

SECTION 27 00 00 – DIVISION 27 - COMMUNICATIONS INTRODUCTORY STATEMENT

PART 1 GENERAL

1.01 REQUIREMENTS

- A. All work included under this heading is subject to the Bidding Requirements, the Instructions to Bidders, the General Conditions, and/or the Division 1 General Requirements written for this entire Specification and shall apply to all work herein.
- B. In addition to conforming to the documents listed in Paragraph 1.01A above, the Work performed by the Division 27 Contractor shall conform to all provisions of Sections 27 00 00 through 27 99 99 as included and made part of this Specification. The Division 27 Contractor is to consider the word "Contractor" when used in these Sections to mean himself/herself.
- C. The Division 27 Contractor must read the entire Specifications of all divisions because he/she will be responsible for any and all Work described in other Sections where reference is made to Division 27 and/or Communications Contractor.

1.02 APPLICABLE SECTIONS

- A. Division 27 Contractor shall perform work described in the preceding paragraphs, and as it relates to Division 27 work in the following Sections (as included):
 - 03 30 00 Cast-in Place Concrete
 - 26 00 10 Coordination Between Trades
 - 26 00 11 Coordination with Utility Companies
 - 26 00 55 Sleeves, Seals and Firestops
 - 26 05 10 Wire and Cable
 - 26 05 26 Grounding & Bonding
 - 26 05 27 Telecommunications Bonding Infrastructure
 - 26 05 29 Hangers and Supports (Seismic Loads)
 - 26 05 33 Conduit and Fittings
 - 26 05 34 Outlet Boxes
 - 26 05 35 Pull and Junction Boxes
 - 26 05 43 Underground Raceways
- B. Where reference is made to the Division 26 Contractor in the above applicable Division 26 Specification Sections, it shall be construed to mean Division 27 Contractor.
- C. Refer to 26 05 27 Telecommunications Bonding Infrastructure for Division 27 grounding and bonding requirements.

1.03 RESPONSIBILITY

- A. The Engineer's efforts under this Contract are aimed at designing a project that will be safe during construction and after full completion of the project. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might

be discussed must not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

- B. If a conflict occurs between the Drawings and/or the Specifications, immediately call the conflict to the attention of the Architect at least ten (10) days before bids are submitted, so an addendum clarification may be issued. Conflicts not brought to the Architect's attention before bids are due, shall be priced by the Contractor to include the most expensive, highest quality and quantity of the conflicting items in question.

1.04 CONTRACTOR QUALIFICATIONS

- A. The Division 27 Contractor approved for this project shall meet the following qualifications and provide information as listed.
 - 1. Must be a member of Building Industry Consulting Service International (BICSI) or have at least five (5) years' experience in Telecommunications Industry.
 - 2. A list of a minimum of five (5) projects over \$100,000 that the firm has completed along with contact names and phone numbers of the Owner's Representatives for those projects. At least three (3) of the completed facilities shall have been occupied and in full operation for at least one (1) year.
 - 3. Manufacturers shall have, within 150 miles, a service department of a duly authorized distributor who stocks standard parts on the premises.
 - 4. Refer to individual specification sections for additional qualifications.

