



Section 27 10 00

COMMUNICATIONS CABLING

PART 1 - GENERAL

1.1 GENERAL INTRODUCTION

- A. The work shall consist of the design, provision, termination, testing and documentation of a complete and fully functional structured high performance copper and optical fiber communications cabling system. The instructions in this section are specific to communications installations and should be read in conjunction with other contract documents as applicable.

1.2 DEFINITIONS

- A. Throughout this specification, the following definitions will apply:
  - 1. Provide: Supply, furnish, deliver, install, pull, fix, dress, terminate, label, test, ground and document the components as per these specifications.
  - 2. BDF (Building Distribution Frame) Rooms, are special-purpose rooms that provide space and maintain a suitable operating environment for the termination of backbone and campus cabling and house centralized communications and/ or computer equipment (such as Core Switches and Servers).
  - 3. IDF (Intermediate Distribution Frame), or Tele/Data Rooms are floor-serving spaces that provide a connection point between backbone and horizontal distribution pathways.
  - 4. Backbone Cables: Cables linking the BDF and the IDF.
  - 5. Horizontal Cables: Cables linking the IDF to each workstation outlet.
  - 6. External Cables: Cables that link the building to external connection point(s) and/or other building(s). These cables are considered to be Outside Plant (OSP).
  - 7. Station Cables: Cables linking workstation outlet to active equipment.
  - 8. Client: MiraCosta Community College District
  - 9. Architect: Per project
  - 10. Consultant: Project consultant
  - 11. Bidder: A company invited to bid for the works
  - 12. Installer/Contractor: The Company installing the equipment as defined in this specification



13. Construction Manager / Owner's Representative

**1.3 MANUFACTURER'S COMPLETE SYSTEMS**

- A. The cabling system specified in this document shall be an end to end solution that is sourced from a single manufacturer or partnered manufacturers. Unless explicitly noted within these specifications, this shall include patch panels, connectors, cables, patch cords, faceplates and other associated components.
- B. Where it is specified that a system be provided by "manufacturer xxx or equal", a substitution of another manufacturer's products will only be considered for a complete end to end solution of equal quality, as determined by the Owner's Representative. All substitutions shall conform to the substitution requirements detailed in the specifications. In instances where these specifications do not include the statement "or equal" for a particular component or system, substitutions will not be entertained.

**1.4 JOB CONDITIONS**

- A. Prior to bidding visit the site and determine all existing conditions affecting work. The Bidder shall examine all drawings and specifications to familiarize themselves with the type of construction to be used, and the nature and extent of work provided by other trades.
- B. Verify dimensions and the correct location of hardware before proceeding with the installation of hardware, cabling and/or connections.
- C. Notify the Owners' Representative in writing immediately on discovery of dimensional discrepancies and other conditions detrimental to proper performance of the Work.

**1.5 PERSONNEL**

- A. The personnel who will be employed on the contract shall be suitably trained in the management of a project of this nature and/or in the installation and maintenance of products of the type being provided so as to be able to carry out all work in a competent manner.
- B. The Installer shall provide a site manager responsible for all site-related issues. This individual shall be the single point of contact for the project team and shall carry a mobile phone so they can be contacted during the working hours of the project.
- C. The Installer shall be certified by the component manufacturer(s) in the installation and testing of the cabling system and shall be able to provide a manufacturers' extended performance warranty for the 'end to end' cabling system.

**1.6 LABELING AND NUMBERING SCHEME**

- A. Labeling of the cabling system shall be in accordance with EIA/TIA 606 for the Administration of the Telecommunications Infrastructure for Commercial Buildings.

**1.7 WARRANTY**

- A. Installer to provide a warranty for one year from Notice of Completion on all materials and workmanship installed or supplied as part of the cabling system.



- B. The Installer shall also supply an extended performance warranty, as offered by the components' manufacturer(s).

#### 1.8 QUALITY

- A. The Contractor shall be responsible for the complete provision and installation of all components as specified herein. The Contractor shall provide all tools, equipment, fixtures, appliances, ancillary piece parts and hardware as necessary to complete the assembly and installation as required. The Owner's Representative may conduct scheduled or unscheduled inspections of the Contractor's work at anytime during construction. All work included in the scope assigned to the contractor that is associated with this project shall be accomplished in a workmanlike manner, installed and assembled plumb, level and square. The product shall be delivered to the Owner finished, complete, and ready to operate according to the manufacturer's specifications.
- B. All installation work shall be completed to the standard of the samples approved by the Owners Representative during the submittal process. Any products not installed to the quality detailed in these specifications and approved in the submittal process shall be reworked by the Installer to the satisfaction of the Owner's Representative at no additional cost to the Owner.

#### 1.9 STANDARDS

- A. All materials provided by the Installer shall meet the requirements of the following where applicable:
  - 1. National Electrical Manufacturer's Association (NEMA)
  - 2. American National Standards Institute (ANSI)
  - 3. Underwriters Laboratories, Inc. (UL)
  - 4. ETL
- B. All products, services and documentation provided by the Installer shall meet the requirements of the following where applicable:
  - 1. National Electrical Code (NEC)
  - 2. Relevant State Electric and Fire Codes
  - 3. ANSI/EIA/TIA 568-C.2 Commercial Building Telecommunications Wiring Standard
  - 4. ANSI/EIA/TIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces
  - 5. ANSI/EIA/TIA 606 The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
  - 6. ANSI/EIA/TIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications



7. Building Industry Consulting Service International (BICSI) publications:
  - a. Network Design Reference Manual
  - b. Telecommunications Cabling Installation Manual
  - c. Customer Owned Outside Plant Design Manual
8. Manufacturer's recommendations and installation guidelines including but not limited to:
  - a. Belden CSV Installation Guidelines
  - b. Chatsworth (CPI) Installation Guidelines
  - c. 3M Installation Guidelines

C. All publications referred to in this document shall be the latest edition.

#### 1.10 SUBMITTALS

- A. All submittals shall be sent to the Construction Manager / Owner's Representative for initial processing and distribution. Three copies of each submittal should be provided unless otherwise noted. Each submittal should be provided no later than six weeks prior to the work associated with that submittal to allow time for submittal review.
- B. Project References
  1. Submit for approval, references for a minimum of three similar projects successfully undertaken and completed within the last three years. These projects should be a similar scale, complexity and have similar time scales as this project.
  2. Provide project name and address, client contact name and telephone number and construction manager name and telephone number. Provide a brief description of each project indicating types of system installed, quantities and configurations of outlets and project time scales.
  3. At least two of the references shall be located in Southern California and shall be available for the Owners Representative and other members of the Design Team to visit and inspect the installation, should, in the opinion of the Owners Representative, this be necessary.
  4. These references are intended to show that the Installer has successfully completed similar projects. Failure to produce satisfactory references may result in the bid being deemed non-compliant.
- C. Personnel Training
  1. Submit for approval records regarding the management, installation and testing personnel. These records shall include resumes, training certificates, previous work experience details (especially on reference projects) and other relevant information.



2. Submit records to confirm that the personnel who will be employed in an installation capacity are suitably trained in the installation and maintenance of equipment and systems of the type being provided.
  3. Submit records to confirm that the personnel that will be responsible for testing the system are suitably trained in the operation of the test equipment being used in this project.
  4. These records are required to ensure that the Installer is able to carry out all work in a competent manner. Failure to produce satisfactory training documentation may result in the bid being deemed non-compliant.
- D. Cabling Diagram
1. Submit, for approval, a complete cabling diagram. The diagram shall be based on the single line drawing included in the Construction Documents. It shall be updated to show quantities and part numbers for all components including patch panels, cable, conduit, cabinets and equipment racks, splices, splice cases and all other associated components.
- E. Test Equipment
1. Submit, for approval, details of each item of test equipment to be used to test the optical fiber and copper components. Include patch cords and other specialized components.
- F. Product Literature/Data Sheets
1. Submit for approval manufacturer's product data sheets for each component of the telephone and data cabling systems. Certify that the data sheets depict the components to be provided by the Installer to make up the complete system as described in this specification.
- G. Component Samples and Mock-ups
1. Provide one full size installation sample mock-up of a normal wall faceplate for approval. All samples are to be fully labeled as per these specifications. Samples are to be delivered to the Construction Manager's office on site prior to installation.
  2. All sample mock-ups are intended to represent the components that are to be installed as part of this project; therefore, they are to be provided with all associated components and labeling necessary to make up a complete mock-up. Installation shall not proceed until the Owner's Representative has approved the samples. Once samples and other documents have been submitted, inspected by the Owners' Representative and approved, they shall be retained. The samples will be used as the standards by which the quality of work on the project by the Installer shall be judged. Any installation that does not meet this standard shall be replaced or re-worked as approved by the Owners' Representative, at no cost to the project.
- H. As-Built Documentation (required upon completion of the work)



1. Following completion of the installation, submit the following record drawings, documentation and testing for approval.
2. As-Built Drawings
  - a. As-built drawings showing locations of telephone, Technology Rooms and data outlets, backbone, link and external cable routes, data rack locations, telephone termination board locations and station identification.
  - b. Provide laminated copies of as-builts on site in each Technology Room.
3. Final Test Results
  - a. Test results for each cable indicating tests performed, results obtained and values measured.
4. All documentation and drawings shall be provided in an un-locked acceptable electronic format. AutoCAD (at least R14) for drawings, MS Excel (for schedules) and supplied on CD-ROM or DVD-ROM.

## PART 2 - Products

### 2.1 AIR BLOWN FIBER

- A. Air Blown Fiber to be provided by "Sumitomo" FutureFLEX Air Blown Fiber. This product is a **Board of Trustees Approved Sole Source Item**. No substitutions will be accepted

### 2.2 HORIZONTAL CROSSCONNECT TERMINATED COPPER CABLING

- A. Provide Belden GigaFlex 2400 series, no equal **(Sole Source)**, Category 6 UTP Cable. Each cable shall have four pairs of unshielded twisted-pair solid copper conductors. The cable shall be plenum-rated (CMP). Each cable shall meet or exceed the performance specifications in this document when installed as part of the end to end cabling system described in this specification.
- B. The high performance copper cabling system shall meet or exceed the performance specifications for Category 6 cabling as detailed in EIA/TIA 568-C.2. This covers all Category 6 components installed as a part of the installation.
- C. Voice copper cables shall be white in color.

### 2.3 HORIZONTAL INTERCONNECT TERMINATED COPPER CABLING

- A. Provide Belden GigaFlex 3600 series, no equal **(Sole Source)**, Category 6 UTP Cable. Each cable shall have four pairs of unshielded twisted-pair solid copper conductors. The cable shall be plenum-rated (CMP). Each cable shall meet or exceed the performance specifications in this document when installed as part of the end to end cabling system described in this specification.



- B. The high performance copper cabling system shall meet or exceed the performance specifications for Category 6 cabling as detailed in EIA/TIA 568-C.2. This covers all Category 6 components installed as a part of the installation.
- C. Data copper cables shall be black in color.

## 2.4 LINK COPPER CABLING

- A. Provide Belden, no equal **(Sole Source)**, Category 6A UTP Cable. Each cable shall have four pairs of unshielded twisted-pair solid copper conductors. The cable shall be plenum-rated (CMP). Each cable shall meet or exceed the performance specifications in this document when installed as part of the end to end cabling system described in this specification.
- B. The high performance copper cabling system shall meet or exceed the performance specifications for Category 6A cabling as detailed in EIA/TIA 568-B.2. This covers all Category 6A components installed as a part of the installation.
- C. Link copper cables colors shall be verified with the Owner prior to procurement of materials.

## 2.5 OPTICAL FIBER CABLES

- A. All site fiber is Sumitomo Air Blown Fiber in innerduct **(Sole Source)**.
- B. 50/125 Micron Multimode Cable (OM4) Elements shall conform to the following specification:
  - 1. 50/125 micron multimode optical fiber cable with glass core and cladding (tolerances 50+/-3 micron, 125 +/-2 micron)
  - 2. Graded refractive index profile
  - 3. Attenuation coefficient at 850 nm of 3.5 dB/km or less
  - 4. Attenuation coefficient at 1300 nm of 1.5 dB/km or less
  - 5. Bandwidth distance product at 850 nm of 4900 MHz.km or more (laser) and 1500 MHz.km (overfilled launch)
  - 6. Bandwidth distance product at 1300 nm of 500 MHz.km or more
  - 7. Individual glass elements proof tested at 100 kpsi (100,000 lbs. per square inch)
  - 8. Number of elements as indicated on the drawings
- C. Singlemode Cable Elements shall conform to the following specification:
  - 1. 8.3 micron core diameter, 125 micron cladding diameter (+/- 1 micron)
  - 2. Mode field diameter of between 8.7 and 9.3 (with +/- 0.5 micron tolerance) at 1310 nm
  - 3. Attenuation coefficient at 1310 nm of 1.0 db/km or less
  - 4. Attenuation coefficient at 1550 nm of 1.0 db/km or less
  - 5. Cladding non-circularity of +/- 1%
  - 6. Core to cladding concentricity error of no more than 0.8 micron
  - 7. Maximum dispersion rate of 2.80 ps/nm-km at 1300 nm
  - 8. Maximum dispersion rate of 17.00 ps/nm-km at 1550 nm
  - 9. Individual glass elements proof tested at 100 kpsi (100,000 lbs. per square inch)
  - 10. Number of elements as indicated on the drawings
- D. External Cable: Provide Sumitomo ABF, no equal **(Sole Source)**, external optical fiber cable. The cable shall be recommended by the manufacturer for use as an external cable suitable for installation in an underground duct. Optical fibers shall be contained within tight buffered tubes





utilizing water blocking tapes or compounds surrounding these tubes. The cable will be an all-dielectric construction, with a central strength member.

## 2.6 TELEPHONE SYSTEM CABLING

- A. External Gel-Filled ASP Cable. Provide Belden, no equal **(Sole Source)**, filled core telephone cable suitable for direct-burial or in-duct applications. The cable shall have solid annealed copper conductors, with a core filled with a Flex-Gel filling compound and wrapped in a non-hygroscopic core tape. The ASP sheath shall consist of a 0.008" corrugated aluminum shield, with a 0.006" corrugated steel shield and a black polyethylene jacket. The jacket shall be sequentially printed with a footage marker at regular intervals. A flooding compound shall be applied over the core and to all surfaces of the aluminum and steel shields to resist moisture entry and to inhibit corrosion. Provide printed length markings on the cable jacket every two feet. Provide the number of pairs as indicated on the drawings.
- B. External Splice Point. Utilize existing splice closures in Vault T6 provided as part of previous site preparation project.
- C. Internal Splice Point. Provide a splice enclosure suitable for internal use. The splice case shall be sealed to be moisture and vermin resistant. The case shall allow all elements/cables to be dressed in without violating any manufacturer's specifications. The splice closure shall be suitable for installation in building entrance applications and shall be properly grounded. The closure shall provide mechanical support for the splice. Provide 710 modules, splice connectors and all associated components. Provide 3M SLIC closures, no equal **(Sole Source)**.

**2.7 TELEPHONE SYSTEM TERMINATION FRAMES**

- A. Rack- Mounted BIX Wiring Blocks. Provide Belden, no equal **(Sole Source)**, rack-mounted BIX wiring blocks. The blocks shall be sufficient to accommodate the backbone and horizontal voice cables throughout the project and also include vertical cable managers.

