quality thermal transfer printer.
3. Thermal transfer polyolefin tape printed with a high quality thermal transfer printer.
4. Self laminated dot-matrix labels, printed with a high quality dot matrix printer.
5. Non-laminated dot-matrix labels, printed with a high quality dot matrix printer.
6. Pre printed labels from marker books.

E. ENGRAVING: All push buttons in user interfaces part of the AVS shall be engraved with descriptive wording of the use of the button. The AVS installers shall submit and receive approval for the proposed wording in each button before doing the engraving. Failure to follow this step might cause the AVS installers to replace the buttons in interfaces where the Owner is not satisfied with the wording of the label at no additional cost to the Owner. The color of the wording in the engraving shall have high contrast with the background color of the button.

F. PROJECTOR INSTALLATION: The Installer shall adhere to, at a minimum, the following installation practices for projectors:

1. Projector shall be provided with corresponding mounting brackets depending on the projector selected.
2. All anchors and supports whether pre-fabricated or customs, required to mount the projector where indicated in the design drawings are in the scope of work of the AVS installers.

G. FLAT PANEL DISPLAY INSTALLATION: The AVS installers shall adhere to, at a minimum, the following installation practices for flat panel displays:
1. All anchors and supports whether pre-fabricated or customs, required to mount the displays where indicated in the design drawings are in the scope of work of the AVS installers.

2. All walls where flat panel displays will be installed shall be re-enforced with sheet metal behind the drywall. The extent of the re-enforcing shall be the contour of the flat panel display to be installed and no less than twice the distance between 2 drywall stud frames.

3. When flat panel displays are installed inside a wall niche, the AVS shall provide a wall mount with adjustable depth that allows the flat panel display to be installed flush with the exterior wall.

4. Power and AV outlets to be installed behind flat panel displays shall use an FSR PWB-100 or approved equal box.

H. SPEAKER INSTALLATION: The Installer shall adhere to, at a minimum, the following installation practices for speakers:

1. All ceiling mounted speaker shall have a support wire tie to the building structure. Ceiling speakers shall not be supported from the ceiling grid.

2. All ceiling mounted speakers shall be installed with a backbox to prevent sound from dispersing into the plenum space and causing noise issues in adjacent rooms.

3. When ceiling speakers are mounted in fire rated partitions, the speakers shall have UL listed speaker back boxes with a fire rating no less than the rating of the partition.

4. All in-wall speakers shall be installed with pre-construction brackets.

I. EQUIPMENT RIGGING: When speaker assemblies or arrays weight more than 100 lbs, the AVS installers shall follow all rigging instructions from the manufacturer and shall be done by an experienced rigger. The AVS installers shall also adhere to the following practices:

1. Only the rigging equipment and method listed by the manufacturer of the equipment are approved for the installation No substitutions are accepted.

2. Only the rigging points available in the speaker assembly are accepted as means of support.

3. All anchors and supports whether pre-fabricated or customs, required to mount the displays where indicated in the design drawings are in the scope of work of the AVS installers.

4. Shop drawings for rigging methods shall be signed and sealed by a licensed structural engineer.

J. MILLWORK OPENINGS: When AV equipment like flip tops and plates will be mounted in millwork provided by the owner or third parties, the AVS installers shall provide cut out dimensions for all the AVS equipment listing location in the millwork where the cuttings need to be done. It is the AVS installer’s responsibility to install those devices in the millwork, once the openings have been done. All millwork opening shall be done by the furniture manufacturer.

K. FLOOR BOXES. Floor boxes are the preferred method to wire teaching lecterns. Floor boxes used for connection to teaching lecterns shall have at least the following minimum requirements:

1. Floor boxes shall be large enough to have at least 3 different compartments, one for power one for voice/data cables and one for AV.

2. Each low voltage compartment shall have a separate raceway back to the accessible ceiling space. If speaker wires are run from the lectern, the AV compartment shall have
one 1” and one ¾” conduit to the nearest accessible ceiling space. If no speaker wires are run from the lectern, at least one 1” conduit from the AV compartment to the accessible ceiling shall be provided. Additional conduits might be required depending on the application.

3. There shall be no daisy-chaining of AV conduits between adjacent floor boxes. Floor boxes shall also allow to recess the connectors from the umbilical cord tied to the lectern.

4. Floor boxes shall have a recessed compartment to hold connectors. Floor boxes that leave AV connectors flushed with the floor are not desirable since they become tripping hazards and could be easy broken with the lectern when moved.

5. AV compartments shall have termination plates and connectors for all cables coming from the accessible ceiling space. Pass-through cables shall not be allowed in floor boxes. All connectors shall be properly secured to the plates in the floor box. All unused compartments shall have blank plates.

L. STRUCTURED CABLES INFRASTRUCTURE: The AVS installers shall adhere to specification section 271000 for all requirements of structured cabling components to be used as part of the AV system. The structured cabling components include but are not limited to:

1. All unshielded twisted pair Category cables and fiber optic cables
2. Termination devices like termination jacks, patch panels and faceplates.
3. All UTP and fiber optics patch cords.
4. All testing procedures for Category and fiber optic cables.

M. IP ADDRESSES. All AVS equipment that requires an IP address shall have and IP address provided by USF IT department, unless USF IT department specifically approved the use of a separate network for the AVS. The AVS installer shall provide a list of all IP addresses needed for the project in advance. Reprogramming of AVS due to un-approved addresses use by the AVS installer shall be at the installer’s expense.

N. DSP PROCESSORS. AVS installer shall program all audio and/or video DSP processors unless specifically noted by owner during the program phase of the project. DSP processors shall be program to include filters like high-pass filters, Acoustic echo cancellation, compression/limiter, gates, mixing, level control and routing. Whenever DSP processor have a PC based user interface, it shall be programmed by the AVS installer and provided for the owner to use.

3.2 SOFTWARE PROGRAMMING AND TESTING

A. The software programming and testing of the AVS system will be a multi-step process. The AVS installers shall provision in the proposal for the time indicated in each of the steps:

B. BRIEFING STEP: No later than 6 months after receiving the notice to proceed, but no sooner than 1 year before substantial completion of the project, the AVS installer shall request one or more briefing sessions with the Owner and/or design engineer to go over the expectation of each system and clarify any points that might not be clear in the design documents. Some important notes about this step are:

1. The AVS installers shall allocate at least 16 hours of meeting time
2. Travel time will not be counted as part of the meeting time.
3. The quantity of staff required to attend these meetings by the AVS installers is sole decision of the AVS installers.
4. Before the start of this step the AVS installers shall have software programming submittals approved as described in part 1 of this specification section.
5. The AVS installers shall prepare meeting minutes of the key decisions made during these meetings. The approval of these meeting minutes by the Owner and Design Engineer will be accepted as approval notice of this step.

C. SHOP PROGRAMMING STEP: Once the briefing step has been completed and approved, the AVS installers shall allocate off-site programming time to accomplish all the requirements listed in this specification and the clarifications done in the previous step. It is the sole responsibility of the AVS installers to estimate how many man hours are required for this step. This step does not require approval by the Owner and/or design Engineer.

D. FIELD VERIFICATION STEP: After all AVS equipment has been installed on site and the system has been programmed, the AVS installers shall request one or more working sessions with the Owner and/or design engineer to verify in the field the functionality of the AVS system. Some important notes about this step are:

1. The AVS installers shall allocate at least 20 hours of working sessions.
2. Travel time will not be counted as part of the working sessions.
3. The AVS installers shall have different AV media and sources to test all features in the AVS system.
4. The quantity of staff required to attend these meetings by the AVS installers is sole decision of the AVS installers.
5. Physical installation of all devices will be checked by the Owner and/or the Design Engineer. Any deviations in the installation of the equipment part of the AVS from this specifications and previous meetings, will be noted by the Design Engineer in a “punch list”. This punch list will be send to the AVS installers within the next 5 days of the meeting for immediate corrective action. One punch list will be prepared for each room with AVS.
6. The AVS installers shall prepare meeting minutes of the key decisions made during these meetings that affect the programming sequence. The approval of these meeting minutes by the Owner and Design Engineer will be accepted as approval notice of this step.

E. FINAL ADJUSTMENT STEP: Once the previous step has been approved, the AVS installers shall allocate time to make any corrections to the AVS system on site based on the conclusions of the previous step. It is the sole responsibility of the AVS installers to estimate how many man hours are required for this step. This step does not require approval by the Owner and/or design Engineer.

F. FINAL ACCEPTANCE STEP: Once the AVS installers has completed the previous step the AVS installers shall allocate time to review the complete AVS system with the Owner and/or design engineer, for compliance with this specification, previous punch list and conclusions in previous meetings and working sessions. Some important notes about this step are:

1. It is the sole responsibility of the AVS system installer to estimate the time allocated for this step. It is assume that at this point in time all the features of the AVS system are clear to the Owner and the AVS installers so this step is just to make sure that all the features are working properly as agreed.
2. The AVS installers shall have different AV media and sources to test all features in the AVS system.
3. The quantity of staff required to attend these meetings by the AVS installers is sole
decision of the AVS installers.

4. Physical installation of all devices will be checked again by the Owner and/or the
Design Engineer. All previously noted punch list items shall have been corrected by the
AVS installers.

5. Failure to complete one or more of the previously issued punch list items or failure to
correct any programming changes previously noted will revoke acceptance of the room
or system being tested.