END OF SECTION

SECTION 27 00 15 – SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Refer to the GENERAL CONDITIONS and Division 1 for general requirements.
- B. Materials and equipment installed in this work shall meet all the requirements of the Contract Documents and no materials or equipment shall be ordered until submittals are reviewed and approved by the Architect and Engineer.
- C. Submit complete catalog data or shop drawings for each manufactured item of equipment and all components to be used in the work, including specific performance data, material description, rating, capacity, working pressure, dimensional data, material gauge or thickness, wiring diagrams, brand name, catalog number, and general type.
- D. Catalog data for equipment reviewed by the Engineer shall not take precedence over the requirements of the Contract Documents. The review of the Engineer shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Trades.
- E. When submitted for review, all shop drawings shall bear the Contractor's signed certification that he/she has reviewed, checked, and approved the shop drawings, that they have been coordinated with the requirements of the project and with the provisions of the Contract Documents, and that he/she has verified all field measurements and construction criteria, materials, catalog numbers, and similar data. Annotations shall be in red ink.
- F. Each required Specification Section submittal shall be complete with all required information included in one PDF file. External web links are not permitted. Include a transmittal cover page indicating Specification Section name and number.
- G. Submittals shall be sent to shopdrawings@korda.com.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Complete review of shop drawings, product data, and samples prior to submission.
- B. Determine and verify:
 - 1. Field Measurements
 - 2. Field Construction Criteria
 - 3. Catalog Numbers and Similar Data
 - 4. Conformance with Specifications
- C. Coordinate each submittal with requirements of the work and the Contract Documents.
- D. Include a letter in the front of the submittal of any deviations in the submittals from the requirements of the Contract Documents.
- E. Make submittals and resubmittals, if necessary, promptly in accordance with the approved schedule and in such sequence as to cause no delay in the work or in the work of any other Contractor, or the project as a whole.

- F. Make any corrections or changes in rejected submittals as required by the Architect and resubmit until approved.
- G. Begin no fabrication or work which requires submittals until approved submittals are returned.

1.03 INCORPORATION OF SUBMITTALS INTO RECORD AND INFORMATION MANUALS

- A. Refer to Section 26 00 20, "Record and Information Manuals."

1.04 CERTIFICATIONS

- A. Provide:
 - 1. Test Agency results verifying capacities, operating conditions and power requirements at design conditions
 - 2. Manufacturer's Statement of Compliance with Standards discussed in individual Specification Sections
 - 3. Equipment labels indicating Certification requirements
 - 4. Quality standard designations on each unit piece
 - 5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with
 - 6. Other Certifications listed in other Sections of the Specifications

1.05 REQUIRED SUBMITTAL INFORMATION

- A. Submittal Transmittal
 - 1. Provide the following information on the Transmittal Form for each submittal:
 - a. Project name and address.
 - b. Specification number, as listed for each submittal item required in Paragraph 1.05C below.
 - c. Item description, as listed for each submittal item required in Paragraph 1.05C below. Where equipment is identified by number or tag on the documents, same shall be indicated on the submittal.
 - d. Specification number and item description (b and c, above) for each submittal if more than one submittal is sent under one transmittal form.
 - e. Name, address and telephone number of Contractor.
 - f. Bid package number (if applicable).
 - 2. Submittal Transmittal Forms not properly identified with the above information will be returned (without review) to the Contractor.
- B. Refer to the following letter key:

KEY FOR REQUIRED SUBMITTALS:

- A. Shop Drawings and/or Layout Drawings
- B. Product Data Sheets
- C. Color Samples
- D. Product Samples
- E. Typed Statement
- F. Typed Verification of Compliance with Certification Requirements
- G. Motor Efficiencies and Power Factor

- H. Wiring Diagrams
- I. Installation, Operation, and Maintenance Instructions (Due at the end of project)
- J. Reports or Test results (Due at the end of project)

C. Submit information on equipment items as listed below.

SECTION #	CONTRACT ITEM	SUBMITTALS REQUIRED
27 10 00	STRUCTURED CABLING SYSTEM	A, B, J
27 41 20	CLASSROOM AUDIO/VIDEO SYSTEM	A, B, H, I, J
27 41 33	VIDEO DISTRIBUTION SYSTEM	A, B, H, I, J
27 41 50	FLAT-PANEL TELEVISION	B, I,
27 41 70	MULTI-PURPOSE ROOM AUDIO-VIDEO EQUIPMENT	A, B, H, I, J
27 51 13	PAGING SYSTEM	B, H, I, J

D. After approval, one (1) copy shall be returned to the Contractor. Contractor shall make prints of the approved transparencies and reproductions of all other shop drawing information as necessary for his/her use and for inclusion in the Record and Information Manuals.