**2.8 WORK AREA CONNECTORS**

- A. Provide Belden GigaFlex PS6+, no equal **(Sole Source)**, eight-position modular RJ45 jacks. Each connector shall meet or exceed the channel performance specifications in this document when installed as part of the end to end cabling system described in this specification. The pin outs for the jack shall conform to the T568B wiring scheme.
- B. Work area connectors shall be blue for all communications ports.
- C. Provide additional 25% spare work area connectors.

**2.9 PATCH PANELS**

- A. Data Patch Panels. Provide Belden GigaFlex PS6+, no equal **(Sole Source)**, Patch Panels (AX101613) conforming to the following specification:
  - 1. Suitable for mounting in standard EIA 19" racks.
  - 2. Configured with 48 jacks housed in each 2U (3.5") of usable rack space.
  - 3. Provide strain relief for each cable terminated on the connector at the rear of the patch panel.
  - 4. Allow for labeling of each individual connector.
  - 5. Allow any individual cable to be terminated or otherwise handled without disturbing other cables.
- B. Link Patch Panels. Provide Belden Key Connect no equal **(Sole Source)**, Modular Patch Panels conforming to the following specification:
  - 1. Suitable for mounting in standard EIA 19" racks.
  - 2. Configured with 48 jacks housed in each 2U (3.5") of usable rack space.
  - 3. Provide strain relief for each cable terminated on the connector at the rear of the patch panel.
  - 4. Provide Category 6A connectors, colors to be verified with Owner, for each cable installed.
  - 5. Allow for labeling of each individual connector.



6. Allow any individual cable to be terminated or otherwise handled without disturbing other cables.
- C. Rack Mounted Optical Fiber Patch Panel. Provide Belden FiberExpress optical fiber patch panel, conforming to the following specification:
1. Each panel shall be suitable for installation in EIA 19" mounting frame.
  2. Configured with 72 connectors housed in each 4U (7") of usable rack space.
  3. Allow for labeling of each individual connector.
  4. Allow any individual cable to be terminated or otherwise handled without disturbing other cables.
  5. Each panel shall provide fiber handling for fiber elements, including 36" fiber reserve (service loop) inside the patch panel with no bends sharper than 2" bend radius.
  6. Provide blanking adapter plates to cover all unused spaces as necessary.
  7. Belden FiberExpress Manager Connector Module with Metal Sleeve, multimode 12 fibers (LC duplex).
  8. Belden FiberExpress Manager Connector Module with Zirconia ceramic, singlemode, 12 fibers (LC duplex).
  9. Belden Field Breakout Kit
  10. Belden Blank Adapter Panel
- D. Provide 25% additional capacity in patch panels.

## 2.10 OPTICAL FIBER CONNECTORS

- A. Multimode Optical Fiber Connectors. Provide fusio-spliced factory manufactured pig-tails, no equal, LC OM4 multimode optical fiber connectors, conforming to the following:
1. Duplex, handling one pair (two elements) per connector.
  2. Beige in color.
  3. Compatible with both 900 micron buffered strands and 250 micron loose tube strands.
  4. Maximum insertion loss, of mated pair, less than 0.5 dB at acceptance.
  5. Minimum return loss of greater than or equal to 20 dB.
  6. Durability better than 500 matings, with a maximum increase in insertion loss of not more than 0.2 dB.



7. Meets ANSI/TIA/EIA 568-B and ISO 11801 standards.
- B. Singlemode Optical Fiber Connectors. Provide fusio-spliced factory manufactured pig-tails, no equal, LC optical fiber connectors, conforming to the following specification.
1. Duplex, handling one pair (two elements) per connector.
  2. Blue in color.
  3. Compatible with both 900 micron buffered strands and 250 micron loose tube strands.
  4. Maximum insertion loss, of mated pair, less than 0.5 dB at acceptance.
  5. Minimum return loss of greater than or equal to 50 dB.
  6. Durability better than 500 matings, with a maximum increase in insertion loss of not more than 0.2 dB.
  7. Meets ANSI/TIA/EIA 568-B and ISO 11801 standards.

#### 2.11 PATCH CORDS

- A. Provide two high performance copper patch cords per telecommunications outlet. These shall be sourced from the same manufacturer as the connectors provided as a part of this project. Each cord shall meet or exceed the performance specifications in this document when installed as part of the end-to-end cabling system described in this specification.
1. 30% of the patch cords shall be 1 feet in length and black in color
  2. 10% of the patch cords shall be 3 feet in length and black in color
  3. 40% of the patch cords shall be 7 feet in length and black in color
  4. 20% of the patch cords shall be 11 feet in length and black in color
- B. Optical Fiber. Provide one optical fiber patch cord per optical fiber pair installed. These shall be sourced from the same manufacturer as the optical fiber connectors provided as a part of this project. Each cord shall meet or exceed the optical fiber performance specifications in this document.
1. 20% of the patch cords shall be 3 feet in length and orange/aqua/yellow in color
  2. 60% of the patch cords shall be 7 feet in length and orange/aqua/yellow in color
  3. 20% of the patch cords shall be 11 feet in length and orange/aqua/yellow in color
- C. The patch cords are to be passed to the client on completion of the project. Each cord is to have a manufacturer's certificate of conformance and shall be in its original, unopened packaging.

**2.12 WORK AREA FACEPLATES**

- A. Wall-mounted Faceplate. Provide Belden MediaFlex (P/N: AX101747) no equal, wall-mounted flush modular faceplate to house work area jacks, capable of housing a minimum of four jacks. The faceplate shall fit over a standard NEMA electrical outlet box fitted with a single gang plaster ring cover and shall be office white in color.
- B. Blanking Inserts. Provide blanking inserts, matching faceplates, in sufficient quantities to cover all unused openings in every faceplate.
- C. Wallphone Faceplate. Provide a Belden MediaFlex, no equal, wall-mounted flush modular faceplate to house a single work area jack. The faceplate shall fit over a standard NEMA electrical outlet box fitted with a single gang plaster ring cover. The faceplate shall be capable of having a wall-mounted telephone fitted directly over it.
- D. Furniture Faceplate. Provide a Belden MediaFlex, no equal, flush-mounted modular faceplate to house work area jacks. The faceplate shall fit over a modular raceway.
- E. Floorbox Faceplate. Provide an internal blank bracket to house combinations of work area connectors in a flush-mounted floorbox. The bracket shall be provided by the manufacturer of the flush floorbox and shall be designed to fit in the floorbox installed as a part of this project.

**2.13 LABELS**

- A. Provide labels for connectors, cables, outlets, termination frames and patch panels.
- B. The lettering on each label shall be as large as is practicable. All labels shall be machine-produced. Hand-written labels will not be acceptable.
- C. A standard relative orientation shall be adopted for all labels unless otherwise specified.
- D. Labels shall be robust, durable, shall resist abrasion and shall be UV inhibiting, permanent and indelible. Labels shall be proof to 140 degrees Fahrenheit.
- E. All labels shall be readily visible and shall be fixed so that they remain in a visible position wherever practical.
- F. Labels shall carry the full complement of characters to designate the unique identifications for the item that they identify.
- G. The faceplate labels are to be a white and black laser or thermal printed label, i.e. black letters on white background. Labels are to be placed below the clear plastic lens on the Mediaflex face plate.
- H. The patch panel labels are to be a white and black adhesive-backed nylon thermal printed labels, i.e. black letters on white background. Labels are to be placed below the clear plastic lens on the Mediaflex face plate.
- I. The Patch Panel labels shall be permanently fixed to the patch panel front cover with an epoxy adhesive

**J. Cable Labels**

1. Provide self-laminating wrap labels for cables with less than ½" diameter. The labels shall permanently fixed to each cable once they have been installed. Any labels that split, partially split or otherwise damaged shall be replaced.
2. Horizontal Cabling: Label each cable so that the label is within 8" of the end of the cable at the patch frame end and within 6" of the end of the cable at the outlet end.

**2.14 EQUIPMENT RACKS****A. Provide CPI 46353-703, no equal, as shown on the Drawings. Each rack shall conform to the following specification:**

1. Each rack shall consist of a modular EIA 19" mounting frame, with a minimum of 84" (45U) space for equipment in the vertical plane.
2. Provide all mounting components and accessories to securely fix racks to floor and supporting walls. Provide appropriate seismic transverse and longitudinal bracing per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines).
3. Provide overhead ladder rack, CPI 10250-718, no equal, fixed to the top of each rack and running from the top of the rack to the telephone backboard where the feeder and horizontal cables run, as shown on the drawings.
4. Provide cable bend management fixtures to maintain the proper bend radius as the cables drop into the rack. Do not allow cables to be unsupported as they run from conduit or cable tray to equipment cabinets.
5. Provide appropriate seismic bracing brackets for anchoring the cabinets on raised floor. Use a minimum of 5/8" threaded rod and appropriate concrete drop-in anchors for securing the cabinets above on the raised floor. The 5/8" threaded rod shall be further secured with aircraft cable per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines).
6. Each rack shall have a load-carrying capacity of 1000 lbs.
7. Provide patch management ring runs in each rack. Provide (1) 2U front-side horizontal patch management in the top and bottom of each rack and top and bottom of each 4RU worth of patch panels – CPI 30530-719, no equal. Provide two-sided CCS type vertical cable management with hinged doors on both sides of each rack – CPI 30162-703, no equal.
8. Provide strain relief and cable management at the rear of each rack to ensure tidy routing of all feeder and horizontal cables.
9. The rack shall be manufactured from extruded aluminum and black in color.

**2.15 EQUIPMENT CABINETS**



- A. Provide CPI Megaframe, no equal, Equipment Cabinets as shown on the Drawings. Each cabinet shall conform to the following specification:
1. Each cabinet shall house two 19" internal mounting frames. Each pair of mounting rails shall be depth adjustable for front and rear equipment support. Cabinet shall be 32" wide by 42" deep.
  2. Each cabinet to provide a minimum of 84" (45U) space for equipment in the vertical plane.
  3. Each cabinet shall have a minimum load-carrying capacity of 2500 lbs.
  4. Provide grommets openings at the top of each cabinet requiring top access. The openings shall be a series of 4" diameter holes with bushings. The openings shall allow the cables to easily enter the cabinet and be routed into the cabinet cable management.
  5. Provide all mounting components and accessories to securely fix cabinets to floor. Provide appropriate seismic transverse and longitudinal bracing per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines).
  6. Provide cable bend management fixtures to maintain the proper bend radius as the cables drop into the cabinet. Do not allow cables to be unsupported as they run from conduit or cable tray to equipment cabinets.
  7. Each cabinet to have a lockable perforated metal front door, lockable double perforated metal rear doors, and two solid side panels.
  8. Provide Velcro cable straps, at the front of the cabinet, to each side, to manage patch cords, every 5U on both sides of each rack.
  9. Provide cable supports, to each side, at rear to loom fixed cable terminations
  10. Provide (1) 2U front-side horizontal patch management in the top and the bottom of each cabinet and top and bottom of each patch panel CPI 30530-719, no equal. Each cabinet shall be equipped with at least one internal vertical cable manager designed for the selected system.
  11. All other parts needed to make the cabinet into a usable system shall be provided. These parts include appropriate bolts, installation kits, and mounting equipment for items specified.

## 2.16 AUDIOVISUAL EQUIPMENT RACKS

- A. Provide Middle Atlantic Equipment Cabinets as shown on the Drawings. Each cabinet shall conform to the following specification:
1. Gang-able rack enclosures shall be used in locations where two or more racks are grouped together. Height and quantity as indicated on drawings. Unless otherwise specified, the enclosure depth shall be 36" minimum. Finish shall be black powder coat. Acceptable: Middle Atlantic series WRK, or comparable by CPI, Atlas Sound, Lowell, or Stantron.



2. Provide the accessories noted below for each gang-able rack enclosure. All accessories shall be from the same manufacturer as the rack enclosure.
  - a. Side panels (for end racks of each group of racks)
  - b. Cable chase (as required)
  - c. Vented top and solid rear door
  - d. Grounding stud in top rear of rack
  - e. Forced air ventilation configured for equipment and heat loads
  - f. Full height rear mounting rails
  - g. Full height solid copper bus bar bonded to rack
  - h. Rack work light
  - i. Horizontal lacing bars (as required)
  - j. Seismic base and support
  - k. Switched & circuit protected vertical power strip(s)
3. Stand-alone rack enclosures shall be used in locations where single racks are specified. Height and quantity as indicated on drawings. Unless otherwise specified, the enclosure depth shall be 32.5" minimum. Finish shall be black powder coat. Acceptable: Middle Atlantic series WRK-SA, or comparable by Atlas Sound, Lowell, or Stantron
4. Provide the accessories noted below for each stand-alone rack enclosure. All accessories shall be from the same manufacturer as the enclosure.
  - a. Solid top and solid rear door
  - b. Grounding stud in top rear of rack
  - c. Forced air ventilation configured for equipment and heat loads
  - d. Full height rear mounting rails
  - e. Full height solid copper bus bar bonded to rack
  - f. Rack work light
  - g. Horizontal lacing bars (as required)
  - h. Caster base or seismic base
  - i. Switched & circuit protected vertical power strip(s)

## 2.17 CABLE SUPPORTS

- A. Provide J-Hooks to support communications cables running in the ceiling void in locations where cable tray and/or conduit is not provided. J-Hooks to be B-Line, Mono Systems 'The Hook', Caddy 'Cable Cat' or equal.

## PART 3 - EXECUTION

### 3.1 HORIZONTAL CABLING AND COMPONENTS

#### A. Horizontal Cabling

1. Provide one four-pair high performance plenum-rated horizontal cable running from each work area connector to the patch panels located in the Technology Room serving that outlet. Terminate all four pairs of each end of each cable with an RJ45 communications connector using the EIA/TIA 568B.2 termination scheme.

#### B. Work Area Outlets





1. Standard Work Area Outlet. Each standard work area outlet will be a wall-mounted flush modular faceplate configured with (4) RJ45 connectors, unless otherwise noted. The faceplate shall fit over a deep NEMA electrical outlet box fitted with a single gang plaster ring cover and shall match the electrical faceplate color. Any unused faceplate opening shall contain a matching blanking insert.
2. Wall-phone Outlet. Each wall-phone outlet will be a wall-mounted flush modular faceplate to house a single (1) RJ45 connector. The faceplate shall fit over a deep NEMA electrical outlet box fitted with a single gang plaster ring cover and be capable of having a wall-mounted telephone fitted directly over it.
3. Furniture / Raceway Outlet. Each Furniture outlet will be a flush-mounted modular faceplate to house (4) RJ45 work area jacks as shown on the drawings. The faceplate shall fit over a modular raceway.
4. Floorbox Outlet. Each Floorbox outlet will be a flush-mounted modular faceplate to house (4) RJ45 work area jacks as shown on the drawings.

### 3.2 OPTICAL FIBER AND HIGH PERFORMANCE COPPER LINK CABLING

#### A. High Performance Copper Link Cable

1. Provide Category 6A high performance 4-pair cables running between each of the Telecommunications Rooms, as shown on the drawings. The high performance cables shall not exceed 90 meters.
2. Terminate all four pairs of each end of each cable with an RJ45 communications connector fitted in a rack-mounted patch panel using the EIA/TIA 568B termination scheme. Label each connector with the link cable number.