6. Final acceptance will be granted on a room by room basis.

G. DATA WIRING AND FIBER OPTIC TESTING: Testing of UTP data wiring, copper patch
cords, fiber optic cables and fiber optic patch cords shall be done as indicated in specification
section 271000. Testing results shall be submitted as indicated in the same specification
section.

H. TEST EQUIPMENT: The AVS installers shall supply all testing instruments required for the
equipment programming and system tests. Test equipment manufactured by Tektronix,
Extron, Fluke, and Wavetek, are acceptable for use on the Project. The AVS installers shall
use test equipment meeting the minimum specifications, identified herein, to perform system
calibrations and adjustments. The AVS installers shall make available the same test
equipment available, for inspection by the Engineer, during Final Acceptance step.

1. Direct reading Audio Impedance Meter.
   a. Minimum of three frequencies ranging from 250Hz to 4kHz.
   b. Range 1 ohm to 1M ohm.
   c. 10% accuracy.
   d. Direct reading of dBm across 600-ohm load.

2. Digital Multimeter.
   a. DC to 20kHz bandwidth.
   b. 300V range.
   c. 100mV resolution.
   d. 10M ohms input impedance.
   e. DC resistance to 0.1 ohms.

3. Dual-trace oscilloscope.
   a. 450MHz minimum bandwidth.
   b. 1mV/cm sensitivity.
   c. Dual timebase capability.

4. Sine/Square Wave Generator.
   a. 5Hz to 5kHz bandwidth.
   b. Output level of 0dBm with less than 0.5%THD.

5. Sound Level Meter – ANSI & IEC Type 2.
B. SIGNAL ADJUSTMENT: The AVS installers shall ensure that the following adjustments, tests and measurements, at a minimum, have been completed:

1. The system shall be measured and adjusted for optimum signal quality and minimum signal loss, to all audio and video signals, through the system channel, using appropriate test equipment and standardized testing procedures.
2. The system shall be measured and adjusted for optimum signal-to-noise ratio and maximum headroom in the system electronics.
3. The system shall be measured and adjusted to eliminate distortions or degradation of signal resulting from, but not limited to, clipping, hum, noise, and RFI interference.
4. The Installer shall check the quality of each signal, at its source, and compare it against the quality of the signal at various points of its transmission through the system. The Installer shall correct the system for any significant (the lesser of 2dB or the manufacturers throughput requirements) signal distortion or loss.

3.3 TRAINING

A. The AVS installers shall only start the testing process after the testing submittal described in Part 1 of this specification has been approved and the Operation and Maintenance manuals have been completed and reviewed by the design Engineer. The AVS installers shall provide the owner with different types of training as described herein.

B. SYSTEM ADMINISTRATION TRAINING. The AVS installers shall provide system administration training at the job site as described below:

1. Duration of system administration training will be indicated for each AVS in the corresponding specification section.
2. Travel time will not be counted as part of the training sessions.
3. Training will be broken down to several sessions in different days. Each session shall be no longer than 6 hours. The number of sessions will be indicated for each AVS in the corresponding specification section.
4. The objective of the system administration training will be to properly operate, troubleshoot, calibration and perform specific field repairs to AVS equipment.
5. Field repair and calibration training will be limited to those repairs notes by the manufacturer of the equipment as field repairs done by non factory trained personnel.
6. Training shall be done at the job site with all the equipment operational after final acceptance.
7. Training will be limited to a maximum of 5 attendees per session.
8. Operation and Maintenance manuals shall be delivered at the beginning of these sessions.

C. USER TRAINING. The AVS installers shall provide user training at the Job site as described below:

1. Duration of user training will be indicated for each AVS in the corresponding specification section.
2. Travel time will not be counted as part of the training sessions.
3. Training will be broken down to several sessions in different days. Each session shall be no longer than 6 hours. The number of sessions will be indicated for each AVS in the corresponding specification section.
4. The objective of the user training will be to properly operate the AVS.
5. Training will be limited to a maximum of 20 attendees per session.
6. User short form guides shall be provided to all attendees of the sessions.
7. Short form guides shall provide the users with quick finding ways to operate the system. If AVS operation is different from one room to the other, one separate short form guide shall be provided for each room.

D. OTHER TRAINING REQUIREMENTS: The AVS installers shall also comply with the following training requirements:

1. At least one of each type of training sessions shall be videotaped by the AVS installer. The AVS installers to provide 2 Blu-rays with all the training sessions done in MPEG-2 format. All video clips shall be edited to keep only the content of the training session.

3.4 COMMISSIONING

A. NOTE TO DESIGNERS OR CONSULTANTS: USF might choose to have third party commissioning of Audio/Visual system. Designers shall confirm with the USF project Manager if this is a project requirement. If so, designers shall include a description in the specifications of the commissioning process so the AVS installer can factor the required commissioning time in their bid.

3.5 WARRANTY

A. During the first year of service the AVS installers shall ensure that manufacturer certified repair and maintenance personnel are available during regular business hours from Monday through Saturday. The AVS installer shall provide a copy of the standard maintenance service agreement to the owner.

B. The overall AVS equipment and software shall be warrant for at least one (1) year. Individual pieces of equipment could be required to have longer warranties when specifically noted in this specification section. The warranty shall start from the day the AVS installers receives the approval of the Final Acceptance Step.

C. Manufacturer warranties longer that one year shall be transferred to the owner. The AVS installer shall provide a list with all equipment in the project and duration of the warranty as issued by the manufacturer.

D. During the warranty period the AVS installers shall visit the site as many times as required to fix any software bugs in the system.

3.3 CLOSE-OUT DOCUMENTATION

A. General: Refer to the requirements of the related documents identified in Part 1.1 of this specification, for close-out documentation requirements supplemented by this specification section. The following is a list of required close-out documentation:

1. Drawings indicating final floor plan locations of all AV devices
2. One line diagrams with all devices connected in the system.
3. All programming source code done by the AVS for this project for all pieces of equipment in digital format (no printed copies required).
4. List of all IP addresses assigned to each equipment part of the AVS.
5. Compiled executable files as requested for Computer based user interface.
6. All Operations and Maintenance Manuals (digital format is acceptable, no paper copies)
7. All printed test results.
8. Video tapes of training sessions when requested in this specification section.
9. List of all equipment used in the project and duration of warranty for each piece of equipment extending beyond one year. The manufacturer’s warranty conditions shall be provided as well.

END OF SECTION 274100
SECTION 274110

SMALL CLASSROOM AUDIO/VISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: The General Requirements, Conditions of the Contract, these Specifications, Drawings, Addenda and Contract Modifications (the Contract Documents), and definitions of legal entity (such as Contract, Installer, Engineer, Owner, etc…) shall apply to the work of this specification section.

B. Supplemental: Refer to specification section 274100 PART 1 for additional requirements, which are supplemented by this section.

1.2 SCOPE OF WORK (SOW)

A. General: A small classroom is considered an open use environment classroom used for less than 60 students.

B. General: The scope of work for the installer of these rooms is to provide and install all equipment and wiring for the small classrooms. Programming for these rooms is provided by USF IT department unless the program requirements for the classrooms indicate particular features not available in standard USF small classrooms.

C. The following is a list of small classrooms where Audio Visual system shall be provided in this project:

1. List all rooms.

D. Consumables: The Audio Visual System (AVS) Installer shall provide as part of the scope the following consumable devices:

1. 10% of lamps for each type of projector used the projects.

1.3 ARCHITECTURAL CONSIDERATIONS

A. General: AVS designers shall provide architectural recommendations for this type of rooms in the project. These recommendations shall include room layout, lighting and acoustics.

B. Tier seating: unless the particular program requires it, this type of room does not require tier seating.

C. Screen quantity. This type of rooms only requires one screen unless the specific program request more than one.

D. Dimming lights are not required in this type of classroom, but two level lighting is recommended. To obtain the two levels ½ or 1/3 of the lamps in each fixture shall be controlled separately. At a minimum there needs to be two control circuits for all the light
fixtures in the room, the light fixtures closest to the screen shall be on a separate switch from
the rest of the fixtures in the room, so they can be turned off during presentation mode but
the remaining lights can be left on.

E. Acoustical considerations. This type of room does not require any special acoustical
considerations with the exception of the regular considerations for privacy between adjacent
classrooms.

1.4 ROOM AUDIO/VISUAL FUNCTIONALITY

A. General: Room Audio/visual functionality shall be as described in the current standard
program for the control processor installed in most classrooms of this type. It is the intent of
the USF IT department to keep this functionality as uniform as possible to reduce training
time for teachers and support staff.