END OF SECTION

SECTION 27 00 20 – RECORD AND INFORMATION MANUALS

PART 1 GENERAL

1.01 REFERENCE

- A. Refer to Division 1 for general requirements and for specific information regarding Record (As-Built) Drawings and quantity required.

1.02 SUBMITTALS

- A. Submit one (1) copy of draft manual to the Architect for review and approval thirty (30) days before final inspection is due.
- B. After approval, submit three (3) approved manuals to the Owner and obtain receipt. (See Section 26 00 99, "Requirements for Contract Completion.")

PART 2 PRODUCTS

2.01 MANUALS

- A. Manuals shall be loose leaf, three-ring, hard-cover binders. Material shall be typewritten or printed and be fully legible. Each section shall be divided by labeled tabs.
- B. The following items, together with any other necessary pertinent data, shall be included in each Manual:
 - 1. Each manual shall be labeled on front cover with project name, Contract, Contractor's name, Architect, Engineer, and date of project completion.
 - 2. Manufacturers' names, nearest Factory Representative, and model and serial numbers of components of systems
 - 3. Operating instructions, start-up and shutdown procedures
 - 4. Maintenance instructions
 - 5. Routine and 24 hour emergency service/repair information:
 - a. Name, address, and telephone number of servicing agency
 - b. Names of personnel to be contacted for service arrangements
 - 6. Parts list with numbers of replaceable items, including sources of supply
 - 7. Manufacturers' literature describing each piece of equipment
 - 8. One (1) approved copy of each submittal
 - 9. Written warranties
 - 10. Certificate of Material Receipt and Certificate of System Completion
 - 11. Record (As-Built) Drawings
 - 12. IP and MAC address identified for each item required to have an address
 - 13. Certificate of Final Inspection signed by Building Authority Having Jurisdiction
 - 14. Test results
 - 15. Video recordings of all equipment demonstrations and training sessions

END OF SECTION

SECTION 27 10 00 – STRUCTURED CABLING

PART 1 GENERAL

1.01 DESCRIPTION

- A. This document describes the product and execution requirements related to furnishing and installing the Structured Cabling System as shown on the Drawings and specified herein.

1.02 SCOPE OF WORK

- A. The Structured Cabling Contractor (SCC) shall provide a complete Structured Cabling System (SCS) as defined in this section.
- B. As described elsewhere in these Documents the system consists of fiber optic and copper cabling, and related hardware. In addition to the basic cable plant requirements, the testing and identification requirements are also defined. Finally, racks, enclosures and other related hardware are indicated herein.
- C. The installation shall be of an "Open System," using standard media and layout, standard connections and interfaces. The Contractor shall adhere to this Specification, local and national codes and provide quality workmanship.
- D. This section includes:
 - 1. Main Telecommunications Room (MTR)
 - 2. Telecommunications Room (TR)
 - 3. Racks, Enclosures and Cable management
 - 4. Ladder Rack
 - 5. Rack mounted surge suppressor
 - 6. Lightning Protector
 - 7. Backbone cabling
 - 8. Horizontal cabling
 - 9. Consolidation Points
 - 10. MTR and TR connections
 - a. Patch Panels
 - b. Fiber enclosures
 - 11. Work Area outlets
 - a. Faceplates
 - b. Connectors (jacks)
 - 12. Work Area Extensions to Device
 - 13. Hangers and Supports
- E. The components used on this project for voice, data, and CATV shall be as identified in Part 2 of this Section.
- F. Unless noted otherwise on the Drawings, for all 4 pair Category cable, this project shall use T568B termination for eight (8) position modular jack pair assignments as specified per the ANSI/TIA 568-C wiring standard. For fiber, follow ANSI/TIA 568-C.3, Optical Fiber Cabling Components Standard, and its published addenda.