### 3.3 EXTERNAL CABLING AND COMPONENTS

#### A. Copper Cabling

1. Provide external telephone cable running from the nearest Communications Manhole to the Telecommunications Room, as shown on the drawings.
2. Utilize external splice case in nearest Communications Manhole and splice new multi-pair copper cable to existing multi-pair copper cables utilizing 710 splice modules, quantities as required. Properly ground and bond copper cables and splice case. Provide encapsulate as needed per project.
3. Upon entering Telecommunications Room, provide an internal splice case. Splice external copper cable to internal copper cable utilizing 710 splice modules, quantities as needed per project. Properly ground and bond copper cables and splice case.
4. Extend internal copper cable from splice case to rack-mounted BIX wiring blocks. Terminate, test, and label each copper pair.

#### B. Optical Fiber Cabling



1. Provide external optical fiber running the Telecommunications Room to the MDF in the Student Services building, as shown on the drawings. Contractor shall use existing innerduct running from the nearest Communications Manhole to the MDF. Terminate each pair of optical fiber elements with the same optical fiber connectors used for the backbone cabling system, fitted in an optical fiber rack-mounted patch panel. Label each connector with the backbone cable number.
2. Provide patch panels fitted in the equipment cabinet, racks, and/or wall-mounted as needed per project to house optical fiber cables terminated on optical fiber connectors.
3. Securely fix all patch panels in place.
4. Provide a sufficient number of patch panels to house all specified optical fiber cables and connectors.
5. Terminate all elements of each optical fiber cable with the specified connectors. Strip back the optical fiber cable jacket, providing a 36" service loop for each optical fiber element. Neatly dress these loops in the patch panel using appropriately sized spiral wrap, so they are protected.

### 3.4 TECHNOLOGY INFRASTRUCTURE

#### A. Data system equipment cabinets and racks

1. Provide equipment cabinets and racks, as shown on the drawings.
2. Securely fix the cabinets/racks in place.
3. Whenever cables are to enter the cabinets from above, provide a 12"x6" grommeted opening on the top of the cabinet.
4. Attach the power strip to the cabinet/rack. Ensure that the power strips are connecting to the cabinets/racks in such a way that the structural integrity of the cabinets/racks is not compromised. Connect the cabinet power strip to an appropriate power receptacle.
5. Fix each cabinet and rack to the floor and supporting walls to provide stability and prevent movement of the cabinet or rack. Fix adjacent racks and cabinets together.
6. Install the appropriate seismic transverse and longitudinal bracing per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines).

#### B. Conduit, Ladder Rack And J-Hook Installation

1. Where shown on the drawings, provide solid metal conduit to protect cable runs. Securely fix this conduit to structural elements at regular intervals. Provide couplings, end pieces, grommets and associated components to make up a complete conduit run. All conduit installation shall be done in accordance with the relevant NEC regulations. No L-bends (condulets) are to be installed; any bends in the conduit runs are to be provided using sweeps.



2. Where cables are installed in an open cabling method (i.e. J-Hooks) and encounter full height partitions or other obstructions, Contractor shall provide conduit sleeves. Conduits sleeves shall be sized and fire-stopped per all applicable national and local electric and fire codes.
3. Ladder rack. Where shown on the drawings, provide metal ladder rack to support equipment racks and route communications cabling.
4. J-Hooks. Where conduit or cable tray is not provided to support cable runs, provide J-Hooks fastened to the structural slab at 48" centers. J-Hooks shall not be attached to beams, ceiling tile tee grid or wire hangers used to support the ceiling grid. J-Hooks shall be attached to the slab using anchors and ¼" rod used exclusively for supporting J-Hooks. J-Hooks can be fixed to stud walls provided the cable load is no more than 10lbs per stud.
5. Install the appropriate seismic transverse and longitudinal bracing per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines).

C. Innerduct

1. Provide innerduct to protect air blown optical fiber cable runs. Securely fix the innerduct to structural elements at 36" centers. Provide couplings, end pieces, grommets and associated components to make up a complete innerduct run. The innerduct shall be a suitable fire rating for the installed environment.

D. Communications Manholes

1. Provide a 12' service loop for each external cable that passes through a communications manhole. Dress the cable to keep it clear from any water that may be in the bottom of the manholes and to minimize any risk of damage caused by later visits to the manhole.

### 3.5 INSTALLATION PRACTICE

- A. Provide bushings, grommets and strain-relief for cables terminating at wall-mounted outlets and patch panels to ensure durable and robust connections. The bushings and grommets are intended to protect the cables from any sharp edges that present a risk to the cables. Ensure that all sharp edges are covered to protect the cables from damage.
- B. No cables shall be installed in a fashion that contravenes either the minimum installed or the minimum under-load bend radius of the cable.
- C. No cable is to be pulled through a conduit "L-bend" (condulets). In existing routes with L-bends, the cables are to be pulled to the L-Bend. The cable is then to be carefully pulled through the remainder of the conduit run.
- D. Install all cables in complete runs from outlet or patch panel to patch panel. In-line joints, splices, distribution points or other intermediate connections are not permitted unless specifically called out by this specification.



- E. At no point shall the communications cables be tied to power cables or other building services or their supports, or run in the same ducts, raceways, conduits or connection boxes as power cabling.
- F. Use plenum-rated Velcro tie wraps in plenum spaces.
- G. Reinstate all pull-wires in conduits and ducts after use to facilitate future addition of cables.
- H. Cables shall not be held so tightly with cable ties that the cable jackets are indented by the cable ties.
- I. Ensure that all waste materials are disposed of in a safe manner. Pay particular attention to waste materials produced during the termination of optical fiber cabling. Ensure that all used components and fiber cut-offs are collected in purpose-made containers and disposed of properly.
- J. Replace all moisture and fire barrier material in ducts, conduits and other penetrations disturbed during installation of communications cabling. Install barrier material in all fire-rated penetrations that have cabling running through them. The barrier material shall be installed so the final penetration has the same fire rating as the original wall/floor.
- K. Use purpose-built pulling grips during cable installation. Do not pull cables by attaching pull wires to cable jackets, elements or reinforcement. Use strain gauges or equivalent measures to ensure that the maximum tensile load rating of the cables is not exceeded during installation.
- L. Provide J-hooks and cable hangers as necessary to support cables running in the ceiling void. J-hooks shall be appropriately sized to allow a minimum of 50% spare capacity for future cable installation. J-hooks shall be at least 1" wide, and fitted at no more than 48" centers.
- M. The number of cables in each conduit shall be controlled to allow for future cable installation and to stay within the manufacturers maximum allowable cable pulling tension. Conduit fill ratios shall not exceed the current requirements of the NEC.
- N. The maximum run length of each horizontal cable shall not exceed the 90m (~295ft) limit specified by EIA/TIA 568-B.2. Notify the Owner's Representative immediately if, due to on-site conditions or other factors, a horizontal cable run length exceeds this distance.
- O. Provide Velcro hook and loop ties to secure cabling running in the Telecom Closets. Provide straps at 3' intervals. On completion of installation, neatly run and re-tie all cable bundles in the Closet.
- P. All cable bundles exiting floor or wall penetrations and running into furniture or casework shall be wrapped in spiral wrap or split-loom tubing to protect the cabling and provide a neat installation.
- Q. Labels shall be machine generated, not hand written, and placed within 12 inches of each end of each cable.

### 3.6 UNUSED COMPONENTS



- A. Any components purchased in accordance with these specifications and unused shall be documented and passed to the owner on completion of the project.

### 3.7 TESTING

- A. General Instructions.

1. The testing is to show beyond reasonable doubt that there are no errors, damaged or incorrectly installed components, that the installation is correctly labeled and that all the installed components meet or exceed the criteria detailed in these specifications. Any test that does not show that a component is satisfactorily installed, as per these specifications, shall be repeated. If a test procedure needs to be modified to satisfactorily test some components, the modification shall be submitted for approval of the Owner's Representative, prior to the tests being conducted.
2. Following optical fiber and data cable installation, including labeling and termination at both ends, undertake and record tests to ensure that the cabling system will perform satisfactorily in service. In addition to the tests detailed in this specification, the Installer shall carry out any additional tests that the Installer deems necessary to ensure the satisfactory operation of the telephone and data systems. The costs of these additional tests shall be borne by the Installer.
3. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to testing. Any testing performed on incomplete systems shall be redone on completion of the work.
4. Provide the Owners' Representative with the opportunity to witness all testing. On reasonable request, the installer shall demonstrate that the test procedure competently identifies the fault conditions being tested for.
5. Complete all of the tests identified in these specifications.
6. Notify the Owners' Representative ten working days before the date of commencement of the cable tests. Provide details in writing, on that advance date, of proposed tests, the test schedule, equipment to be used, its certification and calibration and the names and qualifications of test personnel.
7. The Owner and Owners Representative shall be invited, to the first instance of each type of test conducted. In the event of a number of tests being conducted by the Installer prior to this first inspection, the Owner's Representative reserves the right to reject these tests as non-compliant and to require them to be repeated at the Installer's cost.
8. The owner will reserve the right to request the use of the specific tester used by the contractor to conduct a random test of approximately 5% of the installed cables. If the measurement results differ appreciably (+/- 20%) from those of the contractor provided report than the sample will be expanded to 20% and be re-tested by the contractor under the observation of the customer. If the variances continue than the customer reserves the right to request a 100% re-test of the installation by a mutually agreeable third party, at the expense of the contractor.



9. Include the cost of obtaining, calibrating and maintaining test equipment and the cost of carrying out and recording the tests detailed in this specification, including labor costs, in the bid sum. No extra costs will be entertained.
10. Ensure that all test equipment is in calibration before delivery to site and throughout the testing period. The Installer shall be responsible for ensuring that any necessary tests and rework to maintain equipment's calibration status is carried out. Any tests performed on uncalibrated test equipment shall be repeated at the Installer's cost.
11. The test documentation shall be available for inspection by the Owners' Representative during the installation period and copies shall be passed to the Owners' Representative within five working days of completion of tests on cables in each area. The Installer shall retain a copy to aid preparation of as-built information.
12. Failures detected during the testing shall be noted on the test results schedule, rectified and re-tested. On the fault being rectified, this shall also be noted. These notes shall not be deleted or obliterated.
13. Rectification of all damaged cables shall include replacing damaged cables with new cables in complete runs, replacing damaged connectors or remaking poor terminations. In-line cable joints, splices or distribution points will not be acceptable except where specified in this document. All damaged cables shall be removed from site.
14. If on submittal of the As-Built documentation there are any missing test results or incorrectly named files, the test shall be repeated at the Installer's expense.

**B. Telephone System External and Backbone Cabling**

1. Test each Telephone System Backbone and External Cable and its associated patch frame connectors. Carry out the following tests on every pair of every telephone system feeder and external cable:
  - a. Wire map
  - b. Length
  - c. Insertion Loss

**C. Category 6/6A Cabling**

1. Test each Category 6/6A Cable and its associated connectors. Carry out the following tests on every pair of every Category 6/6A cable:
  - a. Wire Map
  - b. Length
  - c. Insertion Loss
  - d. NEXT Loss



- e. FEXT Loss
  - f. ELFEXT
  - g. Propagation Delay and Delay Skew
  - h. Return Loss
  - i. Power Sum Near-End Crosstalk (PSNEXT) Loss
  - j. Power Sum Equal Level Far-End Crosstalk (PSELFEXT)
- D. Work Area Faceplates and Blanking Plates
- 1. Carry out a visual inspection of the faceplates and blanking plates. Replace all damaged components.
  - 2. Ensure that all faceplate labels are installed correctly.
- E. Optical Fiber Cabling
- 1. Test each Optical Fiber Cable and its associated connectors. Carry out the following tests on every element of every optical fiber cable:
    - a. Length
    - b. End-to-End Attenuation
    - c. Connector Loss
    - d. Splice Loss
    - e. Power Loss
  - 2. The tester shall have the following parameters:
    - a. Optical Time Domain Reflectometer (OTDR) shall be used to test every optical fiber cabling
    - b. OTDR shall be used to test optical in both directions and take the average. Provide a launch lead and far end drop off lead.
    - c. Multimode optical fibers shall be tested at 850nm and 1300 nm. Singlemode optical fibers shall be tested at 1310nm and 1550nm
  - 3. Test each optical fiber cable element and its associated connectors. Carry out the following test on every element of every optical fiber cable:
    - a. Visually check optical connectors using microscope (minimal magnification x200) to ensure that no physical damage has occurred during the installation process. There are to be no scratches on the core of the fiber or pits on the core or





cladding. If any defect cannot be rectified with polishing, the connector is to be replaced.

- b. Carry out OTDR tests on all elements at 1300nm wavelength for multimode cable runs and at 1310 nm for singlemode. These tests shall be carried out from both ends using a near end launch lead and a far end drop lead.
- c. The number of samples (averages) for each OTDR test shall be such that the noise amplitude is significantly less than the smallest loss of any component under test. This may vary for different cable runs, for shorter runs and fusion splices etc.; it may be necessary to run many samples.
- d. Record the length and loss of each mated connector pair on the test results schedule for all elements.
- e. Verify the labeling of the cable and connectors is correct.
- f. If a element has an excessive attenuation coefficient, a sudden step in attenuation coefficient (greater than 0.2 dB) or back scatter, losses due to micro bending or macro bending or has any other fault then the fault on that element shall be rectified.
- g. The following table lists the pass/fail criteria for all connectors and fusion splices under test. Any component that does not pass these figures shall be re-worked or replaced.

Element Type	Maximum attenuation across mated connector pair (dB) – outward test	Maximum attenuation across mated connector pair (dB) – return test	Maximum Attenuation across fusion splice – averaged over both directions(dB)	Minimum Return Loss (dB) – outward test	Minimum Return Loss (dB) – return test
<b>MM</b>	<b>0.7</b>	<b>N/A</b>	<b>0.1</b>	<b>N/A</b>	<b>N/A</b>
<b>SM</b>	<b>0.5</b>	<b>0.5</b>	<b>0.1</b>	<b>36dB</b>	<b>36dB</b>

- h. The attenuation of each multimode connector shall be measured in one direction (outward). The attenuation of each singlemode connector shall be measured in both directions.
- i. Each fusion splice shall be tested in both directions for both multimode and singlemode elements. The measurements for each direction shall be averaged for the final attenuation figure for each fusion splice.
- j. The return loss must be measured in both directions for singlemode connectors. The return loss shall be greater or equal to the value shown in the table above.
- k. Any failures shall be recorded (including value of excessively lossy terminations) and the results obtained after rectification of the fault shall be recorded.





- I. Graphical printouts shall be taken of OTDR tests for each element. These printouts shall be stapled or otherwise attached to 11" x 8.5" size sheets. They shall be printed at an appropriate scale, such as 0.5 dB per division for the attenuation axis. Provide diskette copies of the OTDR traces to the owner on completion of the testing. Provide a copy of the emulation software and the appropriate license to the client.