PART 2 - PRODUCTS

2.1 APPROVED PRODUCTS

A. General: The following is the list of equipment currently approved by USF for this type of
classroom:

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Projector</td>
<td>PANASONIC</td>
<td>PT-FW300NTU</td>
</tr>
<tr>
<td>Projector Ceiling Plate</td>
<td>CHIEF</td>
<td>CMS0445</td>
</tr>
<tr>
<td>Projector Security Mount</td>
<td>BMS</td>
<td>LCD LOC II DD</td>
</tr>
<tr>
<td>Projection Screen</td>
<td>DA LITE</td>
<td>HDTV HEAVY DUTY MODEL C 79882</td>
</tr>
<tr>
<td>Wall Mount Brackets</td>
<td>DA LITE</td>
<td>40932 #6 White</td>
</tr>
<tr>
<td>Presentation Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Camera</td>
<td>ELMO</td>
<td>P100</td>
</tr>
<tr>
<td>DVD/VHS Combo Player</td>
<td>SONY</td>
<td>RDRVX560</td>
</tr>
<tr>
<td>Desktop PC</td>
<td>DELL</td>
<td>Optiplex 760 SFF</td>
</tr>
<tr>
<td>Interactive Pen Display/Annotation</td>
<td>SMART TECHNOLOGIES</td>
<td>SYMPODIUM ID370</td>
</tr>
<tr>
<td>Laptop and USB Connections</td>
<td></td>
<td></td>
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<tr>
<td>Audio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair Audio Speakers</td>
<td>EXTRON</td>
<td>SI 26CT</td>
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<tr>
<td>Media Control</td>
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<tr>
<td>Media Control Link</td>
<td>CRESTRON</td>
<td>MPS 100</td>
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<tr>
<td>Media Control user interface</td>
<td>CRESTRON</td>
<td>C2N-FT-TPS4-B</td>
</tr>
<tr>
<td>QuickMedia Receiver</td>
<td>CRESTRON</td>
<td>QM-RX</td>
</tr>
</tbody>
</table>
### B. Variations from this list of equipment shall be pre-approved by USF IT department.

### PART 3 - EXECUTION

#### 3.1 EXECUTION OF THE WORK

A. General: See specification section 274100 PART 3, for execution of work requirements supplemented by this specification section.

B. Programming. Programming for the control system for this type of room will be provided by the owner unless specifically requested by the program of the project.

C. All equipment in this type of classroom shall be located in the teaching lectern.

D. Projectors shall be installed using a projector ceiling plate that replaces a 2"x2" ceiling tile. Ceiling plates shall be installed per manufacturer’s recommendation.

E. Sound-reinforcement for this type of room is not required, neither the use of a microphone for the teacher.

F. In this type of room assisted listening devices does not need to be permanently installed in the classroom. Portable units are acceptable.

G. Computers for teaching lecterns will be provided by the owner in this type of classrooms.

H. UPS is not required for this type of classrooms.

I. Integration between the lighting system and the audio visual system is not required, but wall switches shall be located close to the lectern location.

#### 3.2 TESTING

A. General: Because in this type of rooms the programming of the system is done by the owner, the AVS installer does not need to test all the systems, but the installer of these rooms shall
be available during the testing done by the owner to solve any problems associated with the installation of the equipment encountered by the owner during the testing process.

3.3 TRAINING

A. SYSTEM ADMINISTRATION TRAINING. The installer of the systems part of this specification section shall provide four (4) hours of system administration training.

B. USER TRAINING. The installer of the systems part of this specification does not need to provide user training

END OF SECTION 274110
SECTION 274115

LARGE CLASSROOM AUDIO/VISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: The General Requirements, Conditions of the Contract, these Specifications, Drawings, Addenda and Contract Modifications (the Contract Documents), and definitions of legal entity (such as Contract, Installer, Engineer, Owner, etc…) shall apply to the work of this specification section.

B. Supplemental: Refer to specification section 274100 PART 1 for additional requirements, which are supplemented by this section.

1.2 SCOPE OF WORK (SOW)

A. General: A large classroom is considered an open use environment classroom used for more than 60 students.

B. General: The scope of work for the installer of these rooms is to provide and install all equipment and wiring for the large classrooms. Programming for these rooms is provided by the installer.

C. The following is a list of large classrooms where Audio Visual system shall be provided in this project:

List all rooms.

D. Consumables: The Audio Visual System (AVS) Installer shall provide as part of the scope the following consumable devices:

1. 10% of lamps for each type of projector used the projects.

1.3 ARCHITECTURAL CONSIDERATIONS

A. General: AVS designers shall provide architectural recommendations for this type of rooms in the project. These recommendations shall include room layout, lighting and acoustics.

B. Tier seating. Tier seating is not required but highly recommended specially in room with over 100 seats.

C. Projection system. The preferred projection system for this type of rooms is front projection

D. Screen quantity. This type of rooms only requires one screen but double screens are highly recommended.

E. Three point lighting is recommended for this type of rooms. The intent of the 3 point to achieve a good audio/visual experience during presentation mode. The types of lights are:
1. Regular fluorescent lights with wide dispersion (direct recessed or indirect pendants). These fixtures are intended to be used during test, classes that don’t require the use of the projector or for clean-up.repairs mode for staff. These lights do not require two levels unless for some reason the down lights are not possible in the classroom. There is no need to zone these lights because during presentation mode all these fixtures will be turned off.

2. Dimmable down lights. These fixtures are intended to be used during presentation mode. The purpose of these fixtures is to provide a minimum level of lighting for the students to take notes and to provide a safe way to egress the room. The dimmable feature will allow for adjustment of the light levels to an acceptable level. The dimmers on this system shall be controllable dimmers so they can be integrated to the AV system.

3. Presenter lighting. When this type of room has classroom capture cameras (CC) or video teleconference cameras (VTC), it is recommended to provide a directional light at the presenter to improve the quality of the recording. This type of light should be aimed at 45° angle to the presenter to avoid blinding the presenter and also to avoid hitting the projection screen with direct light from this source. These fixtures do not need to be dimmable, but should be controllable from a control system integrated also to the AVS. All different types of lamps should have the same or very similar color temperature to have a uniform look and feel. This type of light should be aimed not only at the podium location but also along the front of the classroom, to keep the effectiveness when the presenter decides to move away from the podium.

F. Acoustical considerations. This type of rooms will use program speakers separated from sound reinforcement speakers, but because of the volume level of main program speakers it is recommended to use some form of acoustical treatment on the walls to avoid undesirable sound reflections. Sound modeling for this type of rooms is a nice to have but not a requirement.

1.4 ROOM AUDIO/VISUAL FUNCTIONALITY

A. General: Room Audio/visual functionality shall be as described in the current standard program for the control processor installed in most classrooms of this type. It is the intent of the USF IT department to keep this functionality as uniform as possible to reduce training time for teachers and support staff.

PART 2 - PRODUCTS

2.1 APPROVED PRODUCTS

A. General: The following is the list of equipment currently approved by USF for this type of classroom:

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Projector</td>
<td>PANASONIC</td>
<td>PT-D4000U</td>
</tr>
<tr>
<td>Lens</td>
<td>PANASONIC</td>
<td>ET-DLE350</td>
</tr>
<tr>
<td>Projector Ceiling Plate</td>
<td>CHIEF</td>
<td>CMS0445</td>
</tr>
</tbody>
</table>
PART 3 - EXECUTION

3.1 EXECUTION OF THE WORK

A. General: See specification section 274100 PART 3, for execution of work requirements supplemented by this specification section.

B. Programming. Programming for the control system for this type of room will be done by the installer but USF IT will provide a base code to be used as a starting point to program these
rooms. Additional features requested by the specific room program will have to be programmed by the installer.

C. All equipment in this type of classroom should be located in the teaching lectern, but additional racks with equipment could be required for some rooms. If additional racks are required, it is recommended these racks be located outside of the classrooms to be able to service them without disrupting the class.

D. Projectors shall be installed using a projector ceiling plate that replaces a 2”X2” ceiling tile. Ceiling plates shall be installed per manufacturer’s recommendation.

E. Sound-reinforcement speakers and program speakers are required for this type of room. These speakers shall be wired through an external amplifier. Program speakers shall only play program audio, sound reinforcement speaker shall play a mix of program audio and microphone outputs.

F. Microphones. At a minimum one wireless microphone is required for the presenter, but depending on the program additional microphones could be required like choir microphones or array microphones (acoustic magic) for audience participation during VTC. If more than one microphone is required in these rooms, it is highly recommended to have a DSP processor to provide mixing and filters to enhance the quality of the audio...

G. In this type of room assisted listening devices shall be permanently installed in the classroom.

H. Computers for teaching lecterns will be provided by the owner in this type of classrooms.

I. UPS is required for this type of classrooms with monitoring capabilities through the RAMS.

3.2 TESTING

A. General: Testing for this type of room shall be done by the installer and reviewed by the owner and design engineer. For this type of rooms all testing requirements described in 274100 shall be followed.

3.3 TRAINING

A. SYSTEM ADMINISTRATION TRAINING. The installer of the systems part of this specification section shall provide four (4) hours of system administration training.

B. USER TRAINING. The installer of the systems part of this specification shall provide at least six (6) hours of user training in two (2) different sessions.

END OF SECTION 274115
SECTION 274120

CONFERENCE ROOM AUDIO/VISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: The General Requirements, Conditions of the Contract, these Specifications, Drawings, Addenda and Contract Modifications (the Contract Documents), and definitions of legal entity (such as Contract, Installer, Engineer, Owner, etc…) shall apply to the work of this specification section.

B. Supplemental: Refer to specification section 274100 PART 1 for additional requirements, which are supplemented by this section.

1.2 SCOPE OF WORK (SOW)

A. General: This specification applies to conference rooms or collaboration rooms smaller than 400 sqft.

B. General: The scope of work for the installer of these rooms is to provide and install all equipment and wiring for the conference rooms. Programming for these rooms is provided by the installer.

C. The following is a list of conference rooms where Audio Visual system shall be provided in this project:

List all rooms.

D. Consumables: The Audio Visual System (AVS) Installer shall provide as part of the scope the following consumable devices:

   1. 10% of lamps for each type of projector used the projects.

1.3 ARCHITECTURAL CONSIDERATIONS

A. General: AVS designers shall provide architectural recommendations for this type of rooms in the project. These recommendations shall include room layout, lighting and acoustics.