- G. All continuous pathways (i.e., conduit, cable tray, raceway, etc.) required to support the cabling shall be provided by the Electrical Contractor under Division 26 unless indicated otherwise in the Contract Documents.
 - 1. All non-continuous or non-rigid pathways (i.e., J-hooks, inner-duct, etc.) required to support the cabling shall be provided by the SCC under the Structured Cabling System, unless indicated otherwise in the Contract Documents.
 - 2. All ladder rack, cable tray, and related pathway hardware built into Telecommunication Spaces shall be provided by the SCC.
- H. The SCC shall be responsible for providing the racks and enclosures as required and specified herein.
- I. The SCC shall test and label the entire installation as specified and required by the codes and standards.
- J. The SCC shall be responsible for providing the hangers and support system specified herein and shown on the Drawings.
- K. Final sizing and location of J-hooks, hangers, and supports shall be the responsibility of the Contractor. However, NO increases to the bid price and/or the schedule extension shall be allowed due to equipment alterations.
- L. For new installations, J-hooks fill capacity shall not exceed 70% of its rated cable fill capacity (i.e., if J-bracket is rated for 100 cables, no more than 70 shall be installed).
- M. J-hooks are intended for voice, data, video, audio, and security cables only. They are intended for cable routing in areas of less than 100 Category 6 cables. All other low voltage cabling systems, such as building controls, shall have cabling run-ins separate raceway system.
- N. All hangers and support material shall be galvanized or stainless steel, rust free material.
- O. The Telecommunications Contractor shall ensure that the General Contractor and Painting Contractor acknowledge that the painting or over spray of any single or group of 4 pair horizontal telecommunications Category cable is not allowed. Any painted or over sprayed cable(s) shall be completely removed and replaced at the Painting Contractor's expense. No in-line connectors, splices, taps or other repairs will be permitted. Painted cable will not be covered as part of an extended warranty. Painted cable obscures the print legend and can alter the cable's mechanical properties and fire rating. Painted cable compromises its integrity and/or performance. It may act as an accelerant or create an additional smoke hazard in the event of a fire and as such this is considered a life safety issue. Paint contamination and/or removing paint from the cable with a solvent can affect the cable's durability and its electrical characteristics.
- P. The Telecommunications Contractor shall ensure that no telecommunications cable shall come into contact with firestopping material. Firestopping material includes putties, paints, and foams as this may void the extended warranty and cause issues with cable performance and future expansion.

1.03 QUALIFICATIONS

- A. The SCC must meet the following requirements to be approved for this project. He/she shall meet the following qualifications and provide the information, as listed, in the submittal package:
1. Must be a member of Building Industry Consulting Service International (BICSI) or Engineer approved, other Telecommunications Organization, and shall have at least five (5) years' experience installing Telecommunications Cabling and Equipment.
 2. Supply a list of a minimum of five (5) projects over \$100,000 that the firm has completed along with contact names and phone numbers of the Owners' Representatives for those projects. At least three (3) of the completed facilities shall have been occupied and in full operation for at least one (1) year.
 3. The SCC shall be a certified installer for the connectivity and cabling solution specified for this project and maintain that status with the warranting manufacturer, including all training requirements, for the duration of the cable infrastructure project.
 4. The SCC shall have, as a direct employee, a minimum of one (1) RCDD on staff. The RCDD must be a full-time employee of the company and must be listed with the company on the BICSI Credential Holder website. This individual shall review all submittals, RFIs, change order proposals, as-built documents, and shall provide system engineering support and oversight of all field work to ensure system installation is fully compliant with all requirements of ANSI/TIA-568-C, ANSI/TIA-569-D, and all associated TSBs, ANSI/TIA-606-B, labeling, and ANSI/TIA-607-C, grounding, including all addenda.
 5. The SCC's RCDD shall stamp all test results included in the Record and Information Manual and the final (field marked) As-Built Drawings, as being correct and accurate, that are included in the Record and Information Manual.
 6. It is the intent of this contract for the Contractor to provide sole responsibility for material, labor, and service for the communication cabling system. The Contractor shall, at a minimum, staff the project with BICSI certified installers for project foremen and crew leader positions.
 7. The SCC must own or have a current lease agreement for equipment to test up to Category 6a and fiber optic cable. He/she shall supply proof as required above in the submittal package, including latest calibration date.
- B. At the time of bid form submission, the SCC shall submit the following information:
1. The SCC's manufacturer certifications for:
 - a. Twisted pair cabling
 - b. Fiber optic cabling
 - c. Connectivity
 2. The RCDD's BICSI certification. Refer to SCC's Qualifications below.
 3. A listing of the like projects within the last three (3) years. Refer to SCC's Qualifications below.
- C. During the bid review, the SCC may be asked to provide any/or all of the following:
1. A listing of the probable team members
 2. BICSI and manufacturer certifications for the installation of the Structured Cable Plant.
 3. Certifications for the installation for any firestopping required under the scope of the Structured Cable Plant installation.