END OF SECTION



## SECTION 274150

## AUDIOVISUAL SYSTEM EQUIPMENT &amp; INSTALLATION

## PART 1 - GENERAL

## 1.1 Scope of Work

- A. The work covered in this Section consists of furnishing all labor, material and services to install a complete audiovisual system as indicated on the project drawings and in these specifications.
- B. Delivery of the work described in this Specification shall include, but not be limited to, the following Basic Services:
- C. Engineering and Design: The Audiovisual Integrator shall provide all system engineering and design necessary to develop the complete systems described herein. Engineering and Design shall include preparation of all necessary electronic schematics, hardware drawings, systems diagrams, schedules and lists. Additionally, final system design and configuration with the Owner, as well as on site audiovisual coordination and infrastructure installation review with the General Contractor is required.
- D. Assembly: The Audiovisual Integrator shall procure and assemble all hardware and equipment and any additional materials as required to deliver completely functioning Audiovisual Systems.
- E. Software Programming: The Audiovisual Integrator shall perform all required software setup, configuration, and programming required to develop a complete operating system in accordance with this Specification, including all control logic and push-button component faceplate or interface programming.
- F. Installation: The Audiovisual Integrator shall install all equipment, cable, wiring, connectors, plates and other material at the Project site per the Integrator's approved designs. The Audiovisual Integrator shall install any owner furnished equipment identified in this document and calibrate it to work with the integrated systems.
- G. Testing and Adjustment: The Audiovisual Integrator shall perform all tests and adjustments, furnish all test equipment necessary and perform all work required to properly configure the systems and to verify their performance in accordance with the information in this Specification and the Integrator's approved engineered designs.
- H. Acceptance Testing: Prior to Owner acceptance and hand-over of the completed Audiovisual Systems, the Audiovisual Integrator shall demonstrate the operation of the complete systems, including all individual devices and specified control functions. Both subjective and objective tests may be required by the Owner to determine compliance with the information in this Specification and the Integrator's approved designs.
- I. Training: The Audiovisual Integrator shall provide technical training of Owner's staff, instructing them on Audiovisual Systems operation, maintenance and troubleshooting.
- J. Warranty: The Audiovisual Integrator shall warranty the Audiovisual Systems in accordance with the terms of this Specification.

## 1.2 Definition of Terms

- A. Definitions of the terminology used in this Specification are as follows:
  - 1. Owner or Client: shall refer to the MiraCosta Community College District (MCCCD), or their designated representative.
  - 2. Architect: shall refer to the awarded project architect.
  - 3. Construction Manager (CM): shall refer to selected services supplier.
  - 4. General Contractor (GC): shall refer to selected services supplier.
  - 5. Audiovisual Consultant (Consultant): shall refer to project sub-consultant



6. Audiovisual Integrator (Integrator): shall refer to the Integrator contracted to provide the services and material delineated herein under the GC or sub-contracted under another Construction Contractor
7. Construction Contractor: shall refer to a designated sub-contractor to the General Contractor
8. Audiovisual Specification (Specification): shall refer to the complete set of designs, performance and delivery requirements delineated within this document and all referenced documents
9. Audiovisual System (AV System): shall refer to the complete compliment of equipment, software and other material that upon completion of assembly, installation and configuration provides the full functionality and technical performance delineated in this Specification
10. Audiovisual Equipment (AV Equipment): shall refer to any and all individual equipment items installed as a part of the Audiovisual System.
11. Work: Design and provision the Audiovisual Systems and associated equipment, software and services for the Project
12. Construction Documents: shall include all documentation associated with the design and general construction of the Project, including this Specification
13. Provide: Supply, deliver, install, test, configure, label, and commission.
14. Manufacturer: shall refer to the original manufacturer of any equipment provided as part of the Work
15. Commissioning Date: shall refer to the date at which a system is formally accepted by the Owner
16. By Others: Shall refer to work or equipment provided outside the scope of work of this section.

### 1.3 Regulatory Requirements

- A. The Audiovisual Integrator shall obtain any permits and shall pay all fees required by public agencies having jurisdiction over the Work.
- B. All products and materials provided shall be listed by Underwriters Laboratory (UL) and shall bear the UL label intended for the purpose specified and indicated. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels.
- C. All equipment and installations under this Specification shall conform to the following:
  1. ANSI/NFPA 70 - National Electrical Code.
  2. ANSI/IEEE C2 - National Electrical Safety Code TIA/EIA Standards 568-A (including TSB-67), 569 and 607
  3. IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- D. The Audiovisual Integrator and their employees shall perform all work in compliance with current Occupational Safety and Health Administration (OSHA) guidelines and regulations and other safety and health requirements as may be mandated by the Owner, the General Contractor or other authorities.
- E. The Audiovisual Integrator shall have a thorough knowledge of governing codes and standards in effect and having jurisdiction over the Project. Lack of awareness of any of the relevant codes and standards will not be accepted as a reason for non-compliance.
- F. The Audiovisual Integrator shall be responsible for providing cable and materials that comply with applicable codes and requirements of regulating bodies. The cost for these materials shall be included in the Bid price, as the Owner shall not accept change orders for changes in materials.

### 1.4 Coordination of Related Work by Others



- A. The Audiovisual Integrator shall coordinate with the General Contractor and other construction trades to ensure proper integration and operation of the Audiovisual Systems with the complete Project designs, building systems and all other elements of the Project. The Audiovisual Integrator should request from the General Contractor complete project Construction Documents to help facilitate effective coordination of the Audiovisual Integrator's work with the work of others.
- B. Some components of the complete Audiovisual Systems will be provided by or impacted by others. It shall be the responsibility of the Audiovisual Integrator to coordinate with all parties whose work impacts the Audiovisual Integrator's work to ensure the complete coordination and successful implementation of the Audiovisual Systems. Related work by others shall include, but may not be limited to, the following:
  - 1. Millwork and Cabinetry: All millwork and cabinetry modifications required to accommodate the installation of Audiovisual Systems, equipment and related cabling and connections, except as may be individually identified in the Specification, shall be provided by others.
  - 2. Owner Furnished Equipment (OFE): Some equipment that will become a part of or connect to the Audiovisual Systems may be provided by the Owner and shall be designated as Owner Furnished Equipment (OFE). Owner Furnished Equipment shall be provided by the Owner and supplied to the Audiovisual Integrator for connection, installation and/or integration into the Audiovisual Systems as delineated in the Audiovisual System designs and these Specifications. This may include new or existing equipment. The Audiovisual Integrator shall be responsible for coordinating with the Owner to ensure that all Owner Furnished Equipment is fully operational and compatible with other Audiovisual Equipment and that it is made available to the Audiovisual Integrator in a timeframe that does not delay the Audiovisual Integrator's work.
  - 3. Information Technology Systems: Unless otherwise specified, all data networking cabling and active electronics shall be provided by others. The Audiovisual Integrator shall be responsible for coordinating with the Owner or the Owner's designated representative regarding connections between the Audiovisual Systems and the Owner's data network, including all client/server computing and peripherals, Internet, digital video storage and other data/media distribution systems. Configuration of all network IP addresses and settings for Audiovisual equipment covered within this scope is to be provided by the AV Integrator.
- C. Electrical (AC) Power Service and Connections
  - 1. Technical Power Service: All electrical panels, power receptacles, lighting fixtures, dimmers, lighting controls, and interconnecting wiring shall be supplied by others.
  - 2. The Audiovisual Integrator shall verify power connection is proper before connecting any AV system equipment.
- D. Low Voltage Cable Containment
  - 1. Low voltage cable containment, including raceways, conduits and junction boxes, required to support Audiovisual System devices and interconnecting cabling shall be as specified in the Construction Documents and shall be provided by others.
  - 2. Upon commencement of work on the Project the Audiovisual Integrator shall review the Construction Documents to confirm that the infrastructure provided is sufficient to accommodate the Audiovisual Systems to be installed. Any conflicts or issues must immediately be brought to the attention of the Audiovisual Consultant.
  - 3. The Audiovisual Integrator shall provide blank cover plates or panels for all floor, wall and ceiling boxes that are dedicated to the Audiovisual Systems but do not have devices and/or connectors at the time of Audiovisual System commissioning. Colors and types shall be coordinated with the Architect. Devices and plates for other trades (HV power, voice/data, and security) within the AV floor boxes are by others.
- E. Low Voltage Cabling and Termination



1. All audio, video, control and other low voltage cabling associated with the Audiovisual System shall be provided, installed and terminated by the Audiovisual Integrator utilizing the cable containment infrastructure (e.g. conduit, raceways, junction boxes, etc.) provided by others as noted on the Construction Documents.
  2. The Audiovisual Integrator shall provide all patch cords and other cable assemblies required to connect Audiovisual Equipment to voice/data outlets and any other required system or network inputs or outputs.
  3. Where cable installation is required, this will include wall and/or floor jacks, plates and terminations at all room devices, and service loops at patch bay locations shall be provided by the Audiovisual Integrator.
- F. Equipment Mounting and Support
1. Structural support for ceiling mounted video projectors, wall mounted monitors and other Audiovisual Equipment shall be provided. The Audiovisual Integrator shall coordinate with Construction other trades as necessary to ensure compatibility of the structural supports provided by others with the Audiovisual Equipment provided by the Audiovisual Integrator.
  2. The Audiovisual Integrator shall install all Audiovisual Equipment, including projector mounts, as indicated in this Specification and the Construction Documents. Exceptions will be the Audiovisual Integrator furnished display wall mounts as those will be provided and installed by the Audiovisual Integrator (refer to Paragraph 1.6-B-8). The Audiovisual Integrator shall verify location and structural suitability before attaching equipment and mounts. Any variations from the drawings and specifications or any question of structural integrity shall be brought to the attention of the Architect and Audiovisual Consultant before installing the equipment.
- G. Audiovisual System Connections to Building Systems and Controls
1. The Audiovisual Integrator shall coordinate with the General Contractor to verify that all devices and controls to be interconnected to the Audiovisual System are functioning properly prior to commencing interconnection to the Audiovisual Equipment.
  2. The Audiovisual Integrator shall investigate all hardware and software control conflicts between the building systems and the Audiovisual Equipment before interconnecting the building systems. Report any conflicts, potential or existing, to the Audiovisual Integrator, in writing, before interconnecting the systems. Damage caused to any base building systems due to the improper connection of Audiovisual Equipment shall be the sole responsibility of the Audiovisual Integrator.
  3. Where indicated, the Audiovisual Integrator shall select and install the appropriate cable type to facilitate device communication from the Audiovisual Equipment to interconnected building systems.
  4. The Audiovisual Integrator shall coordinate with the General Contractor to verify proper operation of the connected Audiovisual Equipment and the building systems after interconnecting the systems.
  5. **Audiovisual Integrator shall coordinate with fire/life safety systems and the General Contractor for connection for automatic audio muting of all Audiovisual Systems for emergency notification and/or announcements. This shall be a 2-conductor trigger cable provided by the life safety contractor run to the Audiovisual System equipment rack for termination within the control system by the Audiovisual Integrator and included within their system programming for the audio muting (released upon clear trigger).**

## 1.5 References



- A. The following documents provide information regarding audiovisual industry “best practices,” including commonly accepted standards for design, installation, and performance of integrated audiovisual systems. The technical quality of the Audiovisual Integrator’s work and the resulting performance of the Audiovisual Systems installed in the Project will generally be measured against the standards and practices delineated in these References.
  - B. Audiovisual Best Practices: The Design and Integration Process for the AV and Construction Industry, Timothy Cape and Jim Smith; Fairfax, VA; International Communications Industries Association, 2005
  - C. ASTM Task Group E33.04C, Acoustical Environment in the Open-Plan Office, Atlas-Soundolier, Addendum, May 1994
  - D. Dashboard for Controls Design Reference, InfoComm International®  
<http://www.infocomm.org>
  - E. Dashboard for Controls Integrators Guide, InfoComm International®  
<http://www.infocomm.org>
- 1.6 Project / Site Conditions
- A. Refer to Division 1 of the Construction Documents for coordination with other trades on this project.
  - B. Coordinate all access to the site at all times with the General Contractor.
  - C. Adhere to the safety standards established by the General Contractor while performing work on site.
  - D. All employees of the Audiovisual Integrator shall wear identification clearly indicating the Audiovisual Integrator’s company name while on site.
  - E. All employees of the Audiovisual Integrator shall comply with rules and policies established by the General Contractor.
  - F. All vehicles of the Audiovisual Integrator or employees shall be parked in areas designated by the General Contractor.
  - G. The Audiovisual Integrator will store equipment in a manner that will not interfere with the work of others. Coordinate secured storage at the site with the General Contractor.
  - H. Do not install equipment in dusty conditions or allow dust to accumulate in or on installed Audiovisual Equipment.
  - I. Protect all work and equipment from damage by others.
  - J. Protect all existing work-in-place by others from damage by the Audiovisual Integrator, the Audiovisual Integrator’s agents and/or sub-contractors, or any employees or vendors. The Audiovisual Integrator will be solely responsible for any/all damage to work-in-place by others.
  - K. Keep areas around and inside of each piece of equipment and each rack free from dust, dirt and debris throughout the project. Equipment that is not properly maintained during installation shall be replaced at no cost to the Owner before final payment is made to the Audiovisual Integrator.
  - L. All equipment and materials stored at the Audiovisual Integrator’s facility(s) or stored and/or installed at the Project site will remain the property of the Audiovisual Integrator unless ownership is legally transferred and accepted in writing by the Owner. The Audiovisual Integrator shall be solely responsible for the protection of all equipment from damage, theft or vandalism regardless of cause, until the work described herein is accepted by the Owner at the time of Final Checkout.
- 1.7 Quality Assurance
- A. The Audiovisual Integrator shall obtain any permits and shall pay all fees required by public agencies having jurisdiction over the Work.





- B. All products and materials provided shall be listed by Underwriters Laboratory (UL) and shall bear the UL label intended for the purpose specified and indicated. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels.
  - C. All equipment and installations under this Specification shall conform to the following:
    - 1. ANSI/NFPA 70 - National Electrical Code.
    - 2. ANSI/IEEE C2 - National Electrical Safety Code TIA/EIA Standards 568-A (including TSB-67), 569 and 607
    - 3. IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  - D. The Audiovisual Integrator and their employees shall perform all work in compliance with current Occupational Safety and Health Administration (OSHA) guidelines and regulations and other safety and health requirements as may be mandated by the Owner, the General Contractor or other authorities.
  - E. The Audiovisual Integrator shall have a thorough knowledge of governing codes and standards in effect and having jurisdiction over the Project. Lack of awareness of any of the relevant codes and standards will not be accepted as a reason for non-compliance.
  - F. The Audiovisual Integrator shall be responsible for providing cable and materials that comply with applicable codes and requirements of regulating bodies. The cost for these materials shall be included in the Bid price, as the Owner shall not accept change orders for changes in materials.
- 1.8 Integrator Qualifications
- A. The successful Integrator shall be contracted to perform the Work based on their bid's attention to the following criteria:
    - 1. Integrator shall have a minimum of three (3) years of experience with the design, engineering, assembly, installation and support of Audiovisual Systems of similar or greater complexity to those identified in this Specification and shall have been operating under the same business name for a minimum of three (3) years.
    - 2. The Integrator shall be able to provide the necessary professional design, engineering, fabrication, installation, and project management personnel to execute the Work and to guarantee a complete, functional system in compliance with the intent of this Specification.
    - 3. The Integrator shall be licensed with all agencies having jurisdiction over the Work.
    - 4. The Integrator shall maintain permanent fabrication, service and support facilities within (150) miles of the Project site.
    - 5. The Integrator shall be bondable at 100% of contract value.
    - 6. As a minimum requirement for this Bid, the Lead Engineer or Project Manager from the Integrator shall have a CTS (Certified Technology Specialist ) certificate from ICIA.
    - 7. The Integrator will have held for longer than a period of one year current manufacturer certifications for the major equipment for the project as appropriate.
- 1.9 Submittals
- A. General Submittal Requirements
    - 1. A submittal package consists of all items (forms, lists, drawings, etc.) specified for that submittal.
    - 2. All specified items for each submittal shall be provided at the same time. Partial or incomplete submittals will be rejected.
    - 3. Unless directed otherwise in writing by the Audiovisual Consultant, the Audiovisual Integrator is not authorized to proceed with the acquisition, assembly or installation of any systems or components until all required submittals have been approved by the Audiovisual Consultant. Any acquisition, assembly or installation of any systems or components without Audiovisual Consultant's approval will be subject to removal at the Audiovisual Integrator's expense.