B. Tier seating. Tier seating is not recommended.

C. Projection system: The preferred projection system for this type of room is a flat panel displays with speakers and tuner, not smaller than 55”. A front projection system shall only be used in this type of rooms if the LFV rule is not being met with a large flat panel display commercially available and project viable (budget).

D. Flat panel display quantity. This type of rooms only requires one flat panel displays. Dual displays are not required unless the specific program request this functionality.
E. Lighting. If flat panel display will be used in this type of rooms, no special considerations are required for lighting with the exception of avoiding locating the display devices on a wall that is subject to direct sun light. If the room will have a front projection system a two point lighting system is recommended for this type of rooms. The intent of the 2 point to achieve a good audio/visual experience during presentation mode. The types of lights are:

1. Regular fluorescent lights with wide dispersion (direct recessed or indirect pendants). These fixtures are intended to be used during test, classes that don’t require the use of the projector or for clean-up/repairs mode for staff. These lights do not require two levels unless for some reason the down lights are not possible in the classroom. There is no need to zone these lights because during presentation mode all these fixtures will be turned off.

2. Dimmable down lights. These fixtures are intended to be used during presentation mode. The purpose of these fixtures is to provide a minimum level of lighting for the students to take notes and to provide a safe way to egress the room. The dimmable feature will allow for adjustment of the light levels to an acceptable level. The dimmers on this system shall be controllable dimmers so they can be integrated to the AV system.

F. Acoustical considerations. This type of rooms will use only program speakers. Program speakers are recommended to be built-in or an accessory to the flat panel displays. Sound modeling for this type of rooms is not required.

G. Equipment racks. It is very likely the AVS in this type of rooms requires the use of rack mounted AV equipment. The preferred location for this equipment is inside the room in a small rack. See specification section 274100 for additional information on racks inside rooms, casework or credenzas.

H. Flip top devices: As a preference user interface plates shall be located in the table and not in the wall. Interface plates in the table are preferred to be installed in a flip top device. The interface plate shall have as a minimum the following connections:

1. One (1) HDMI
2. One (1) Composite video connector and stereo audio in RCA connectors
3. One (1) VGA connector and stereo audio. VGA connector in a HD15 connector and audio in a 3.5 mm stereo connector.

1.4 ROOM AUDIO/VISUAL FUNCTIONALITY

A. General: Room Audio/visual functionality for this type of rooms varies depending on the final use of the room. This functionality needs to be defined with the users and needs to be indicated in the specifications. As a minimum the following features shall be available in the control system:

2. Individual display device on/off control with status indication.
3. Select and route any audio and video source to any of the available audio and video output devices. Each output device shall provide indication in the user interface of the current source selected for that output.
4. Playback control of any recorded media capable of operating in the available input sources. Status indication for playback control include end of tape indication, selected
function and invalid action. The playback control shall at least provide the following functions:

a. Play
b. Stop
c. Rewind
d. Forward
e. Fast Rewind
f. Fast Forward
g. Pause
h. Frame by frame controlled playback
i. Digital media Menu navigation controls.

5. TV channels selection. TV channel selection shall be provided by the following methods:

a. Manual entering channel number
b. Pick from a list of ten (10) favorite channels. Favorite channels shall be labeled by the name of the network and the channel number. The owner will provide list of favorite channels for this room.
c. Channel up and down, by moving up or down in the list of available channels.

6. Selected audio output device(s) volume control. Volume level should always be set to an acceptable user level during power up. Status indication of volume level shall be provided for each controllable output device.

7. Selected audio output device(s) volume mute. Mute status indication shall be provided at user interfaces.

8. Audio settings control including equalization control
9. Individual control and status indication of all features for all controllable devices
10. Video mute for display output devices.
11. Display automation. Motorized Screen shall follow the operation status of the projector, regardless if the manual switch to the screen has been used to operate the screen. When the projector is on the screen shall be down and when the projector is off the screen shall be pulled up.

B. Additional functionality shall be identified with the users and the USF project manager.

PART 2 - PRODUCTS

2.1 APPROVED PRODUCTS

A. General: There is no specific list of equipment to be used in this room. Designer shall recommend equipment for this type of room.

PART 3 - EXECUTION

3.1 EXECUTION OF THE WORK

A. General: See specification section 274100 PART 3, for execution of work requirements supplemented by this specification section.

B. Programming. Programming for the control system for this type of room will be done by the installer.
C. Projectors shall be installed using a projector ceiling plate that replaces a 2”X2” ceiling tile. Ceiling plates shall be installed per manufacturer’s recommendation.

D. Program speakers are required for this type of room. These speakers shall be powered form the flat panel display.

E. In this type of room assisted listening devices are not required permanently installed in the room.

F. UPS is not required for this type of room but power strips are required with surge suppression.

3.2 TESTING

A. General: Testing for this type of room shall be done by the installer and reviewed by the owner and design engineer. For this type of rooms all testing requirements described in 274100 shall be followed.

3.3 TRAINING

A. SYSTEM ADMINISTRATION TRAINING. The installer of the systems part of this specification section shall provide four (4) hours of system administration training.

B. USER TRAINING. The installer of the systems part of this specification shall provide at least six (6) hours of user training in two (2) different sessions.

END OF SECTION 274120
SECTION 274125

CONFERENCE ROOM WITH VTC AUDIO/VISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: The General Requirements, Conditions of the Contract, these Specifications, Drawings, Addenda and Contract Modifications (the Contract Documents), and definitions of legal entity (such as Contract, Installer, Engineer, Owner, etc…) shall apply to the work of this specification section.

B. Supplemental: Refer to specification section 274100 PART 1 for additional requirements, which are supplemented by this section.

1.2 SCOPE OF WORK (SOW)

A. General: A conference room with VTC is a regular conference room where video conference equipment will be installed on a permanent basis. There is no specific size for this type of room, the only criteria are that it is a meeting room (or small classroom) and it has videoconference permanently installed.

B. General: The scope of work for the installer of these rooms is to provide and install all equipment and wiring for the conference room with VTC. Programming for these rooms is provided by the installer.

C. The following is a list of conference rooms with VTC where Audio Visual system shall be provided in this project:

   1. List all rooms.

D. Consumables: The Audio Visual System (AVS) Installer shall provide as part of the scope the following consumable devices:

   1. 10% of lamps for each type of projector used in the projects.

1.3 ARCHITECTURAL CONSIDERATIONS

A. General: AVS designers shall provide architectural recommendations for this type of rooms in the project. These recommendations shall include room layout, lighting and acoustics.

B. Table. For conference room, it is highly recommended to use table shapes suitable for videoconference systems. Those table shapes include “V” shapes or “C” shapes. These shapes improve visibility of all participants in the video conference system. Avoid as much as possible tables with rectangular form.

C. Projection system. The preferred projection system for conference rooms is dual flat panel displays no smaller than 65” diagonal, installed side by side. These displays shall not be mounted higher than 6” from the top of the table, to the bottom of the displays. For
classrooms, dual front projection system and a rear flat panel display for the presenter to see the far side.

D. VTC Camera installation: For meeting rooms, the recommended location for the VTC camera as in between the flat panel displays, above the unit. For classrooms, two cameras are recommended, one for the audience and one for the presenter, installed one in the front and one in the back of the room.

E. Depending on the room size, different types of lights are recommended. For small conference rooms (less than 250 sqft) one type of lighting is recommended. For larger rooms or classrooms (greater than 250 sqft) additional lighting types might be required. As a minimum all conference rooms shall have:

1. VTC lighting. Room shall be layout with fixtures designed specifically for Video Tele Conference. These fixtures are recessed fluorescent fixtures with a reflector shaped to reproduce an effect similar to studio lights. These fixtures throw light at a 45° angle, rather than straight down. It is suggested to position them so that each is mounted far enough in front of a seating position that the angled light falls on the occupant's face, and spaced so that there is a fixture at about 45° to each side of user. These fixtures are not required to be dimmable but are recommended to have 2 levels at least. No specific zoning is required also, a single zone is sufficient.

F. For larger rooms different types of lights shall be provided depending on the room layout and size of the conference table. The designers shall indicate what other type of lights are required for these rooms. Additional lights shall have the same color temperature as the VTC lighting.

G. For the area covering the conference table the following additional lighting requirements shall be followed:

1. There shall be no more than a 10:1 contrast between the lightest and darkest areas in the room – and no more than a 1.5 to 1 contrast between the overall illumination on one person's face and the next. The light levels in the participant's face shall be between 30 to 50 foot-candles.

2. Lamps on these fixtures shall have a color temperature between 3000 - 3500° K and a CRI of 80 or above.

H. Window shades. This type of rooms shall have black out window shades to control ambient lighting in the room. When the specific program requires electric shades, those shades shall be interface and controlled through the AVS.

I. Acoustical considerations. This type of rooms will use program speakers separated from sound reinforcement speakers, but because of the volume level of main program speakers it is recommended to use some form of acoustical treatment on the walls to avoid undesirable sound reflections. Sound modeling for this type of rooms is a nice to have but not a requirement.

1.4 ROOM AUDIO/VISUAL FUNCTIONALITY
A. General: The features for this type of rooms shall be identified and approved with the project manager for USF. There is no specific list of equipment required for these rooms, but there are certain guidelines that shall be followed.

B. Microphones: For small rooms voice tracker array microphones (by acoustic magic) are recommended. For larger rooms boundary microphones in the tables or choir microphones for the audience could be required. The intent is that in these types of rooms all participants (presenter and audience) have means to collaborate during the video conference.