- D. Any/all items listed in paragraph 1.03 subparagraph B.1 or B.2, can and will be checked for authenticity and accuracy. The Owner reserves the right to reject any unauthorized or inaccurate submissions.
- E. Should the SCC either fail or refuse to provide any of the items listed and/or requested in paragraph 1.03 subparagraph B.1 or B.2, the Owner reserves the right to determine the SCC as being not fully responsive and as such discard the bid in its entirety.

1.04 SUBMITTALS

- A. Product Data Sheets
 - 1. All products
 - 2. Copies of all certifications
- B. Shop Drawings
 - 1. The SCC shall submit the following shop drawings:
 - a. A detailed riser diagram demonstrating the SCC's understanding of the backbone cabling.
 - b. Drawings of any floorboxes with details of the various internal faceplates and their respective contents.
 - c. Drawings of any through floor fittings with details of their contents.
 - d. Layout drawings for cable tray and cable runway (1/16" scale minimum) based on trade coordination efforts indicating anticipated routings based on the coordination among the various trades.

PART 2 PRODUCTS

2.01 MAIN TELECOMMUNICATIONS ROOM/DEMARC (MTR)

- A. The SCC shall provide plywood backboard as shown on the Drawings. If the Drawings do not indicate where or how much plywood is to be installed, Contractor shall provide, as a minimum, two (2) walls covered by 3/4 inch x 4 feet x 8 feet fire retardant plywood, painted industrial gray with two (2) coats of fire retardant paint. Plywood shall be AC grade or better and void-free with Grade A surface exposed. To reduce warping, plywood shall be kiln-dried to a maximum moisture content of 15%.
 - 1. Fire retardant plywood shall be securely fastened to wall such that it can and will support equipment to be mounted. Additionally, it shall be mounted such that the 8 feet is vertical. Unless otherwise noted, bottom of plywood shall be mounted 8 inches AFF.
 - 2. Contractor shall cover with masking tape the "Fire Retardant" stamp on the plywood, before painting, and remove tape after painting, so that the inspector can still see the original "Fire Retardant" stamp on the plywood.
 - 3. Cut out plywood around all wiring devices.
- B. The SCC shall provide all equipment required and/or shown on the Drawings to make MTR a safe and usable room for the Structured Cabling System.
- C. For fiber optic cable entering from outside or from another TR coil, provide 30 feet of slack on re-closeable storage ring before routing cable to rack for termination in rack mounted fiber panel using LC connectors (unless otherwise noted).