4. The Audiovisual Integrator shall coordinate with Audiovisual Consultant prior to the delivery of each submittal to obtain the proper quantities of submittals to each recipient.
  5. Product cut sheets shall be submitted electronically on one compact disc with a separate "table of contents" listing all of the cut sheets included.
  6. Product cut sheets shall accompany all requests for product substitutions.
  7. Audiovisual Consultant will notify the Audiovisual Integrator if any sample products are required for fit or finish coordination. Samples shall be provided by the Audiovisual Integrator upon request and at no additional cost to the Owner.
  8. Use the architectural audiovisual infrastructure constructions plans and specifications for reference (obtainable through the General Contractor).
  9. All submitted bill-of-materials equipment listings shall include referenced information listed within this document and will be cross-referenced with the drawings. List will include an itemized breakdown by room (or similar room type) along with model numbers, quantities, etc. Final submittal will include product serial number information for major equipment as appropriate.
- B. Project Commencement Submittals
1. Immediately upon award of contract and authorization to proceed with the Work, the Audiovisual Integrator shall commence initial planning and coordination. Project Commencement Submittals required upon commencement of the Work shall include, but not be limited to, the following:
    - a. Project Plan
      - 1) Listing of Long Lead Time Equipment
      - 2) The Audiovisual Integrator shall submit a list of long-lead items. These are items that may be necessary to order ahead of the submittal and approval sequence in order to avoid adversely impacting the project schedule. Do not include equipment that will be ordered within the scheduled submittal and approval process.
      - 3) The Audiovisual Integrator shall use reasonable judgment in determining which products are legitimate long-lead items. Failure to include an item that may require long procurement lead time shall not relieve the Audiovisual Integrator of responsibility for furnishing the item to meet the agreed Schedule.
- C. Engineering Submittals
1. The Audiovisual Integrator shall present documentation delineating the complete requirements for Audiovisual System engineering, fabrication, assembly, installation, commissioning and testing. Engineering Submittals shall be presented to the Audiovisual Consultant for review, comment and approval prior to commencing further work. Engineering Submittals shall include, but not limited to, the following:
  2. Equipment List (to be submitted in the form of Appendix B)
  3. Audiovisual System Shop Drawings
    - a. At a minimum, Shop Drawings shall include the following:
      - 1) Single-line system design diagrams clearly diagramed with cabling type and numbers and equipment tags
      - 2) Rack elevations
      - 3) Equipment location diagram
      - 4) Equipment plate layout
      - 5) Control panel layout and labeling
    - b. All sheets shall be the same size, oriented the same direction, and shall be bound, not folded.
- D. Control System Software Submittals
1. Control System Software consists of the following three primary components:
    - a. Control System Button Panel Layout





- b. Control System Processor Software
    - c. Initial IP allocation table and request form for all networked AV devices
  - 2. In order to develop Control System Software that is functional and understandable by the intended users it will be necessary for the Audiovisual Integrator to provide “working” copies of software for review and comment by the Owner and the Project team as it is being developed.
  - 3. Include initial IP request table in editable spreadsheet format (obtainable though Owner IT Department or sample form can be requested from Consultant) to coordinate any static IP addresses for networked equipment provided within this scope. Table shall include fields for (but not limited to):
    - a. Device IP number (address, subnet, gateway)
    - b. Device name
    - c. Device location (room number and placement)
    - d. Device manufacturer and model number
    - e. Device MAC address
    - f. Assigned port number (physical port or what port switch is associated with)
- E. Substantial Completion Submittals
  - 1. Substantial Completion of the Audiovisual System installation shall be the point at which all Audiovisual Equipment has been installed, programmed, configured and initially tested to confirm proper operation. The point of Substantial Completion shall be as mutually agreed between the Audiovisual Integrator and the Audiovisual Consultant following discussion and observation. At the point of agreed Substantial Completion, the Audiovisual Integrator shall submit the following:
    - a. Testing Report
      - 1) Perform electrical and electronic tests and present documented results. Provide results to Audiovisual Consultant before scheduling the Preliminary Checkout.
      - 2) Submit test results in a table format stating test description, acceptable result value and measured value (result). Clearly show all values not in acceptable value ranges.
    - b. Preliminary Project Record Documents Submittal
      - 1) Upon Substantial Completion the Audiovisual Integrator shall submit Preliminary Project Record Documents to the Audiovisual Consultant. Preliminary Project Record documents shall be submitted prior to the Preliminary Checkout.
      - 2) Preliminary Project Record Documents shall include:
        - a) Corrected/updated shop drawings
        - b) Updated Equipment List in the form of Appendix A
        - c) Half-size drawings modified to reflect the actual installation conditions
        - d) CD-ROM with manufacturers’ operation manuals arranged alphabetically and current drawings in .DWG format
      - 3) Consultant’s Preliminary Checkout will be scheduled after the Preliminary Project Record Documents and Test Reports have been approved.
- F. Final Acceptance Submittals
  - 1. Prior to Final Acceptance the Audiovisual Integrator shall submit the following:
  - 2. Hardcopy Project Record Documents
    - a. Warranty documentation including warranty start and end dates for each individual piece of equipment provided.
    - b. Explanation of procedures for obtaining telephone support and on-site service during Audiovisual Integrator’s warranty period.
    - c. Recommended dates for the preventive maintenance service calls.



- d. Final Equipment List with itemized listing by room/system, including serial number for each item.
    - e. Final IP address allocation table
    - f. Electrical and electronic test results.
    - g. Key schedule with three copies of each key required for operation of the systems, equipment racks, etc.
    - h. One (1) half-size set of all Audiovisual System design drawings revised to reflect “as-built” conditions.
    - i. One (1) full-size set of all Audiovisual System design drawings revised to reflect “as-built” conditions.
  - 3. Electronic documentation on DVD/CD-ROM(s) to include:
    - a. Product Information which shall consist of electronic versions for all product literature, manuals, software and other material provided by equipment manufacturers with the Audiovisual Equipment. Material shall be assembled in the binders with section dividers and a table of contents.
    - b. Back-up of Audiovisual Control System software code (e.g. user interface software and control processor program). Un-compiled source code shall be submitted in both soft copy and printed out in hard copy documentation. Copies (hard and soft) of the software are to be included in the systems manuals.
    - c. Copies of all custom or purpose-created software, including original source code.
    - d. All software shall be written with remark statements to document function of sub-routines, macro’s and program requirements.
    - e. All control, DSP and specific device application software.
    - f. All final software configuration and final set-up settings.
    - g. Final equipment list with warranty and serial number information.
    - h. Record Drawings in PDF format.
    - i. Record Drawings in .DWG format.
- 1.10 Warranty & Maintenance Support
- A. Basic Warranty
- 1. Basic Warranty provided by the Audiovisual Integrator shall include repair or replacement for one year from Final Acceptance on all Audiovisual Equipment provided (including products having a manufacturer’s warranty of less than one year) and all Audiovisual Integrator workmanship. Basic Warranty shall be provided at no additional cost, except in case of obvious abuse. Consumable items such as lamps, batteries, tapes, etc. are not covered by Basic Warranty.
  - 2. During the Basic Warranty period the Audiovisual Integrator shall:
    - a. Provide telephone support within 4 hours of a call requesting service.
    - b. Provide on-site support within 24 hours of a call requesting service not corrected by telephone support.
    - c. Repair or replace faulty items within 72 hours of on-site service or within manufacturers’ specific repair program whichever is quicker.
  - 3. Audiovisual Integrator shall not involve the Owner with removing, re-installing equipment, shipping or receiving equipment being repaired under Basic Warranty, nor shall the Owner be responsible for any shipping or freight charges associated with any item under warranty.
  - 4. Audiovisual Consultant and the Owner shall be copied with all paperwork related to any and all warranty work during the Basic Warranty period.
  - 5. The Basic Warranty period will commence no sooner than the date of first beneficial use by the Owner and no later than the date of contract closeout.

## PART 2 - PRODUCTS



## 2.1 GENERAL

- A. The information provided in this section describes the basic functional capabilities and operational requirements of the Audiovisual System(s) installed in the Project as well as specific product information. Descriptions are provided by individual area where applicable.
- B. Specific Project Equipment Information
  - 1. Refer to system diagram on construction drawings in audiovisual package for specific information.

## 2.2 DESCRIPTION OF TYPICAL CLASSROOM:

- A. Equipment:
  - 1. Source Equipment:
    - a. 3 Input Transmitter: Extron DTP T USW 233.
    - b. Cable Cubby: Extron Cable Cubby 300S with connection cables, Left/Right Cable Pass-Through and Blank AAPs as required.
    - c. Wireless Collaboration. Extron Sharelink 200Connect to data network and configure settings in conjunction with MCCCC IT Dept.
    - d. Document Camera: Epson DC21 with HDMI digital input. Include Kensington-style lock for securing to instructor desk.
    - e. Blu-ray™ Player: Refer to Campus Standards for equipment model.
    - f. Wireless Microphone System: Shure QLXD14/83.
  - 2. Mixing, Routing, Processing, and Distribution:
    - a. Digital Presentation Switcher: Extron IN1608MA **(or sized as required for room sources and displays).**
    - b. HDMI TP Receiver: Extron DTP HDMI 230Rx.
  - 3. Loudspeaker / Amplification:
    - a. Ceiling Loudspeaker: Extron SF26X 8" full-range ceiling speaker (8-ohm in small rooms or 70V in larger) **per specification 274100.**
    - b. Amplifier (small): Extron MPA series power audio amplifier for smaller 8-ohm configurations.
    - c. Amplifier (medium-large): Extron XPA 2001-70V power audio amplifier.
  - 4. Display:
    - a. Video Projector: Panasonic **#PT-RZ660U** 6,000 ANSI lumens WUXGA (1920 x 1200) resolution **laser** projector (coordinate standard lensing with ceiling elements) with BMS LOC-IV per spec **275116** security enclosure and Premier Mount PDS-Plus ceiling mount (or equivalent). Provide with wireless networking module for wireless presentation connection. Projector to be white model where available.
    - b. Desktop Monitor Mount: Chief Manufacturing # K2C120 articulating monitor mount.
    - c. Coordinate projector throw **and lensing** with projection screen image (16:10) per spec 115213 **and project sizing requirements.**
  - 5. Control System:
    - a. Control System: Extron IPCP Pro 350 (or pro-grade equivalent to accommodate controlled devices).
    - b. Touch Panel: Extron TLP Pro 350T, 700T or 1020T Black. Provide with XTP PI 100 Power-over-Ethernet injector as required. Utilize the standard MCCCC templates for control and user interface graphics. Locate control panel on the top surface of the instructor podium. Include second touch panel mounted on podium or wall face as needed to comply with ADA requirements.
    - c. Control for projection screen to include up/down upon system startup & shut down. Control to include manual override for up/down during system on operation.
    - d. Control to include separate microphone and program audio mute and level controls.
  - 6. Assistive Listening System



- a. Refer to specification 275100.
  7. Equipment Rack (Desk) & Miscellaneous Equipment
    - a. Middle Atlantic 14RU Slim5 with runner kit, RU as required to mount all equipment and must fit under height adjustable desk. Include side doors (final color to be coordinated with Architect and MCCCC prior to ordering), rear locking access door and front locking vented door. Include rear cooling kit to accommodate proper active/forced cooling of internal equipment. Include leveling feet to accommodate underside ventilation and cabling run into rack from bottom side. Coordinate prior to ordering with MCCCC for desk compatibility.
    - b. Middle Atlantic 2RU locking drawer #UD2 with #KYLK lock option.
    - c. Middle Atlantic 2RU clamping shelf for Blu-ray player/wireless mirroring device.
    - d. Middle Atlantic 3RU clamping shelf for PC.
    - e. Middle Atlantic power distribution unit (PDU) #PD-915R or approved equivalent.
    - f. Six-outlet 115VAC surge power strip mounted within rack for monitor & PC, etc.
  8. Room Reservation:
    - a. 25Live software
    - b. 12" display panel
  9. Digital Signage:
    - a. Visix 55"-65" display
  10. Instructor Podium:
    - a. Omni Pacific Podium 3.0 (verify side drawer position by classroom need). Podium to be 38"W x 26"D x 48"H. Finish to be coordinate with architect for room aesthetics compliance. Surface to be angled 25-degrees to accommodate OFCI Dell monitor with a clear tempered glass shield. Include options for device openings and trays per standard podium design drawing (provided by MCCCC). **Final furniture solution to be verified with District media services for latest standard and ADA compliance.**
  11. Instructor Desk:
    - a. Omni Pacific Smart Desk (verify leg well side by classroom need). Desk to be 60"W x 26"D x 28"H. Finish to be coordinate with architect for room aesthetics compliance. Include options for device openings per standard podium design drawing (provided by MCCCC).
    - b. Include Middle Atlantic SRSR-2-12 rack for equipment mounting. **Final furniture solution to be verified with District media services for latest standard and ADA compliance.**
- 2.3 Room Management
- A. AV Remote Management System: Connect to existing Extron GlobalViewer Enterprise 2.0 server application for all new endpoints. Coordinate with Owner for server and network needs, as required to support the software.
- 2.4 Substitutions
- A. The acceptability of a proposed substitution to a specified Audiovisual Equipment item shall be considered under the following terms:
    1. The term "No Substitutions" shall denote that only the listed product(s) are acceptable and no substitutions will be considered or approved.
    2. The term "Or Equal as Approved" shall denote that equivalent products will be considered as alternatives to the specified products pending approval from Audiovisual Consultant.
    3. The term "Or Equal" shall denote that functionally equivalent products shall be acceptable without written approval by Audiovisual Consultant.



- B. Where a specified item has been discontinued by the manufacturer and/or replaced by a new model, the Audiovisual Integrator shall supply the current model at no additional cost to the project. Audiovisual Consultant may require submission of the new model for evaluation prior to acceptance as a substitute.
  - C. Where a manufacturer is listed as "comparable" but a specific model number is not indicated, the comparable products must meet all the listed specifications as a minimum, and the primary specified product (manufacturer and model number) shall be used as the basis of design.
  - D. Unless otherwise noted, product substitution is allowed only by expressed written consent of Audiovisual Consultant.
  - E. The Audiovisual Integrator shall be fully responsible for making a substitute product match the requirements, description and functionality of the originally specified product regarding all options, accessories and external interface requirements.
- 2.5 Software
- A. General
    - 1. All source code becomes the exclusive property of the Owner.
    - 2. All source code changes must be fully documented. Updated programming (compiled and un-compiled hard and soft copy versions of code) must be updated and located at all equipment rack locations and for all equipment manuals.
    - 3. Source code changes and/or additional programming will be warranted by the vendor for a period of 1 year with the Audiovisual Integrator responsible for any required diagnosis and repair.
    - 4. All manufacturer's software operating system updates, bug fixes, patches, etc., shall be installed as part of the periodic system maintenance of the system during the warranty period.
    - 5. An acceptance test will be performed at commissioning during which the software and any additional code changes or upgrades must perform accurately and be error free.