C. When several microphones are located in the room, the use of a separate DSP processor is required. DSP filters shall be set for optimum use during VTC, including acoustic echo cancellation.

D. User interfaces shall be a touchscreen no smaller than 8”. For meeting rooms, a wireless or wired touchscreen on top of the table is preferred. For classrooms a wired touchscreen in the podium is preferred.

E. When front projection is used for this type of rooms, designer or consultant shall try to use as much as possible the same type of equipment used in the small classrooms or large classrooms, to minimize the spare part inventory for the owner. In particular, the projectors shall be the same unless there are specific reasons why this can be achieved.

F. It is common to see in this type of rooms annotation devices. For small rooms or meeting rooms a smart board or an overlay on one of the flat panel displays is acceptable. For larger rooms or classrooms a presenter based system is acceptable, like a touchscreen device or an interactive pen displays (i.e. Sympodium®). Interactive pen displays shall be specified capable of handling HD signals.

G. Signal types. Because of the high proliferation of high definition system, it is highly recommended that the systems specified for this type of room be capable of managing high definition digital signals, including DVI, HDMI and Display Port.

PART 2 - PRODUCTS

2.1 APPROVED PRODUCTS

A. General: See specification section 274100 PART 2.

B. A detailed list of equipment shall be presented to the owner for approval.

PART 3 - EXECUTION

3.1 EXECUTION OF THE WORK

A. General: See specification section 274100 PART 3, for execution of work requirements supplemented by this specification section.

B. Programming. Programming for the control system for this type of room will be done by the installer.
C. When this type of room is a classroom all equipment in this type of classroom should be located in the teaching lectern, but additional racks with equipment could be required for some rooms. If additional racks are required, it is recommended these racks be located outside of the classrooms to be able to service them without disrupting the class. For meeting rooms,

D. Projectors shall be installed using a projector ceiling plate that replaces a 2"X2" ceiling tile. Ceiling plates shall be installed per manufacturer’s recommendation.

E. Sound-reinforcement speakers and program speakers are required for this type of room. These speakers shall be wired through an external amplifier, or for smaller rooms they could be part of the flat panel displays. Program speakers shall only play program audio, sound reinforcement speaker shall play a mix of program audio and microphone outputs.

F. For conference room set up mix-minus systems are highly recommended.

G. For classrooms with capacity larger than 50 students assisted listening devices shall be permanently installed in the classroom.

H. Computers for teaching lecterns will be provided by the owner in this type of classrooms.

I. UPS is required for this type of classrooms with monitoring capabilities through the RAMS.

3.2 TESTING

A. General: Testing for this type of room shall be done by the installer and reviewed by the owner and design engineer. For this type of rooms all testing requirements described in 274100 shall be followed.

3.3 TRAINING

A. SYSTEM ADMINISTRATION TRAINING. The installer of the systems part of this specification section shall provide twelve (12) hours of system administration training.

B. USER TRAINING. The installer of the systems part of this specification shall provide at least six (6) hours of user training in two (2) different sessions.

END OF SECTION 274125
SECTION 274134

BROADBAND DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Supplemental: Refer to the specification sections identified below for additional requirements, which are supplemented by this section.

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>270010</td>
<td>TECHNOLOGY GENERAL PROVISIONS</td>
</tr>
<tr>
<td>270528</td>
<td>PATHWAYS FOR COMMUNICATION SYSTEMS</td>
</tr>
<tr>
<td>270526</td>
<td>GROUNDING &amp; BONDING FOR COMMUNICATIONS SYSTEMS</td>
</tr>
</tbody>
</table>

1.02 SCOPE OF WORK (SOW)

A. For designers or consultants: The scope of work for designers or consultants shall include to a minimum the following tasks:

1. Define system topology, including routing of backbone cables, cable types and location of all active and passive components of the system.
2. Defining the interface to the existing head end system.
3. Prepare initial calculations for the complete system to accomplish the required output at all outlets. These calculations shall produce as a conclusion tap values, equalizer values and location of amplifiers in the system.
4. Establishing the scope of work for the installer and composing the complete set of bid documents (design drawings and specifications).
5. Review shop drawings and answer RFIs
6. Test the system with the installer after completion and verify close-out information.

B. For installers: The scope of work for the CATV installers shall include to a minimum the following tasks:

1. Produce shop drawings
2. Provide and install all cabling passive and equipment (active and passive) per designer’s specifications.
3. Adjust and test the system.
4. Provide training and close out information as indicated in the specifications.

1.03 DEFINITIONS

A. Agile Receiver: A broadband receiver that can be tuned to any desired channel.
B. Broadband: For the purposes of this Section, wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz. A broadband communication system can simultaneously accommodate television, voice, data, and many other services.

C. Carrier: A pure-frequency signal that is modulated to carry information. In the process of modulation, it is spread out over a wider band. The carrier frequency is the center frequency on any television channel.

D. CATV: Community antenna television; a communication system that simultaneously distributes several different channels of broadcast programs and other information to customers via a coaxial cable.

E. CEA: Consumer Electronics Association.

F. dBmV: Decibels relative to 1 mV across 75 ohms. Zero dBmV is defined as 1 mV across 75 ohms. dBmV = 20 log 10(V1/V2) where V1 is the measurement of voltage at a point having identical impedance to V2 (0.001 V across 75 ohms).

G. Headend: The control center of the master antenna television system, where incoming signals are amplified, converted, processed, and combined into a common cable along with any locally originated television signals, for transmission to user-interface points. It is also called the "Central Retransmission Facility."

H. RF: Radio frequency.

1.04 DESCRIPTION

A. Broadband Distribution Systems shall provide distribution of video, television signals to all selected spaces in the buildings. The system design anticipates increasing demands for expanded channel capacity. The system shall include, but not be limited to passive and active infrastructure like distribution amplifiers, directional couplers, taps and splitters as required to achieve a fully functional system.

B. Topology at University of South Florida (USF). Currently USF has a CATV headend system located in Argos Hall in the main campus. This headend system is operated by Privatel. It is the intent of USF of distribute CATV signals from this location to new and renovated buildings on main campus. A signal feed will be provided from Argos Hall to the new project. It is the responsibility to each project to select, specify and install the required fiber optic equipment to get the signal to the new project. Requirements for connection to external service providers shall be discussed in every project.

C. Standards: Distribution system components and overall system performance shall meet or exceed requirements set forth in Federal Communications Commission Technical Specifications Title 47, Part 76 as applied to cable television systems.

D. RFI: Special emphasis shall be placed on radio frequency interference (RFI) integrity as licensed radio services outside the cable system share the same frequencies designated for use within.
E. Distribution of direct broadcast satellite service signals. Whenever a project requires the use of satellite distribution signals, the designer of the system shall coordinate with the owner the location of satellite dishes and the architecture for this system.

1.05 SERVICES SUPPORTED

A. The system configuration will allow the forward distribution of analog and digital channels available in the existing headend.

B. The system bandpass shall allow for the following channel loading and forward distribution:
   1. One hundred and twenty nine (129) channels from 47 MHz to 860 MHz.

C. The system shall allow for a return path with a loading of 3 channels from 5 MHz to 42 MHz.

1.06 INSTALLER QUALIFICATIONS

A. Qualifications: The CATV installer installing this system shall be experienced in the design, installation, proof-of-performance testing and maintenance of broadband cable television systems comparable or larger in size and complexity to the system required on this project. Such experience shall be indicated in a list of successfully completed systems with the submittal for this system. Contact names and addresses for all references shall be provided.

B. Equipment: The CATV installer executing this work shall own and maintain at least the following equipment for execution and maintenance of this system:
   1. A CATV signal level meter capable of measuring levels between 5 and 1000 megahertz. For example Blonder Tongue BTPDA-2
   2. A flat noise generator or sweep/marker generator capable of providing a calibrated output between 5 and 1000 megahertz.
   3. An oscilloscope with a suitable RF detector for use in sweep testing system response.
   4. A return loss bridge and variable termination for on-site cable sweep testing prior to installation.
   5. A time domain reflectometer designed for operation into 75-ohm polyethylene dielectric cable for verification of installed cable.
   6. Composite test sets, simul-sweep equipment and other test systems capable of providing the required functions shall be considered equivalent to the equipment specified.
   7. A stripping/coring tool appropriate for 0.500" hardline cable or larger cables.

C. Resume: A resume of personal cable television experience shall be submitted for the cable foreman, each splicer, each technician, and the system design engineer.

1.07 SUBMITTALS
A. The CATV installer shall submit the following information as part of the shop drawing submittal process:

1. Cut sheet of all devices to be provided as part of this systems. When multiple devices are in the same cut sheet, the installer shall highlight the specific part number to be used.
2. Resumes of installer that will perform the job, with their experience in this type of systems.
3. Cut sheet of labels to be used in the system and a labeling scheme.
4. A list of all testing equipment owned by the installer as requested in this specification. The list shall include all make and model number of all devices and the last time they were calibrated.
5. Drawings indicating all outlets in the project, with cable distances included types of cables and how they are connected to the backbone system. The drawings shall include all pad and equalization calculations to the input of all amplifiers in the system.

B. For quantities of submittal see Division 1 requirements. In all cases no less than 4 copies shall be submitted for approval.

1.08 GENERAL SYSTEM PARAMETERS

A. Devices and products described below may or may not be required for the overall design. If such devices are required in the course of this project to achieve the design distribution parameter, the installer shall provide such devices as a part of their design solution and said devices shall be included as part of the installers package in the bid. These items would include those listed below as well as splitters, taps, couplers and pads.