- D. Terminate copper station cable coming from TRs or work areas in a standard 19 inch data rack, rack mounted patch panel with 110 type punch down terminations located close to incoming protector unit.
- E. Terminate incoming coaxial cable on backboard. Terminate coax station cable coming from TRs or work area on same backboards with "F" connectors.
- F. Install racks, cable management, enclosures, patch panels, ladder racks, cables, and other equipment required in MTR as shown on Drawings. If no equipment location is indicated, coordinate rack and equipment location with Owner before installing equipment.
- G. Provide MTR with ladder racking or wire mesh cable tray as shown on Drawings. Fasten ladder racking or cable tray to data racks.
- H. Provide grounding and bonding as specified in Section 26 05 27, "Telecommunications Bonding Infrastructure."
- I. Provide "D" rings for cable routing support on backboards, for feeding cables up or down from ladder rack and/or floor.

2.02 TELECOMMUNICATIONS ROOM (TR)

- A. The SCC shall provide plywood backboard as shown on the Drawings. If the Drawings do not indicate where or how much plywood is to be installed, Contractor shall provide, as a minimum, each TR with at least two (2) walls covered by 3/4 inch x 4 feet x 8 feet fire retardant plywood, painted industrial gray with two (2) coats of fire retardant paint. Plywood shall be AC grade or better and void-free with Grade A surface exposed. To reduce warping, plywood shall be kiln-dried to a maximum moisture content of 15%.
 - 1. Fire retardant plywood shall be securely fastened to wall such that it can and will support equipment to be mounted. Additionally, it shall be mounted such that the 8 feet is vertical. Unless otherwise noted, bottom of plywood shall be mounted 8 inches AFF.
 - 2. Contractor shall cover with masking tape the "Fire Retardant" stamp on the plywood, before painting, and remove tape after painting so that the Inspector can still see the original "Fire Retardant" stamp on the plywood.
 - 3. Cut out plywood around all wiring devices.
- B. The SCC shall provide all equipment shown on the Drawings or as required to make TRs safe and usable for the structured cabling system.
- C. For fiber optic cable entering from another TR coil, provide 30 feet of slack on re-closeable storage ring before routing cable to rack for termination in rack mounted fiber panel using LC connectors.
- D. For copper station cable, terminate in a rack mounted patch panel with 110 type punch down termination.
- E. For coaxial station cable, terminate on "F" connectors in designated backboard area.
- F. For audio/video cable, terminate in the audio/video rack as required by the equipment using the proper connectors.

- G. Install racks, cable management, enclosures, patch panels, ladder racks, cables, and other equipment required in TR as shown on Drawings. If no location is indicated, coordinate with Owner before installing equipment.
- H. Provide TR ladder racking or wire mesh cable tray as shown on Drawings. Fasten to data racks.
- I. Provide grounding and bonding as specified in Section 26 05 27, "Telecommunications Bonding Infrastructure."
- J. Provide "D" rings for cable routing support on backboards, for feeding cables up or down from ladder rack and/or floor.