### PART 3 EXECUTION

- 3.1 Preparation
- A. Before commencing the Audiovisual Integrator shall verify proper completion of the following work by others:
    - 1. All low voltage cable containment and other infrastructure, including, but not limited to, the following:
      - a. Junction boxes and conduit installed per drawings and specifications.
      - b. Conduit stub-outs finished appropriately to prevent cable abrasion.
      - c. Pull boxes installed per N.E.C. based on total number of turns and angles and on linear feet of conduit.
      - d. Pull strings installed in all conduits.
      - e. Cable tray installed and accessible as specified.
    - 2. All line voltage (120VAC) electrical power services, including verification of service levels, circuiting, grounding and other critical criteria.
    - 3. Fixed millwork and furniture systems.
  - B. Confirm with the General Contractor and the Owner that all work performed by others that impacts the work of the Audiovisual Integrator and the Audiovisual System installation has been completed satisfactorily. Also confirm that any remaining work to be completed will not adversely affect the work of the Audiovisual Integrator of the Audiovisual System installation and/or performance.





- C. Provide written notification of any problems impacting the Audiovisual Integrator's work to Audiovisual Consultant. Failure of the Audiovisual Integrator to notify the Architect and/or Audiovisual Consultant in a timely manner of incomplete, inadequate, unfinished or otherwise unacceptable pre-requisite work by other trades in the base-building infrastructure will not relieve the Audiovisual Integrator of the responsibility to complete the work under this contract.
- 3.2 Installation
- A. General
1. All equipment and enclosures described in this Specification shall be installed plumb and square unless specifically detailed otherwise.
  2. All Audiovisual Equipment, except that designated as movable, portable or loose equipment, shall be secured and permanently attached to racks or other appropriate rigid surface in a manner which will require the use of a tool (e.g.: screw driver, nut driver, etc.) for removal.
  3. All Audiovisual Equipment installed in a manner or location that may visually impact the finished appearance or functionality of any part of the facility shall be coordinated and approved by the Architect and/or the Audiovisual Consultant prior to installation.
  4. All Audiovisual Equipment supports shall meet or exceed the load requirements of the intended application with a minimum safety factor of five times the actual load.
  5. Provide support structure and hardware with a SAE Grade 8 load rating (min.).
- B. Conduit and Raceways
1. Where cabling transitions from the building distribution infrastructure into equipment racks, provide strain relief and insulation as necessary to protect the cables.
  2. Segregate cabling within conduits by signal and cable types.
  3. Do not exceed 40% fill in conduits.
- C. Cable Dressing
1. Cable dressing shall be considered from a maintenance standpoint. Suitable service loops shall be provided to allow removal of equipment, or to extend equipment that is mounted in the rack on rack slides. Where there is no rear access to the rack mounted equipment, this requirement shall be carefully addressed, and cabling shall be of sufficient length to enable the removal and replacement of any individual piece of equipment with all others in place.
  2. It is expected that the Audiovisual Integrator will fabricate some portions of the systems off-site. Pre-wiring is acceptable provided that the pre-wired assembly can easily be transported to its final location without complication, and without risk of cable or equipment damage. Use of intermediate connections for inter-rack cables is not acceptable.
  3. Equipment specified as "Future" shall be accommodated with cables installed and routed normally, with the un-terminated end being labeled, sealed in a plastic bag, and tagged appropriately.
  4. The Audiovisual Integrator shall be responsible for determining the proper length of all cables whether manufactured on or off the job site.
  5. The Audiovisual Integrator shall determine the desired method of securing cables. All of the following requirements must be met by the system:
  6. Plastic cable ties are the preferred method of cable lacing. Lay-in systems are not acceptable except as applied to a horizontal cable tray.
  7. Wires and cable shall be installed in a neat and orderly fashion, with like cable types following similar paths. Groups of cables shall be neatly combed and harnessed. Harnessed groups of cables shall be anchored at suitable intervals to reduce and relieve wire strain, especially strain on connections. Adequate service loops shall be provided at all cable endpoints.
  8. Some rack-mounted equipment utilizes slide assemblies for front extension while in operation. For this type of mounting, additional, carefully dressed service loops on all cables shall be provided and installed with spring operated cable retractor assemblies to gather and recoil the service loop.



9. For all schemes of cable routing, no point in the path shall be subjected to a bend radius of less than eight (8) times the cable diameter, or minimum cable bend radius specified by the manufacturer.
10. Captive cables shall not be laced in such a manner as to prevent removal of the equipment to which they are captive.
11. Wires and cables shall be segregated according to signal type. In addition, audio cable shall be subdivided into three (3) classes: microphone level circuits, line level circuits, and speaker level circuits.
12. Microphone level audio circuits shall be kept at least three inches (3") from any other type of parallel signal circuits and at least six inches (6") from any parallel AC power circuits.
13. Speaker level audio circuits shall be kept a minimum of three inches (3") from line level audio and AC power circuits. All other signal circuits shall be kept at least three inches (3") away from any parallel AC power circuits.
14. Where circuits of different types must cross, they shall do so at right angles and then return to the above required separations in as short a distance as possible.
15. Conductors, wires, and cables shall be continuous between termination points. Splices are not acceptable.
16. Cable tie and lacing installation shall be accomplished using hand tools specifically designed to apply proper tension to the cable tie, and to cut the end off flush with no protruding sharp edges. The Audiovisual Integrator's field supervisor shall spot check assemblies using cable ties both visually and by touch, thereby detecting any sharp edges of improperly cut cable ties. Install cable ties on all cable runs of two or more cables that are not supported by raceway, cable tray, or other means. Place cable ties approximately six inches (6") apart. Do not use more cable ties than are necessary for a neat installation. Cable ties shall not be applied with excessive force that may damage or deform sensitive and fragile cables.
17. Rack mounting rails shall not be used for cable lacing. Lacing bars and/or tie mount bases mounted to cabinets or console shall be provided where appropriate.

**D. Labeling**

1. Provide permanent, self-adhesive, engraved labels on the following (use 1/8 inch letters with contrasting core):
  - a. Front panel of rack mounted equipment to indicate system designation and/or functionality (e.g. Automixer 3, Press Feed, ADA, Speech Amp-Zone A, etc.).
  - b. Terminals (all types) to indicate system designation and/or functionality.
2. Provide permanent, self-adhesive labels on the back of rack mounted equipment to indicate system designation and/or functionality. Text shall be identical to equipment front panels noted above; however, labels for equipment back panels do not need to be rigid, engraved labels.
3. Identification "Vanity Panels" may be used and located at the top most panel location of each equipment rack to identify the Audiovisual Integrator as well as the Audiovisual Consultant.
4. Provide engraved text or graphics directly on the following (use 1/8 inch letters with contrasting paint fill):
  - a. Receptacle plates and panels.
  - b. Rack panels.
5. Provide heat-shrink labels on both ends of all installed cabling. Use self-adhesive wire numbers under clear heat-shrink, direct-printed heat-shrink or direct-printed self-adhesive wrap-around.
6. Provide printed tags 6 inches from the male connector end on all portable cables.
7. Do not indicate the Audiovisual Integrator's name on movable, portable or loose equipment, control panels or wall plates.
8. Text, graphics and colors used on labels visible on finished surfaces visible to Audiovisual System end-users must be approved by Audiovisual Consultant before fabrication of labeling, plates or other labeled items.

**E. Wiring**

1. Do not make any in-line wire splices unless specifically approved and noted.
2. Use only wire pulling lubricants specified by the wire manufacturer.
3. Provide grommets or chase nipples at cable entry where conduit is not installed.
4. Provide cable anchors for any cable or cable bundle  $\geq 1$  inch diameter. Do not use self sticking adhesive cable anchors.
5. Provide a service loop for each cable that connects to equipment in racks or AV furniture.
6. All cables to or from a movable lectern, cart, or desk or lectern shall be highly flexible cable, specifically designed by the manufacturer to be flexed repeatedly. Permanent installation type of cable is not acceptable for this application.
7. Do not install HD-SDI cable or Category type cables with plastic wire ties. Use soft Velcro based cable ties located at random distances apart.

**F. Service and segregation of installed cables:**

1. Refer to AV Drawing package for standard wiring termination and labeling details, standard cable segregation requirements and any special condition wiring details.

**G. Terminations**

1. Use crimping tools recommended by the termination manufacturer. Use ratcheting crimp tools for spade lugs and Molex connector pins.
2. Provide insulated spade lugs for screw terminals, two lugs per terminal maximum.
3. Conductors in phoenix type connectors shall not be tinned.
4. Use properly sized spade lugs for cable gauge and screw size.
5. Terminate conductors with proper mating connectors.
6. Audio shield/drain wires shall not be connected to the connector body at any time.
7. Only one cable or set of wires should be installed into any single connector; do not loop cable in and out of a connector. Provide a terminal block to parallel any audio signal wiring.

**3.3 Quality Control**

- A. Using the necessary test equipment, record and report to Audiovisual Consultant the results of all tests called for under this heading and as noted elsewhere.
- B. Correct or replace at no expense to the Owner any component that does not meet the manufacturer's specifications or indicated performance during any test.

**3.4 Substantial Completion Inspection**

- A. Prior to the Substantial Completion Inspection, the Audiovisual Integrator must verify that he is prepared for the checkout session by filling out a checklist for each room based on field verification. This completed checklist must be faxed or emailed to Audiovisual Consultant before checkout.
- B. During Substantial Completion Inspection the Audiovisual Integrator will verify quality of workmanship, labeling, proper power/signal grounding and overall equipment performance. Audiovisual Consultant will also verify audio setup and equalization and projector adjustments and will test all basic AV system operations. Audiovisual Consultant will prepare a punch list of items the Audiovisual Integrator must address before Final Checkout.
- C. Substantial Completion Inspection will be scheduled after the documentation provided is approved.
- D. The Audiovisual Integrator's Project Manager or a senior technician who is familiar with the system and the control system programmer shall assist Audiovisual Consultant during the Substantial Completion Inspection. The tests will consist of a thorough test, set-up, adjustments and evaluation of all system performance and functionality. Include 16 hours on site for these tests.
- E. Following the Substantial Completion Inspection, Audiovisual Consultant will create a punch list of deficiencies that must be corrected by the Audiovisual Integrator within 7 calendar days. The Audiovisual Integrator must provide documentation indicating that the punch list deficiencies have been corrected no later than 7 calendar days after Substantial Completion Inspection.





### 3.5 Final Acceptance

- A. Prior to the Final Acceptance inspection, the Audiovisual Integrator must verify that he is prepared for the checkout session by again filling out the following checklist verifying that all systems are operational, as well as all punch list items from the Preliminary Checkout Session have been addressed and corrected. This completed checklist, one for each room, must be faxed or emailed to Audiovisual Consultant before checkout.

### 3.6 System Testing & Owner Acceptance Procedures

#### A. Installation Testing and Adjustment

1. The Audiovisual Integrator shall perform all tests and adjustments, shall furnish all test equipment necessary and perform all work required to verify performance of the system in accordance with these Specifications. When these initial tests and adjustments are completed, the Audiovisual Integrator shall notify the Owner that the systems are in compliance with the Specifications and are ready and complete for Acceptance Tests. The scope of this work includes, but is not limited to the following:
2. The acceptance testing process shall reference this Specification for specific system requirements. There are two distinct procedures in the overall acceptance testing process outlined in this section, the Substantial Completion and the Final Acceptance. Often times, punch lists and incomplete elements will preclude considering the first review of the systems to be the final acceptance of the systems. Typically, final acceptance occurs only after all punch lists are completed and the owner has had some time to work the systems (after the systems are substantially complete), final documentation is given to the owner, and all training is performed.
3. Additionally, the Owner shall retain the right to hire a consultant to test the technology systems. Delays to this consultant caused by incomplete work, improper wiring or inoperative equipment may result in consultant's time being billed to the Audiovisual Integrator at current consulting rates. In the event further adjustments are required, or defective equipment is to be repaired or replaced, tests shall be suspended or continued at the option of the Owner.
4. AV system acceptance testing will consist of verifying overall system functionality, internal rack functions and wiring, external device functions and terminations, device operation, and completion of the Audiovisual Integrators testing procedures. The owner and Audiovisual Consultant will spot check the systems installed by the Audiovisual Integrator in accordance with the standards and practices delineated in the Specification documentation. The following requirements will be considered the basis for establishing substantial completion of the AV Systems.
5. Provide as-built equipment list.
6. Provide redlined design drawings, rack layouts, spreadsheets, and any other relevant and current documentation.
7. Integrator's Punch list: Provide an internally constructed punch list of known devices, cables, or systems that are incomplete. Audiovisual Consultant and the owner will construct another punch list after the substantial completion acceptance testing is performed that is based on the inspection and the Audiovisual Integrator's internally constructed list.
8. Test, adjust, balance, equalize and calibrate all equipment (including OFE) as required for optimum quality. Establish and tabulate normal settings for all level controls. These settings shall be recorded in the maintenance manual for reference.
9. Signal and Cable Testing and Documentation: Provide documentation on the point to point testing of all Fiber, CAT6, Audio, Video Inter-Room and Cabling, provided by the Audiovisual Integrator. The following will be tested for each of the respective category of cable and/or signal types:
  - a. Audio: continuity, polarity, sound check
  - b. Speaker: impedance, polarity, proper zoning, buzz & rattle (frequency sweep), sound check, signal quality.



- c. Video: signal continuity, proper routing.
    - d. Control: continuity & confirmation of control capability between designated control locations and control processors.
    - e. Data/Cat6: Bandwidth testing
  - 10. Quality of Installation: The areas around the AV installation should be free of debris and excess wires. Racks, consoles, and equipment should be free from dirt and grease.
  - 11. Labeling and Terminations: All devices, including floor boxes, racks, termination panels, components, closets, panels, and cables should be terminated and labeled according to the Integrator's engineered plans. Visual spot-checking of wire dressing and terminations will be performed during the Acceptance Testing procedure.
  - 12. The Owner's technical staff shall be involved in recommending hardware and software system settings. The Integrator shall be responsible for providing the test equipment for the tests.
  - 13. System Functional Completion Requirements:
    - a. The owner is encouraged to bring in specific testing and operation scenarios that the Integrator may run through.
    - b. The individual areas of the building and the corresponding audiovisual shall be tested for compliance with system functional descriptions described in the Technology Systems Performance Specification.
  - 14. System Technical Performance Completion
    - a. Individual sub-system components of the integrated AV Systems shall meet or exceed the technical performance defined in the Technology Systems Specification. Testing of the performance of these systems is the responsibility of the Integrator and shall include:
    - b. During the Acceptance Testing procedure, each system will be spot checked to verify systems integration and inter-system operability. For instance, a laptop and/or microphone should be able to be plugged into an interface, and the audio routed to a desired speaker zone.
    - c. The Audiovisual Integrator shall supply any necessary testing equipment for Acceptance Testing including a continuity checker, laptop computers with software, patch cables, and video test equipment. Also, video signal must be able to be routed, patched, and scaled or scan converted.
- 3.7 Training
- A. The Audiovisual Integrator shall provide sufficient training for the Owner's designated staff to become proficient in the general operation, routine maintenance, troubleshooting, and other basic system support functions. This training shall include one session of training of up to 2 hours by the Audiovisual Integrator or the equipment manufacturer. This training shall include a session or sessions that are focused on the Owner's designated technical staff and also a session or sessions that focus on the administrative and/or instructional staff. Training of end users will be provided by the Owner's technical staff.
  - B. Times of day for training must be coordinated with Client availability including evening hours if requested for least disruption to Client day time operations.
- 3.8 Contract Close-out
- A. Contract Closeout will be based on completion of Final Checkout, acceptance of Project Record Documents and Completion of Using Agency Training.