B. The CATV installer shall be familiar with the ANSI/SCTE standards and shall follow those standards during the installation process.

C. Amplifiers: In most cases, the output from the amplifier shall be adequate for building distribution. However in larger building distribution systems, additional amplifiers will possibly be required. If such is the case, Input pad and equalizers shall be provided to compensate for short spacing and cable slope, respectively. Outputs shall be adjusted to the rated sloped output of the amplifier selection (typically 36 dBMV to 44 dBMV or rated output by equipment manufacturer) at the selected frequency range indicated in this specification section.

D. Output: All outlets shall provide a minimum output of between +3 dBMV and +10 dBMV for the complete frequency range specified in this section.

E. Minimum acceptable distribution system performance at all outlets shall be as follows:

1. RF Video Carrier Level: Between 3 and 12 dBMV.
2. Relative Video Carrier Level: Within 3 dB to adjacent channel.
3. Carrier Level Stability, Short Term: Level shall not change more than 0.5 dB during a 60-minute period.
4. Carrier Level Stability, Long Term: Level shall not change more than 2 dB during a 24-hour period.
5. Channel Frequency Response: Across any 6-MHz channel in 54- to 220-MHz frequency range, referenced to video, signal amplitude shall be plus or minus 1 dB, maximum.

6. Carrier-to-Noise Ratio: 45 dB or more.

7. RF Visual Signal-to-Noise Ratio: 43 dB or more.

8. Cross Modulation: Less than minus 50 dB.

9. Carrier-to-Echo Ratio: More than 40 dB.

10. Composite Triple Beat: Less than minus 53 dB.

11. Second Order Beat: Less than minus 60 dB.

12. Terminal Isolation from Television to Television: 25 dB, minimum.


15. RF FM Carrier Level: 13 to 17 dB below video carrier level.

16. FM Frequency Response: More than the 88- to 108-MHz frequency range, signal amplitude is plus or minus 0.75 dB, maximum.

17. FM Carrier-to-Noise Ratio: More than 24 dB.

F. RF Leakage: Radio frequency leakage into the system shall be in compliance of all FCC rulings and regulations.

G. Delay: Combined reverse and forward path chroma delay, as measured at the most distant bridged port, to the headend and or main distribution point in the building and back, shall not exceed 28 nanoseconds.

PART 2 - PRODUCTS

2.01 DISTRIBUTION AMPLIFIERS (NOT AT HEAD END)

A. This amplifier shall be used only in the distribution system and shall have the following specifications:

1. Frequency Range: As stated in paragraph 1.5. B of this section
2. Forward gain: 43dB
3. Gain Control Range: Greater or equal to10dB
4. Slope Control Range: Greater or equal to 8dB
5. Input Return Loss: Greater or equal to 16dB
6. Noise Figure: Greater or equal to 7dB
7. Required output Level: 36/44 dBmV,
8. Hybrid technology: Power doubling
9. Input/Output Test Point Level: -30dB

B. Design Selection: Blonder Tongue BIDA 5900 series, or approved equal with required pads and equalizers.

2.02 PASSIVE DEVICES

A. All passive devices shall have a minimum bandwidth of 5 to 1000 MHz.
B. Splitters for drops or backbones designed with RG-6 or RG-11 lines: Splitters shall be Blonder Tongue SXRS-2, 3, 4 & 8 as required by the system configuration.

C. Directional Couplers for drops or backbones designed with RG-6 or RG-11 lines: shall be Blonder Tongue SRT series, with dB TAP setting as required by the system configuration.

D. Splitters for backbones designed with PIII-500 or bigger diameter cable: shall be Toner TGSP series as required by the system configuration.

E. Directional couplers for backbones designed with PIII-500 or bigger diameter cable: Shall be Toner TGDC series as required for the system configuration.

F. Multi-taps shall be Toner Total tap with 3 or 6 tap housings as indicated by the system configuration. Tap values and quantity of tap ports as indicated in system configuration.

G. Equalizer. Equalizer shall be mounted in the tap housings and shall be a Toner TXMT plate. Equalizers could be mounted also inside distribution amplifiers. The value to equalize shall be as indicated in system configuration.

2.03 OUTLETS

A. The television outlet shall provide (1) "F" type barrel connector mounted alone or with other audio/visual system connectors on a common face plate. Outlets shall be mounted as indicated on the documents, or as otherwise indicated and directly in line with the proposed television location. Coordinate final location based upon provided drawings and coordination with the Owner. A three wire grounded, 120 VAC power outlet shall be located adjacent to the television outlet and be provided by owner selected Division 26 Installer. Coaxial cable shall be provided by the CATV installer to each outlet location indicated on the drawings. Conduit and boxes shall also be provided according to specifications section 270528. Coordinate location with electrical installer if not already provided at time of installation of this work.

B. Design selection: F- connector with a single barrel connector to match (faceplate style and color) de design selection of the structured wiring system as described in specification section 271000.

2.04 VIDEO DISTRIBUTION CABLE

A. Structural Return Loss Testing: All cable shall be 100% swept tested. Return loss shall not be less than 23dB at any given frequency between 5MhZ and 1000MhZ.

B. Construction: Cable shall be constructed of a copper clad steel or solid copper center conductor, gas expanded cellular polyethylene dielectric, multiple aluminum braided shields, and an overall jacket. All cables shall have characteristic impedance of 75 Ohms.

C. Attenuation: Attenuation characteristics in decibels per 100 feet at 20°C shall not deviate more than 10% from the following values:

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>RG-6</th>
<th>RG-11</th>
<th>PIII-500</th>
</tr>
</thead>
</table>

Broadband Distribution System
### Broadband Distribution System

#### (MHz)

<table>
<thead>
<tr>
<th>MHz</th>
<th>0.57</th>
<th>0.36</th>
<th>0.16</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1.5</td>
<td>0.95</td>
<td>0.54</td>
</tr>
<tr>
<td>55</td>
<td>2.87</td>
<td>1.81</td>
<td>1.09</td>
</tr>
<tr>
<td>211</td>
<td>3.43</td>
<td>2.17</td>
<td>1.31</td>
</tr>
<tr>
<td>300</td>
<td>4.0</td>
<td>2.53</td>
<td>1.53</td>
</tr>
<tr>
<td>400</td>
<td>4.28</td>
<td>2.69</td>
<td>1.63</td>
</tr>
<tr>
<td>450</td>
<td>4.76</td>
<td>3.01</td>
<td>1.82</td>
</tr>
<tr>
<td>550</td>
<td>5.62</td>
<td>3.58</td>
<td>2.16</td>
</tr>
<tr>
<td>750</td>
<td>6.09</td>
<td>3.9</td>
<td>2.35</td>
</tr>
<tr>
<td>870</td>
<td>6.54</td>
<td>4.23</td>
<td>2.53</td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**D.** RG-6 Cable: No 18 AWG solid bare copper conductor. Four layers of shield, two aluminum foil-polyester tape aluminum foil, one 60% aluminum braid and one 40% aluminum braid. NEC article 820. Jacket shall be suitable for the environment being installed.

**E.** RG-11 Cable: No 14 AWG solid bare copper center conductor. Two layers of shield, one aluminum foil-polyester tape aluminum foil and one 60% aluminum braid. NEC article 820. Jacket shall be suitable for the environment being installed.

**F.** PIII-500: 0.109" diameter copper clad center conductor. Solid aluminum tube swaged onto a high compression micro-cellular foam dielectric core. NEC article 820. Jacket shall be suitable for the environment being installed.

**G.** Indoor Cables: The following table indicates the design selection for all CATV cables.

<table>
<thead>
<tr>
<th>CABLE TYPE</th>
<th>GENERAL (CM)</th>
<th>RISER RATED</th>
<th>PLENUM RATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG-6</td>
<td>Belden 5339Q5</td>
<td>Use plenum rated cable</td>
<td>Belden 6339Q8</td>
</tr>
<tr>
<td>RG-11</td>
<td>Belden 1617A</td>
<td>Use plenum rated cable</td>
<td>Belden 1153A</td>
</tr>
<tr>
<td>PIII-500</td>
<td>Use riser rated cable</td>
<td>Commscope P3 500 JCAR</td>
<td></td>
</tr>
</tbody>
</table>

**H.** Outdoor Cables: When coaxial cables are to be installed outdoors or underground in conduit, they need to have a jacket with a water blocking compound.

**I.** RG-59 cable shall never be used for the distribution system.

**J.** For all fiber optic cables and connector for broadband distribution see specification section 271000. All connector for fiber optic cables shall be APC (Angled polished connectors) type connectors.

### 2.05 CONNECTORS AND ADAPTER

**A.** Site Cable Connectors: All connector shall be as recommended by the Cable manufacturer for the cable size and jacket of the cable.
B. Connectors for RG-6 cables. All connectors for RG-6 cable shall be one piece compression connectors with color coded sleeve. Design selection: Thomas&Betts, part number SNS1P6QS or equivalent.

C. Connectors for RG-11 cables. All connectors for RG-11 cable shall be one piece compression connectors with color coded sleeve. Design selection: Stirling, part number SPL-11 or equivalent.

D. Connectors for PIII-500 cables. All connectors for PIII-500 cable shall use a 5/8" 3 pin type connector. Design selection: Amphenol ACC-500-CHT10 or equivalent.

E. Adapters. The installer shall provide all adapters to connect all different cables listed above to an F type connector or a 5/8" 3 pin connector, as required in the design to make complete connections. Design selection: Amphenol ACC series or equivalent.