2.03 RACKS, ENCLOSURES, AND CABLE MANAGEMENT

- A. Two post network equipment racks nominal 19 inches
 - 1. Manufactured from extruded aluminum. Finish shall be flat black, post dimensions to be 84" tall x 20" wide x 3" deep with anchor plates at the top and bottom.
 - 2. Free standing data rack, 45RMU
 - 3. Floor anchored with minimum of four (4) floor anchors, anchor top of rack to either ladder racking / cable tray above rack or to backboard using angle iron or unistrut
 - 4. Minimum load rating for rack shall be 1,000 lbs. weight capacity
 - 5. EIA/ECA-310-E compliant, double sided universal mounting holes #12-24, supply minimum of twenty-four (24) #12-24 mounting screws
 - 6. Approved manufacturer Chatsworth #48353-703
 - a. Equivalents by Belden, B-line, Hoffman, and Great Lakes
- B. Four post network equipment racks nominal 19 inches, adjustable depth
 - 1. Manufactured from extruded aluminum. Finish shall be flat black, post dimensions to be 84" tall x 20" wide with anchor plates at the top and bottom.
 - 2. Free standing data rack, 45RMU
 - 3. Floor anchored with minimum of four (4) floor anchors, anchor top of rack to either ladder racking above rack or to backboard using angle iron or unistrut
 - 4. Minimum load rating for rack shall be 1,000 lbs. weight capacity
 - 5. EIA/ECA-310-E compliant, double sided universal mounting holes #12-24, supply minimum of twenty-four (24) #12-24 mounting screws
 - 6. Approved manufacturer Chatsworth #1521X-703
 - a. Equivalents by Belden, B-line, and Great Lakes
- C. Wall Mount Enclosure nominal 19 inches
 - 1. Manufactured from 14-gauge steel. Finish shall be flat black powder coat, post dimensions to be 24" tall x 21.5" wide x 24.5" deep.
 - 2. Wall mounted data rack, 12RMU
 - 3. Lockable solid steel front door.
 - 4. Dust resistance kit.
 - 5. Vented sides for airflow.
 - 6. Reversible cabinet for left and right-hand swing-out.
 - 7. EIA/ECA-310-E compliant, double sided universal mounting holes #12-24, supply minimum of twenty-four (24) #12-24 mounting screws

8. Approved manufacturer Great Lakes GL24WMS
 - a. Equivalents by Belden and Chatsworth
- D. Vertical Cable Management
1. The vertical cable manager nominal height shall match the height of the rack(s)/frame(s).
 2. The vertical cable manager shall bolt to the side of racks/frames with included hardware.
 3. The cable manager shall be sized to match cabling requirements. Maximum cable fill shall be calculated by dividing 50% of the usable area within the cable manager by the area of a single cable.
 4. A single vertical cable manager may be used in between bayed racks/frames if it is sized to match cable requirements for both racks/frames.
 5. The double-sided vertical cable manager shall be a double-sided H-shaped trough with a front door and a rear door. The double-sided trough shall provide independent front and rear cable pathways. The front and rear sides of the cable manager shall have T-shaped cable guides separated by openings that align with each U space on the rack. The middle of the managers shall be mostly open to allow easy cable pass-through. Three movable mid-sections shall allow attachment of cable management accessories inside the cable manager.
 - a. Double-Sided Vertical Cable Manager (for use on ends of rows), 80.5" High (minimum) x 6" Wide x 16.6" Deep (minimum), black.
 - b. Double-Sided Vertical Cable Manager (for use in between racks), 80.5" High (minimum) x 12" Wide x 17.8" Deep (minimum), black.
 6. Approved manufacturers:
 - a. Belden
 - b. B-line
 - c. Chatsworth
 - d. Great Lakes
 7. Basis of Design - 6 inches wide vertical cable manager: Chatsworth Velocity #13912-703
 8. Basis of Design - 12 inches wide vertical cable manager: Chatsworth Velocity #13915-703
- E. Horizontal Cable Management
1. Units shall be 1U to 3U construction.
 2. Units shall be single sided.
 3. Units shall have covers that have a dual hinge technology.
 4. Access into and out of the top and bottom of the Management shall be finger type construction.
 5. Approved manufacturers:
 - a. Belden
 - b. B-line
 - c. Chatsworth
 - d. Great Lakes
 6. Basis of Design – 1U horizontal vertical cable manager: Chatsworth #30139-719
 7. Basis of Design – 2U horizontal vertical cable manager: Chatsworth #30130-719
 8. Basis of Design – 3U horizontal vertical cable manager: Chatsworth #30131-719