END OF SECTION



Section 27 51 00

ASSISTIVE LISTENING SYSTEMS (ALS)

PART 1 - GENERAL

1.1 SUMMARY

- A. The work includes the provision of Assistive Listening Systems (ALS) as part of the building project.
- B. The fixed ALS shall function with the voice reinforcement systems to be installed by the Audiovisual Contractor or Owner.
- C. In the absence of fixed ALS, portable ALS shall be provided to the Owner, where specified.
- D. Scope of Work: The work shall consist of the design, provision, termination, testing, and documentation of a complete and fully functional ALS. The instructions in this section are specific to the ALS installations and should be read in conjunction with other contract documents as applicable.
- E. Deliverables: Prior to ordering materials or commencing any construction activities, the contractor shall provide the Owner with a complete bill of materials, including all quantities of components, devices, equipment, and wiring required to complete this work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. ALS equipment to be manufactured by Listen Technologies, no equal (Sole Source), **no equal (Sole Source)**
- B. Portable Systems: Provide a minimum of 2 complete systems per building with accessories as described below. More may be required per specific building project. Refer to Construction Project Management or Architect for criteria.
- C. Fixed/Permanent Systems: Provide one fixed systems for each room with occupancy levels of 50 seats or greater as per ADA guidelines.
- D. Portable ALS Equipment
  - 1. Provide the following Listen Technologies FM equipment for operation with the fixed voice reinforcement systems or portable systems as described below.
  - 2. Transmitter/receiver set product – Listen Technologies # LS-06 including charging case.
  - 3. 1 transmitter and microphone and 7 receiver units and headsets.
  - 4. Portable charging carrying case.
  - 5. The receiver shall have 57 user-selectable, 72MHz FCC compliant, approved channels.



6. Provide for Each Portable Transmitter:
  - a. One Pair of NIMH Battery #LA362 or equal
  - b. Lavalier Microphone #LA261 or equal
  - c. Omni Conferencing Microphone #LA277 or equal
  - d. Line/Mic Y Cable #LA263 or equal
- E. Fixed ALS Equipment
  1. Provide Listen Technologies digital FM equipment for operation with the fixed voice reinforcement systems only as described below.
  2. Base Station #LT-800-072 for fixed installations only with the following capabilities:
  3. The receiver shall have 57 user-selectable, 72MHz FCC compliant, approved channels.
  4. The receiver shall have on/off, FM volume, Aux volume, Monitor volume, test tone on/off,, Super Quiet Companding Technology on/off, Contour and channel up/down controls and an FM reception LED on the front panel. The front panel shall include a 2-digit channel LED display.
  5. The receiver must have installer controls and ports on the back panel which include: antenna port; transmitter power settings; (2) mix outputs; (2) unbalanced audio inputs, selectable between +10 dBu and -10 dBu; (1) balanced XLR/¼" audio input, selectable between microphone, microphone with phantom power, and line level; and a separate DC jack to power the transmitter.
  6. The channel display shall have an indicator light illuminated when the main power is off. The size of the receiver must be 20.3 (W) x 1.75 (H) x 20 (D) cm/8.0 (W) x 1.75 (H) x 8.0 (D) in. and weigh 1.4kg/3lbs.
  7. The receiver must operate on 72MHz band, or other operating band approved by FCC for assistive listening devices.
  8. Miscellaneous transmitter equipment to include the following:
  9. Transmitter Antenna – provide a standard or large area antenna as required to generate a signal to receivers located at any point in the instructional space covered by the dedicated transmitter.
  10. Accessories:
    - a. Provide the following accessories for operation with the fixed and portable systems only as described below.
- F. Provide for each system (both portable and fixed):
  1. Provide for Each Receiver:
    - a. Dual Earbud #LA-162 with one package of replacement cushions (LA-163)
    - b. One Pair of NIMH Battery #LA362 or equal
    - c. One induction neck loop #LA166 or equal
- G. Provide for each system (both portable and fixed):
  1. Charger #LA-321 with the following capabilities:
    - a. The charger must be capable of storing or recharging up to 8 transmitters or receivers at once.
    - b. The charger must have an external UL- and CSA-approved wall transformer that plugs directly into the charging unit itself. It must have a pocket to contain the power wall transformer during storage. There must be no on/off switch.
    - c. The charging circuitry must be fully automatic and be capable of recharging the transmitter/receiver batteries in 14 hours maximum when 500mA/Hr batteries are used.
    - d. The charger must be capable of recharging NiCad batteries without the need for removal of the batteries from the transmitter/receiver.



- e. The charger must have a large, foam-lined storage space for accessories, a locking lid, and a handle

## 2.2 ACCESSORIES

- A. Provide the following accessories for operation with the fixed and portable systems only as described below.
  - 1. Provide for Each Receiver:
    - a. Dual Earbud #LA-162 with one package of replacement cushions (LA-163)
    - b. One Pair of NIMH Battery #LA362 or equal
  - 2. Provide for Each Portable Transmitter:
    - a. One Pair of NIMH Battery #LA362 or equal
    - b. Lavalier Microphone #LA261 or equal
    - c. Omni Conferencing Microphone #LA277 or equal
    - d. Line/Mic Y Cable #LA263 or equal
  - 3. Provide for each system (both portable and fixed):
    - a. Charger #LA-321 with the following capabilities:
      - 1) The charger must be capable of storing or recharging up to 8 transmitters or receivers at once.
      - 2) The charger must have an external UL- and CSA-approved wall transformer that plugs directly into the charging unit itself. It must have a pocket to contain the power wall transformer during storage. There must be no on/off switch.
      - 3) The charging circuitry must be fully automatic and be capable of recharging the transmitter/receiver batteries in 14 hours maximum when 500mA/Hr batteries are used.
      - 4) The charger must be capable of recharging NiCad batteries without the need for removal of the batteries from the transmitter/receiver.
      - 5) The charger must have a large, foam-lined storage space for accessories, a locking lid, and a handle
    - b. Provide one induction neck loop #LA166 or equal

## PART 3 - EXECUTION

### 3.1 EQUIPMENT INSTALLATION

- A. Assistive Listening transmitters shall be provided to the Owner in the following rooms:
  - 1. Each room with 50 seats or more shall receive a fixed and installed ALS transmitter system.
  - 2. Each room with a sound reinforcement system shall receive a fixed and installed ALS transmitter system.
  - 3. If multiple transmitters are specified within a facility, it is recommended that the adjacent transmitter channels be at least 300MHz apart. If no interference, the following channels are recommended; 2C, 2D, 2E, 2F, 2G, 2H, 2J, 2K, 2L.
- B. Assistive Listening receivers shall be provided to the Owner as follows:
  - 1. For sound reinforcing, per CBC Section 1104B.2, each room with 50 or more seats shall receive a quantity of ALS receivers that equals at least 4% of the number of seats in the



room (rounding up to the nearest integer), but no less than two. (I.e. A classroom of 80 would receive 4 receivers.)

2. Each portable system will be provided with 4 receivers
- C. Fixed ALS transmitters will be located at AV Equipment rack positions dedicated to each room listed above, or where applicable in portable AV racks.
- D. Portable ALS transmitters and receivers will be given to the Owner for distribution.
- E. Equipment to be installed in accordance with manufacturer's instructions.

### 3.2 TESTING

- A. Following the installation of transmitters and antenna, each transmitter and receiver will be tested.
- B. Transmitters shall support signal distribution at all specified channels at any position in the instructional room to which its use is dedicated.
- C. Receivers shall be tested to verify function as specified by manufacturer.
- D. This is to be done before hand-off to College or to the College's representative for remaining Audiovisual System integration to test for short-life product failures.
- E. All transmitter/receiver sets will be tested simultaneously to ensure no channel conflicts occur.

### 3.3 WARRANTY

- A. Manufacturer's standard warranty.
- B. Contractor to provide all completed product warranty cards or register product with product manufacturer for the College.

END OF SECTION



Section 27 51 16

**AUDIOVISUAL EQUIPMENT - MOUNTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: This Section specifies stationary ceiling mount and equipment enclosure and related accessories for ceiling installation of multimedia projectors.

**1.2 ACTION SUBMITTALS**

- A. General: Submit listed submittals in accordance with Contract.
- B. Product Data: Submit for specified products as follows:
  - 1. Manufacturer's product data, including manufacturer=s technical data sheet(s).
  - 2. Catalog pages illustrating products to be incorporated into project.
- C. Shop Drawings: Indicate information on shop drawings as follows:
  - 1. Layout indicating locations.
  - 2. Dimensions.
  - 3. Installation details.
  - 4. Anchorage details.
  - 5. Manufacturer's recommendations for accessories and mounting kits.

**1.3 INFORMATION SUBMITTALS**

- A. General: Submit listed submittals in accordance with Contract Conditions.
- B. Manufacturer=s Instructions: Submit manufacturer=s installation instructions.
- C. Source Quality Control: Submit documentation verifying that components and materials specified in this Section are from single manufacturer.
- D. Mounting details per field conditions.
- E. Quantity / type per room (including assigned room number).

**1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data:
  - 1. Submit operation and maintenance data for installed products.
- B. Warranty Documentation: Submit warranty documents specified.





- C. Keys for enclosure lock.

## 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer:
    - a. 5 years of experience manufacturing components similar to or exceeding requirements of project.
    - b. Having sufficient capacity to produce and deliver required materials without causing delay in work.
    - c. Capable of providing field service representation during construction.
  - 2. Installer: Acceptable to manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.

## 1.6 DELIVERY, STORAGE & HANDLING

- A. Delivery and Acceptance Requirements:
  - 1. Deliver material in accordance with project guidelines and in accordance with manufacturer=s written instructions.
  - 2. Deliver materials in manufacturer=s original packaging with identification labels intact and in sizes to suit project.
- B. Storage and Handling Requirements:
  - 1. Store materials protected from exposure to harmful weather conditions and at temperatures recommended by manufacturer.
- C. Packaging Waste Management:
  - 1. Separate waste materials for recycling.
  - 2. Remove packaging materials from site and dispose of at appropriate recycling facilities.
  - 3. Collect and separate cardboard for disposal for recycling.
  - 4. Fold metal and plastic banding, flatten and place in designated area for recycling.

## PART 2 - PRODUCTS

### 2.1 CEILING PROJECTOR MOUNT

- A. Description:
  - 1. Mount shall be adjustable to accommodate multiple models of projectors of up to 75 lbs in weight.
  - 2. Compatibility:
    - a. Ensure components and materials are compatible with specified accessories and adjacent materials. Mate all components to standard 1-1/2" NPT couplers and devices.
- B. Manufacturer: Premier Mounts.
  - 1. Contact: 130 E. Miraloma Avenue



Anaheim, CA 92806 USA

(800) 832-4888 / [www.mounts.com](http://www.mounts.com)

2. Single Source Responsibility: Provide like components and materials specified in this section from a single manufacturer.

C. Model: Shall be Premier Mounts model #PP-5A or approved equivalent.

## 2.2 UNIVERSAL PROJECTOR MOUNT

A. Description:

1. Mount shall be adjustable to accommodate multiple models of projectors of up to 75 lbs in weight.
2. Compatibility:
  - a. Ensure components and materials are compatible with specified accessories and adjacent materials. Mate all components to standard 1-1/2" NPT couplers and devices.

B. Manufacturer: Premier Mounts.

1. Contact: 130 E. Miraloma Avenue  
Anaheim, CA 92806 USA  
(800) 832-4888 / [www.mounts.com](http://www.mounts.com)
2. Single Source Responsibility: Provide like components and materials specified in this section from a single manufacturer.

C. Model: Shall be Premier Mounts model #PDS-PLUS-W or approved equivalent.

D. Design/Performance Criteria:

1. Pitch: Plus or minus 15 degrees.
2. Roll: Plus or minus 20 degrees.
3. Swivel: 360 degrees.
4. Load Capacity: To 50 lb (23 kg).

E. Operation:

1. Allows alignment of projector lens to the pivot axes.
2. Allows fine tuning of the image to the viewing screen.

F. Mounting:

1. Mounts to ceiling.
2. Include tamper resistant fasteners for projector and mount.

G. Materials:

1. Mount: Mild steel.
2. Grooved Coupling: 1 1/2 inch (38.1 mm) NPT steel half pipe.
3. U-Joint, Legs: 14 gauge formed steel.
4. Pitch Bracket, Locking Ring, Base Disk: 11 gauge steel.

H. Finish: Powder coated WHITE to match ceiling tiles.

**2.3 PROJECTOR LOCK**

- A. Description:
  - 1. Mount shall be adjustable to accommodate multiple models of projectors of up to 75 lbs in weight.
  - 2. Compatibility:
    - a. Ensure components and materials are compatible with specified accessories and adjacent materials. Mate all components to standard 1-1/2" NPT couplers and devices.
- B. Manufacturer: BMS
- C. Model: Shall be BMS model #LCD LOC IV and shall be keyed alike according to College master key number. No exceptions allowed **(Sole Source)**.
- D. Finish: Powder coated WHITE to match ceiling tiles.

**2.4 WALL TV/MONITOR MOUNT**

- A. Description:
  - 1. Mount shall be adjustable to accommodate multiple models of flat panel monitors of up to 160 lbs in weight.
  - 2. Compatibility:
    - a. Works with 26" to 85" diagonal monitors with standard VESA patterns (75x75, 100x100, 200x100 & 200mm x 200mm).
- B. Manufacturer: Premier Mounts.
  - 1. Contact: 130 E. Miraloma Avenue  
Anaheim, CA 92806 USA  
(800) 832-4888 / [www.mounts.com](http://www.mounts.com)
  - 2. Single Source Responsibility: Provide like components and materials specified in this section from a single manufacturer.
- C. Model: Shall be Premier Mounts model #P2642F, P4263F or P5080F by display size or approved equivalent that will allow capacity of flat panel monitor.

**2.5 ACCESSORIES**

- A. Extension Pipes and Couplers:
  - 1. Model, Description: In conjunction with ceiling equipment box, use Premier Mount #PWH-10 as cable pathway and mounting extension and mate between ceiling box and universal mount. To be white in color to match with other mount components.
  - 2. In locations where no ceiling equipment box is used or no drop ceiling grid occurs, use adjustable extension mount and pole to mate to above ceiling Uni-strut structure. Use Premier Mount #AST adjusting length so end of pole and universal projector mount extend below ceiling by 8"-12".
  - 3. As required to accommodate cabling to be passed through the box, pole and mount ultimately to the projector, a fish-mouth 1-1/2" NPT coupler shall be included. This can be



part of of included within the static or adjustable extension pole. Product to be Premier Mount #MSCC or appropriate model as required.

4. In the Career Training room, use I-Beam clamp mount #PP-ITC48C from Premier Mounts.
5. In the Career Training room, use locking pole mounted medium sized equipment box #GB-MBX220 from Premier Mounts.
6. In the Career Training room, use the 24" to 46" adjustable pole #APP-2446 from Premier Mounts for the ceiling projector.