F. Crimping: All connectors shall be installed using the connector manufacturer’s recommended cutting, coring and pin crimping tools.

2.06 SURGE SUPPRESSION

A. All coaxial cables entering or exiting a building (above or below ground) shall be surge protected as required by NEC article 820.

B. All surge suppression devices shall be grounded with an AWG-12 isolated wire to the closest electrical ground.

C. All surge suppression devices shall be UL 497 listed, gas tube suppression, power passing and specifically designed for broadband network applications.

D. Design selection: TII in-line coaxial lighting surge protector 212FF757225-31

2.07 FIBER OPTIC BROADBAND TRANSMITTER

E. The fiber optic broadband transmitter (FOBT) shall be able to transmit broadband signals over a single mode fiber optic link and shall be able to accommodate a variety of different modulation formats such as AM/VSB, 8VSB, QAM, QPSK, etc. The FOBT shall use a high-power, low noise 1310 nm distributed feedback (DFB) laser diodes to transmit the signals.

F. The specifications of the FOBT shall be:

1. Channel loading: Same bandwidth as requested in part 1.5.B of this specification section.
2. Operating Wavelength: 1310 nm
3. Required Fiber Bandwidth: 1,000 Min. MHz
4. Input Return Loss: =>16 dB @ 75 Ohm
5. Back Reflection: -50 min. dB
6. Optical Output Power: as indicated in design documents.
7. RF Input Level (110 Ch. Load): + 18 dBmV/Ch
8. CNR (-1 dBm Input, 77 Ch. Load + QAM 550-860 MHz @ -6 dB Ref. Analog): ≥ 52 dB
9. CTB: ≥ 69 dB
10. CSO: ≥ -63 dB
11. Side Mode Suppression Ratio (SMSR): 30 dB
12. Fiber optic connector type: FC (APC)
13. Mounting: rack mounted with built in power supply.

G. Design selection: Blonder Tongue FIBT series or equivalent.

2.08 FIBER OPTIC BROADBAND RECEIVER AND AMPLIFIER

A. The fiber optic broadband receiver (FOBR) shall be able to receive broadband signals over a single mode fiber optic link and shall be able to accommodate a variety of different modulation formats such as AM/VSB, 8VSB, QAM, QPSK, etc. The FOBR shall have an included distribution amplifier built in.

B. The optical specifications of the FOBR shall be:

1. Channel loading: Same bandwidth as the FOBT.
2. Bandpass Flatness: 1.0 dB P/V
3. Operating Wavelength: 1310/1550 nm
4. Optical Input Range: -6.0 to +3.0 dBm
5. Output Impedance: 75 Ω
6. CNR -1 dBm Input, 40 Ch. Load: 56 dB
7. CNR -1 dBm Input, 79 Ch.+ Data: 55 dB
8. CNR -1 dBm Input, 110 Ch. Load: 54 dB
9. Input Connector: FC/APC

C. The specifications of the distribution amplifier part of the FOBR shall be:

1. Channel loading: Same bandwidth as the FOBT.
2. Impedance - All Ports: 75 Ohm
3. Return Loss Output: 16 dB
4. RF Gain: 43 dB
5. Test Port: -30, ±2 dB
6. Gain Control Range: 10 dB
7. Slope Control Range: 8 dB
8. Number Of Hybrids: 2
9. Hybrid Technology: Power Doubling
10. Channel Loading: same as described in part 1.4.B. of this specification section
11. Flatness ± 0.75 dB
12. Output Level (Low/High): 34/42 dBmV
13. Composite Triple Beat (CTB) -60 dB
15. Hum Modulation: -70 dB

D. Design selection: Blonder Tongue FRDA series.
2.09 FIBER OPTIC BROADBAND COUPLER

A. The fiber optic broadband coupler (FOBC) shall be a passive device capable of splitting a broadband signal modulated in a fiber optic signal to multiple outputs.

B. The specifications of the FOBC are:

1. Number Of Inputs: 1
2. Wavelength: 1310 & 1550 nm
3. Number of Outputs: As indicated in design drawings
4. Connectors: FC/APC

<table>
<thead>
<tr>
<th>Number of Outputs</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion Loss (Individual Port):</td>
<td>≤3.6 dB</td>
<td>6.0 dB</td>
<td>7.3 dB</td>
<td>9.7 dB</td>
<td>10.8 dB</td>
</tr>
<tr>
<td>Uniformity:</td>
<td>≤0.6 dB</td>
<td>1.0 dB</td>
<td>1.0 dB</td>
<td>1.0 dB</td>
<td>1.9 dB</td>
</tr>
<tr>
<td>Directivity:</td>
<td>≥ 50 dB</td>
<td>≥ 50 dB</td>
<td>≥ 50 dB</td>
<td>≥ 50 dB</td>
<td>≥ 50 dB</td>
</tr>
</tbody>
</table>

C. Design selection: Blonder Tongue FOC-22 series

PART 3 - EXECUTION

3.01 INSTALLATION PRACTICES

A. In Raceway: All cables shall be installed in raceways without kinks, dents, or abrasions. Specified pulling strength of cable shall not be exceeded.

B. Separation of Raceways: USF does not allow the use of raceways or cable trays design for structured cabling systems to be used for CATV distribution cables with the exception of fiber optic cables. Raceways for audio/visual system can be used for CATV distribution cables when required. Cable tray supports can be used as supports for hangers for CATV distribution cables.

C. Raceways for CATV outlets: Outlets for CATV cables shall be composed of a 4" square box with a single gang device adapter and a 1" conduit to the nearest accessible ceiling space.

D. All indoor rated cables can be supported with j-hooks or cable hangers above accessible ceiling spaces. J-hooks shall be spaced no longer than 4. Ft.

E. All indoor cables shall have no splices at any points.

F. Terminal Locations: Cables at terminal locations shall be neatly formed using a bending form to prevent kinks or other discontinuities. Cables showing evidence of abuse or physical damage shall be replaced at the installer's expense.

G. It is envisioned that television service will migrate into the overall telecommunications scheme for a given facility, therefore television distribution shall be accomplished via the following methods. In general, television distribution points shall be located throughout the facility such and all wiring shall be run back to the Telecommunication room where the connection to the Broadband distribution backbone will take place.
H. Location of CATV distribution equipment inside telecommunication rooms shall be closely coordinated with structured cabling system components.

I. All unused outputs of splitters, directional couples or distribution taps shall have a 75 ohm termination installed.

J. All unused cavities of the Toner Total Tap housing shall be filled with blank plates.

K. All equipment with a grounding lug shall be grounded as recommended by the equipment manufacturer to an acceptable grounding point as described by the NEC.

L. All amplifiers shall be used at the rated output. The installer shall provide the required equalization and attenuation pads for all amplifiers to operate at the rated output at only 80% of the maximum gain control of the unit.

M. Cable and equipment identifiers shall be provided and shall follow a standard labeling system like TIA/EIA-606. The identification system chosen by the CATV installer shall be submitted for approval.

N. The only approved types of labels for cables and devices part of the broadband distribution system are:
   1. Non-laminated thermal transfer labels, printed with a high quality thermal transfer printer.
   2. Laminated thermal transfer labels printed with a high quality thermal transfer printer.
   3. Thermal transfer polyolefin tape printed with a high quality thermal transfer printer.
   4. Self laminated dot-matrix labels, printed with a high quality dot matrix printer.
   5. Non-laminated dot-matrix labels, printed with a high quality dot matrix printer.
   6. Pre printed labels from marker books.

O. Any type of write-on labels, hand writing on cable jackets or directly on equipment, labels made with masking tape or any other type of tape not listed in previous paragraph are not acceptable and shall be corrected with approved labeling methods at no additional cost to the owner.

P. The installer shall use attenuator or adjustment for fiber optic equipment to ensure proper budget levels are getting to each receiver.

3.02 INSTALLATION OF CONNECTORS

A. Provisions: All connectors shall be installed in strict accordance with the manufacturers' instructions.

B. Residue Removal: All dielectric residues shall be removed from surfaces of center conductors to insure proper electrical contact.

C. Preparation: Semi-rigid cables shall have jacket removed to a length of 2" from the cable end to allow proper seating of connectors without scoring of the aluminum sheath. A tubing
cutter shall not be used for this purpose. All flooding compound shall be removed from the connector location with a suitable solvent.

D. Connections: All connections including terminations and connections on flexible cables shall be wrench tightened to insure RFI integrity.

E. Tooling: Cables shall be prepared to accept connectors using the manufacturer's recommended tooling.

F. Heat Shrink Boot: All cables containing flooding compound shall be provided with a heat shrink boot at all termination points which covers the housing connector boss, body of the connector and extends not less than 12" along the cable jacket. Heat shrink boot shall be of the filled type.

G. Splices: Cable splices below grade or in other locations shall be made according to manufacturers’ recommendations, tested, and covered with a filled heat shrink boot approximately 30" in length. Boot shall contain a resilient compound which melts as heat is applied and fills all voids between the shrink tube and cable jacket. Resin casts shall not be acceptable.

3.03 EQUIPMENT MOUNTING

A. Mounting: All remote terminal equipment (amplifiers, taps, couplers etc.) shall be neatly arranged and securely mounted. When installed above the ceiling all devices need to be in accessible places.

B. Integrity: All equipment housing hardware including amplifiers shall be wrench tightened to insure full RFI integrity.