B. Accessories:

1. Include ceiling guy-wire attachment for four places per manufacturer instructions and project / Architect details. Use Premier Mounts #QLCS or approved equivalent using Uni-Strut members and pipe-clamp attachments from McMaster Carr.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Verify that conditions of substrates previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer=s instructions prior to universal projector mount installation.
1. Inform Consultant of unacceptable conditions immediately upon discovery.
  2. Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 PREPARATION

- A. Verify that mounting surface is capable of supporting a static load of four times the combined weight of the projector and the mount.
- B. Remove projector mount assembly contents from carton and verify that there are no damaged or missing parts.
- C. Surface Preparation: Prepare surface in accordance with manufacturer=s written recommendations.

### 3.3 INSTALLATION

- A. Coordinate installation of universal projector mount in accordance with construction details, manufacturer's installation instructions and reviewed shop drawings at locations and heights indicated.
- B. Coordinate universal projector mount work with work of other trades for proper time and sequence to avoid construction delays.
- C. Install universal projector mount plumb and level to supporting substrate.
- D. Replace non-secure screws with security screws.



- E. Accurately fit, align, securely fasten and install free from distortion or defects.

### 3.4 ADJUSTING

- A. Adjust components and systems for correct function and operation in accordance with manufacturer=s written instructions.
  - 1. Verify that roll adjusts to plus or minus 20 degrees as designed and to meet project requirements.
  - 2. Verify that pitch adjusts to plus or minus 15 degrees as designed and to meet project requirements.
  - 3. Verify that mount operates with 360 degrees of swivel as designed and to meet project requirements.

### 3.5 CLEANING

- A. Upon completion, remove surplus materials, rubbish, tools and equipment.
- B. Waste Management:
  - 1. Coordinate recycling of waste materials with section for Construction Waste Management and Disposal.
  - 2. Collect recyclable waste and dispose of or recycle field generated construction waste created during demolition, construction or final cleaning.
  - 3. Remove recycling containers and bins from site.

### 3.6 PROTECTION

- A. Protect installed product from damage during construction.
- B. Repair damage to adjacent materials caused by universal projector mount installation.

END OF SECTION



Section 27 53 13

CLOCK SYSTEMS

PART 1 – GENERAL

1.1 General Requirements and Scope

- A. Furnish and install a complete new GPS or NTP Wireless Synchronized Clock system using the Innovation Wireless KRONOSync System, SOLE SOURCE. Specify GPS or NTP time source.
- B. All Bids shall be based on Innovations Wireless' product specification as contained herein.

1.2 Summary

- A. GPS, NTP Wireless Transmission System
  - 1. Transmitter with GPS Receiver or NTP (Network Time Protocol).
  - 2. Secondary Transmitter
- B. Wireless Receiving Devices
  - 1. Digital Clocks – AC Powered

1.3 Related Divisions and Sections

- A. Division 26- Electrical 120V grounded outlet required for Transmitter, AC powered Analog Clocks, and Digital Display Clocks.

1.4 References

- A. Innovation Wireless Operations Manual and Associated drawings.
- B. National Fire Protection Agency (NFPA) – 70, National Electric Code 2005

1.5 Definitions

- A. (GPS): Global Positioning System, a worldwide system that employs 24 orbiting satellites in an integrated network to determine geographic location anywhere in the world, and which employs and transmits atomic time (UTC).
- B. (NTP): Network Time Protocol, Short for *Network Time Protocol*, an Internet standard protocol (built on top of TCP/IP) that assures accurate synchronization to the millisecond of computer clock times in a network of computers. Based on UTC, NTP synchronizes client workstation clocks to the U.S. Naval Observatory Master Clocks in Washington, DC and Colorado Springs CO. Running as a continuous background client program on a computer, NTP sends periodic time requests to servers, obtaining server time stamps and using them to adjust computers clocks.

1.6 Submittals



- A. System Product Data: Submit all data for each component, describing its operational and physical characteristics along with the method of installation. Submit a brochure showing all available colors and dimensions of clocks.
- B. Operating License: The system must operate in accordance with a "Radio Station Authorization" form FCC 601 granted by the Federal Communication Commission (FCC). Submit evidence of application for operating license prior to installing equipment. Furnish the license, or if the license has not been received, a copy of the application for the license, to the Owner prior to operating the equipment. Upon receipt of License, deliver original license to Owner.
- C. Samples: Submit one clock for approval. The approved sample is to be tagged and installed as part of the final operating system.
- D. Manufacturer's Instructions: Submit complete installation, set-up and maintenance instructions.
- E. Schematic indicating the location of the transmitter(s) and all clocks must be submitted by owner prior to installation.

#### 1.7 Quality Assurance

- A. Qualifications:
  - 1. Manufacturer: Company specializing in manufacturing of timekeeping products with a minimum of 30 continuous years of documented experience.
  - 2. Installer: Company with documented experience in the installation of commercial timekeeping systems.
- B. Permits: Obtain FCC license for Transmitter authorization

#### 1.8 Regulatory Requirements

- A. Equipment and components furnished shall be manufacturer's latest model.
- B. Master Transmitter and receiver shall comply with Part 90 of FCC rules, as follows:
  - 1. This device must not cause harmful interference and must accept interference received, including interference that may result in undesirable operation.
  - 2. Transmitter frequency shall be governed by FCC Part 90.35.
  - 3. Transmitter output power shall be governed by FCC Parts 90 and 74.
- C. System shall be installed in compliance with local and state authorities having jurisdiction.
- D. The end user must acquire an operating license, or "Radio Station Authorization" that will be granted by the FCC. This permits the end user to legally operate this Wireless system.

#### 1.9 Delivery, Storage and Handling

- A. Deliver all components to the site in the manufacturer's original packaging. Packaging shall contain manufacturer's name and address, product identification number, and other related information.





- B. Store equipment in finished building, unopened containers until ready for installation.

#### 1.10 Project Field Conditions

- A. Clocks shall not be installed until painting and other finish work in each room is complete.
- B. Coordinate installation of GPS receiver to an exterior wall or to an access point on the roof. GPS receiver must be mounted and wire ran back to the Transmitter and all entrances to the building made watertight.

### PART 2 – PRODUCTS

#### 2.1 Manufacturer

- A. Innovation Wireless: KRONOSync Wireless Time System  
11869 Teale Street, Culver City, CA 90230  
Phone: 1-888-559-5565  
Fax: 301-482-3480  
Website: [www.InnovationWireless.com](http://www.InnovationWireless.com)

#### 2.2 System Description and Operation

The KRONOSync Wireless GPS, NTP timekeeping system consists of a master Transmitter located on the inside the building, a GPS receiver mounted on the roof, exterior of the building or window, or NTP receiver box connected via an RJ45 Ethernet cable from an in-house computer network to the transmitter, along with analog or digital clocks, and accessories. Once operational, the transmitter shall keep all system clocks synchronized to the second all day, each day, everyday.

System shall synchronize all clocks to each other. System shall utilize GPS or NTP technology to provide atomic time to components.

System shall not require hard wiring for its components except for AC power. Analog clocks may be battery operated for full portability if required.

Clocks shall automatically adjust for Daylight Saving Time per the Daylight Saving time settings in the Master Clock.

Analog Clocks shall synchronize to +/- 1 second of the master clock displayed time.

The system has an internal clock that will continuously be updated by the GPS or NTP. If a GPS or NTP failure were to occur, the clocks would continue to be synchronized to the internal clock and would not deviate from one another. Once GPS or NTP time is restored, all clocks would once again be synchronized.

The system has a fail safe design so that if a power interruption were to occur, the clocks will continue to operate. Upon the restoration of power, the transmitter will once again communicate with the clocks and normal operation will resume.

Analog clocks shall require 2 "D" cell batteries and be portable and if AC powered, wired to end user specifications.

System shall be 100% programmable from the front operation panel with lights that indicate power status, and GPS or NTP reception.



System programming for Time Zone, Frequency, 12 or 24 hour operation and DST on/off must be programmable from the front of transmitter to avoid system movement.

## 2.3 Equipment

A. Master Wireless Transmitter: The Transmitter is to be installed in an internal location, and can be mounted as a stand alone unit, or as part of a rack system. The LED and associated buttons on front of Transmitter will allow for the programming and display of the following operating features:

1. Master Transmitter: KRONOSync Model # 101005 shall have an internal clock which will guarantee that the operation of the clocks will continue to be synchronized in the event of a temporary GPS failure, SOLE SOURCE.
2. Time Zones: Display and programming must allow for the selection and display of Time zones for all of North America: Eastern, Central, Mountain, Pacific, Alaska and Hawaii. It must also allow for all international time zone options.
3. Daylight Saving Time: Transmitter must allow for automatic adjustment of the system, allowing it to be active or inactive.
4. 12hr or 24hr Operation: System must allow for programming of desired method of operation on the face of the transmitter.
5. Frequency Range: 467.2125- 467.4375 MHz.
6. Programming: All programming of operating features must occur on the front of the Transmitter and all changes must be able to be viewed on the digital display as the changes are being made.
7. GPS Receiver: GPS roof mounted receiver comes with an attached 15' cable (3m). The GPS receiver will be water tight and has a built in receiver. Additional extension cable lengths of 25' 50' and 100' are available. A GPS mounting bracket is provided for secure roof mount or side wall installation.
  - a. NTP Receiver: Receiver box comes with a 20" Ethernet cable.
  - b. Transmitter Power: 5 watt.
  - c. Transmission Range: Up to 2 miles radius (transmitter power dependent)
  - d. Operating Range: 32 degrees F to 158 degrees F (0 degrees C. to 70 degrees C.)
  - e. Radio Technology: Narrowband FM, 12.5 KHz bandwidth
  - f. Antenna: Shall be used for indoor applications and attached to the rear of the transmitter. No external antenna required.
  - g. Power Supply: (included with transmitter)
    - Input: 120-volt AC 50/60 Hz
    - Output: 12-volt DC, 3 Amps



h. Recommended: Surge Protector/Battery Backup:

- Input: 120-volt AC 60 Hz +/-1 Hz.
- Output: 120-volt AC, 550VA, 300 watts
- Surge Energy Rating: 365 joules

8. Analogue Clocks: Analog clocks will be battery operated using 2 "D" cell batteries provided by the manufacturer or AC power based on specification. All clocks shall be wall mounted. Clocks shall have ABS (polystyrene), Wood, or Metal Frame and polycarbonate or glass lens. (other options available). Face shall be white or antique. Hour and minute hands shall be black, second hand is red.

a. Clock features:

- Clocks shall automatically update from the transmitter 6 times a day. 2:00, 6:00, 10:00 AM/PM. Use manufacturers provided "D" cell batteries or AC power adapter. Logo Clock Faces: Analog clocks shall bear the Owner's logo as indicated. Custom logo's are available as an option.
- Additional finishes and colors available.
- Automatically adjusts for Daylight Savings Time, if option is selected.
- Clocks will keep operating in synchronized mode if GPS or NTP signal is lost due to GPS or NTP failure. Once signal is re-acquired, clocks will resume GPS or NTP time synchronization.
- Clocks will keep operating as quartz based clocks if there is a transmitter malfunction.
- Clock Models: (Battery/Electric)
  - i. 13" Standard Model # 210001 #312001 120VAC, #311001 24VAC
  - ii. 16" Standard Model # 220001 #322001 120VAC, #321001 24 VAC
  - iii. Wood Clocks: (see brochure or website for specific model)
  - iv. Brushed Aluminum Clocks: (see brochure or website for specific model)
  - v. Digital Display Clocks: (see brochure or website for specific model)
  - vi. Security Brackets: Built in to rear of clocks for wall mounting

b. Digital Clocks must be able to receive synchronized time signals from the Innovation Wireless KRONOsinc Transmitter and possess the same operating features as all Analog clocks.

c. Wire guards: Provided to protect clocks in harsh environments:

- 16 x 16 inch Wire Guard for 13-inch diameter analogue clocks Model #104001.
- 19 x 19-inch Wire Guard for 16-inch diameter analogue clocks Model #104002



## 2.4 System Operation and Startup

- A.** Transmission System shall receive Atomic Time information every second from the GPS receiver which is mounted with an unobstructed view of the sky and is connected to the system master transmitter, or the NTP receiver mounted on and connected to transmitter. Upon power up and receipt of GPS or NTP time, the Transmitter will then transmit GPS or NTP synchronized time to all receiving devices programmed to the system frequency. The transmitter and all receiving devices will monitor receipt of GPS or NTP time and remain synchronized.
- B.** Wireless Master Transmitter Operation
  - 1. When power is first applied to the master transmitter, the power light will flash and it will search for a valid GPS or NTP signal and upon receipt, it will set the internal clock of the transmitter. The transmitter will update its internal clock whenever it receives a valid time signal from the GPS or NTP receiver. It shall transmit GPS or NTP time 3 times per minute to all receiving devices.
- C.** Analog Clock Operation
  - 1. For battery clocks, insert the two supplied "D" cell batteries. The receiver will search for a signal from the transmitter by scanning all frequencies. Upon receipt of the signal, the clock will store the frequency in memory and set the clock to the exact second of the transmitter. The clocks will locate the position of the hands and automatically set them to be in perfect synchronization to the Master Transmitter. The clock hands will move in a quick "clockwise" motion until they get to the transmitter time.
- D.** Digital Clock Operation
  - 1. Connect the DC adapter (supplied with each digital clock) to the appropriate power source. The built in receiver will search for a signal from the transmitter by scanning all frequencies. Upon receipt of signal confirmation, the digital clock will store the frequency in its non-volatile memory and synchronize to the exact time of transmitter.

## PART 3 - EXECUTION

### 3.1 Examination

- A. Verify that construction is complete in spaces to receive equipment and that rooms are clean and dry.
- B. Verify that 120-volt electrical outlet is located within 6 feet of location of transmitter and the outlet is operational and properly grounded.
- C. Verify that all 120-volt electrical outlets for the AC powered clocks are located at the exact installation point and the outlet is operational and properly grounded.

### 3.2 System Installation

- A. Install in accordance with manufacturer's installation manual furnished with system.



B. The GPS receiver shall be mounted on the outside wall of the building, roof, or inside window. In all cases the GPS unit must have a clear view of the sky. If mounted on exterior side wall, there is to be no overhanging structure that can block its view of the sky. If located on the roof, it must be at a height that will prevent it from contacting potentially standing water, or buried under snow. If inside window mounted, the class cannot contain chemical shielding. (Low E)

C. The NTP receiver shall be located next to or sit on top of the Transmitter. Connect the RJ45 Ethernet cable from your computer network to back of the NTP receiver. Connect the NTP receiver to the Transmitter with the supplied cable. The NTP receiver does not require individual power supply.

### 3.3 Cleaning

A. Prior to final acceptance, clean exposed surfaces of all system components, using cleaning methods recommended by the manufacturer. Remove any labels from the faces of the clocks.

### 3.4 Manufacturer Services/Demonstration

A. Provide technical assistance to owner's representatives on functioning of the system and ongoing operation requirements. Use operations manual, or call 1-888-559-5565.

### 3.5 Field Inspection

A. Prior to final acceptance, inspect entire system to ensure proper functioning and synchronization of components and replace any parts found defective. Contact Innovation Wireless at 1-888-559-5565.

END OF SECTION