3.04 SYSTEM ADJUSTMENTS

A. Installation: System design drawings are based on estimated distances between devices. The installer shall measure the exact cable footages between equipment locations and submit a revised drawing to the engineer for review containing the following:

1. Exact footage of each cable
2. Revised coupler and tap values
3. Revised equalizer and pad values

3.05 SYSTEM PERFORMANCE

A. General: Upon completion the system shall be adjusted, tested, and left in perfect operating condition.

B. Provisions: The system shall not exhibit any audible or visible components of hum, noise, or distortion.

C. Before the system acceptance test, the installer shall test all outlets in the system and document the result in a spreadsheet, called TEST RESULT REPORT (TRR). The TTR spreadsheets shall include the following information:
1. Project name and location
2. Day test was done (if done in different days, the report shall be broken in sections by
days the tests were done).
3. Name of the installer that performed the test
4. Serial number of the tester used.
5. For each outlet in the project the report shall include:
   a. Room number:
   b. Room name:
   c. Outlet number (with permanent label matching as-built drawings)
   d. Lowest channel - signal level (in dBmV)
   e. Mid bandwidth channel – signal level (in dBmV)
   f. Highest channel (as identified in part 1 of this specification) – signal level (in
      dBmV)
6. For each amplifier in the system the report shall include:
   a. Room number:
   b. Room name:
   c. Lowest channel - signal level (in dBmV, measured @ test port)
   d. Mid bandwidth channel – signal level (in dBmV, measured @ test port)
   e. Highest channel (as identified in part 1 of this specification) – signal level (in
      dBmV, measured @ test port)

3.06 SYSTEM ACCEPTANCE TEST

A. General: The Installer shall demonstrate the operation of the system to the Architect &
   Engineer (A&E) during the final inspection in the following manner:
   1. Measure signal levels with a calibrated field strength meter at outlets and or
      amplifiers selected by the A&E. At a minimum 5% of all outlets will be tested. The
      readings of the meter shall be between 1.5 dBmV of the value documented in the
      TRR
   2. Observe picture quality at outlets selected by the Engineer using a television
      receiver.

B. If at least one measurement fails, the A&E can request to the installer to test more outlets
   (beyond the 5% indicated previously) until the A&E is satisfied with the results. Any failures
   shall be corrected by the installer at no additional cost to the owner.

3.07 TEST EQUIPMENT REQUIRED

A. At a minimum during the acceptance test to the A&E the installer shall have the following
   equipment:
   1. TV Receiver: 17" minimum diagonal screen size color receiver in good working
      order.
   2. Signal Meter: Signal level meter capable of measuring peak carrier levels within the
      5 MHZ to 1000 MHZ spectrum. The signal meter shall be capable of downloading
      test results to a computer system or directly to a printer. Example: Sadelco
      DisplayMax 500 or similar. This signal meter needs to be the same tester used
3.08 TRAINING

A. The CATV installer shall provide training to the owner of the project.

B. Training shall only be done after the final acceptance test has been completed and passed as indicated in this specification. Any test done prior to final acceptance will not be accounted for the formal training requested and the installer shall re-do all training after the final acceptance test is passed, at no additional cost to the Owner.

C. The training shall include the following topics:

1. How to make connectors part of this system with the provided tools.
2. A walk-through of the facility pointing out the location of all active and passive equipment part of this system and showing to the owner the as-built drawings with matching labels for those pieces of equipment.
3. A complete training on the use of the test tool provided.

3.09 SPARE PARTS AND TOOLS

A. As part of this contract the installer of this system shall provide the following materials and tools:

1. Twenty (20) RG-6 connectors, same make and model as the units used in this project.
2. Five (5) 75 Ohm terminators (f connector)
3. One (1) 5/8” 75 Ohms terminator.
4. Two (2) surge protectors.

3.10 AS BUILT DRAWINGS AND CLOSE-OUT DOCUMENTATION

A. General: Complete system of as-built drawings shall be provided in AutoCAD (version as indicated in Division 1) and include the following information:

1. A block diagram of the entire system indicating all cable routing and lengths
2. Revised coupler and tap values for each cable drop
3. All cable types, active components, and passive components.
4. All equalizing and attenuating pads used for each amplifier.
5. All system settings.
6. All brands and part number of all devices shall be indicated in the drawings.
7. Location of each outlet and the unique label identifier of each outlet.
8. High/low signal level measured at each amplifier test port.
B. The CATV installer shall also provide as part of the close out information the following information:

1. A copy of the TRR signed approved by the A&E.
2. A copy of receipt of all spare parts and tools signed by the owner of the project.
3. A copy of the training attendance list indicating the names of all attendees.
4. A copy of all manufacturers’ warranties.

END OF SECTION 274134
SECTION 274135

LARGE VENUE AUDIO/VISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: The General Requirements, Conditions of the Contract, these Specifications, Drawings, Addenda and Contract Modifications (the Contract Documents), and definitions of legal entity (such as Contract, Installer, Engineer, Owner, etc…) shall apply to the work of this specification section.

B. Supplemental: Refer to specification section 274100 PART 1 for additional requirements, which are supplemented by this section.

1.2 SCOPE OF WORK (SOW)

A. General: A large venue audio/visual system shall consist of any space with an occupancy above 200 people. Among this type of rooms are Auditoriums, Theaters, large classrooms, multipurpose rooms, ballrooms, etc. This specification applies to all those rooms when audio/visual systems are required in those rooms.

B. Program: It is required for the designer or consultant for the project to establish an specific audio/visual program for all large venue spaces, in conjunction with the owner and the users. The intent of the program is to indicate exactly all uses of the room and all types of activities that can be done by the users with the room.

C. General: The scope of work for the installer of these rooms is to provide and install all equipment and wiring for the large venue rooms. Programming for these rooms is provided by the installer.

D. The following is a list of large venue rooms where Audio Visual system shall be provided in this project:

1. List all rooms.

E. Consumables: The Audio Visual System (AVS) Installer shall provide as part of the scope the following consumable devices:

1. 10% of lamps for each type of projector used the projects.

1.3 ARCHITECTURAL CONSIDERATIONS

A. General: AVS designers shall provide architectural recommendations for this type of rooms in the project. These recommendations shall include room layout, lighting and acoustics.

B. Line of sight. All rooms in the audience shall have a line of sight of the projection screens. See screen sizing considerations in specification section 274100.
C. Tier seating is highly recommended in this type of rooms.

D. Projection system. The preferred projection system for this type of room has to be determined with the owner and the users during the program phase. Single screen front projection systems are recommended for Auditoriums and Theaters.

E. Lighting for this type of spaces shall be planned carefully. A software model of the lights is highly recommended for this type of room, to verify lighting levels in aisles, and projections screens. The use of a centralized dimming system for these rooms is highly recommended. The light fixtures selected by designers shall address the following scenarios:

1. Clean-up or service lights, with 2X4 fluorescents or other high lumen output fixtures, non dimmable.
2. Dimmable down lights for notes or setting different scenes.
3. Stage lights for presenters and performers.
4. Step lights, for safety purposes at all steps.
5. Decorative sconces or wall washers.
6. For performing theaters or large auditoriums the use of a DMX system for stage lighting is recommended.

F. Window shades. This type of rooms shall have black out window shades to control ambient lighting in the room. When the specific program requires electric shades, those shades shall be interface and controlled through the AVS.

G. Acoustical considerations. Sound modeling for this type of room is highly recommended. Speaker shall be selected by designers with extreme care and balancing aesthetics and performance. Walls and ceilings are recommended to have acoustic treatment.

H. An AV room shall be considered for this type of spaces. Preferable located in the back of the rooms and with a view of the stage or the front of the room. When the program requires the use of a green room, communication between the AV room and the green room shall be installed as well as an audio and video feed from the stage or front of the room.

1.4 ROOM AUDIO/VISUAL FUNCTIONALITY

A. General: The features for this type of rooms shall be identified and approved with the project manager for USF. There is no specific list of equipment required for these rooms, but there are certain guidelines that shall be followed.

B. Microphones: Microphone connections from the stage shall be available in the AV room but also in the back of the room for a possible in audience console. Wiring for microphones shall be planned to be as flexible as possible, allowing for different microphone lay outs, and console locations.

C. User interfaces shall be a touchscreen no smaller than 8". Wireless touchscreen are highly recommended for this type of rooms.

D. Signal types. Because of the high proliferation of high definition system, it is highly recommended that the systems specified for this type of room be capable of managing high definition digital signals, including DVI, HDMI and Display Port.
PART 2 - PRODUCTS

2.1 APPROVED PRODUCTS

A. General: See specification section 274100 PART 2.

B. A detailed list of equipment shall be presented to the owner for approval.

PART 3 - EXECUTION

3.1 EXECUTION OF THE WORK

A. General: See specification section 274100 PART 3, for execution of work requirements supplemented by this specification section.

B. Programming. Programming for the control system for this type of room will be done by the installer.

C. UPS is required for this type of rooms for all control processors with monitoring capabilities through the RAMS.

3.2 TESTING

A. General: Testing for this type of room shall be done by the installer and reviewed by the owner and design engineer. For this type of rooms all testing requirements described in 274100 shall be followed.

B. Additional testing for these type of rooms is recommended like acoustic test.

3.3 TRAINING

A. SYSTEM ADMINISTRATION TRAINING. The installer of the systems part of this specification section shall provide twelve (12) hours of system administration training.

B. USER TRAINING. The installer of the systems part of this specification shall provide at least six (6) hours of user training in two (2) different sessions.

END OF SECTION 274135