2.04 LADDER RACK

- A. Ladder rack shall be manufactured from tubular steel. Stringers (side rails) shall be 1.5 inches deep. Maximum fill is equivalent to TIA recommended maximum fill of 6 inches deep. Provide accessory cable retaining posts if cable fill height exceeds 2 inches. Where cable retaining posts are used, they shall be 8 inches high and shall attach to the side stringer of the ladder rack with included hardware. The top of the cable retaining posts shall be fitted with a rubberized end cap to protect cables.
- B. Unless otherwise noted on the Drawings, ladder rack width shall be 18 inches with cross member (rung) spacing on 9 inch centers.
- C. All cross members shall be welded into position for maximum strength and electrical continuity of elements. No cross members shall protrude below side members that would interfere with supporting structures.
- D. All straight sections shall be provided in standard 10 foot nominal sections.
- E. Provide a method of splicing ladder rack sections and fabricated turns together end-to-end or side-to-end to form a continuous pathway.
- F. Vertical-to-horizontal and horizontal-to-vertical 90-degree turns shall be provided as required
- G. Ladder rack supports shall be of the trapeze type. Supports shall be sized to match the width of the ladder rack that is supported. Support design shall allow the support to be placed under the ladder rack at any point mid-span, but not under a ladder rack splice.
- H. All ladder rack elbows, tees, and cross fittings shall be furnished in a radius of 12, 24, or 36 inches in 30, 45, 60, or 90 degrees of arc as necessary to meet the National Electrical Code and BICSI bending radius limitations of cables to be installed in the trays. Using straight runs with radius corner brackets is also acceptable.
- I. Dropouts shall be aluminum sheets with round radius attached to either side stringer or cross member to permit cable exit out of bottom of cable tray. Where cable exits or enters the side of overhead ladder rack to access a rack, frame, cabinet or wall-mounted rack, cabinet or termination field, a radius drop shall be used to guide the cable.
- J. End caps shall be provided to cover the ends of the ladder rack. End caps shall be manufactured from a black fire-retardant rubberized material.
- K. Cable straps used for attaching cable bundles to the ladder rack cross members must be reusable with a hook and loop-style closure, at least 3/4 inch wide, and sized for cable bundles that are 2 inches, 3 inches, or 4 inches in diameter.
- L. Unless otherwise noted, finish on all metal components shall be black epoxy-polyester hybrid powder coat.
- M. Separate different cable media types within the ladder rack pathway. Treat each type of cable media separately when determining cable fill limits.

- N. Provide touch-up paint color-matched to the finish on the component and correct any minor cosmetic damage (chips, small scratches, etc.) resulting from normal handling during the installation process prior to delivery to the Owner. If a component is cosmetically damaged to the extent that correction in the field is obvious against the factory finish, replaced with a new component finished from the factory. If a component is physically damaged due to mishandling or modification during the installation process, it shall not be used as part of the ladder rack system.
- O. Approved manufacturer: Chatsworth Universal Cable Runway
 - 1. Equivalents by Belden Runway Products, B-line, Great Lakes, Snake Tray, and Middle Atlantic

2.05 RACK MOUNTED SURGE SUPPRESSOR

- A. For all wall-mounted enclosures less than 4 feet in height, provide horizontal rack mounted power strip with surge protection and six NEMA 5-20R outlets. Basis of design is CPI 12816-707 with equivalents by APC, Belden, or Geist.
- B. For all other equipment racks and enclosures, provide two (2) vertical rack mounted power strip with surge protection and 14 NEMA 5-20R outlets. Basis of design is CPI 12850-706 with equivalents by APC, Belden, or Geist.

2.06 LIGHTNING PROTECTOR

- A. Provide one Telecom Building Entrance Terminal, sized for the amount of pairs entering the building, at the demark to cover incoming and outgoing connections.
 - 1. Units shall utilize 110 blocks for both input and output.
 - 2. Units shall comply with UL 497.
 - 3. Units shall be powder epoxy coated.
 - 4. Units shall utilize a five pin socket for devices.
- B. Acceptable Manufacturer and Model
 - 1. Circa 1880ECA1 series (25, 50, 100), with C3B1S solid state protector modules.
 - 2. Equivalent by Siemon or Porta Systems.

2.07 BACKBONE CABLING

- A. The SCC shall provide all backbone cabling system as shown on the Drawings and as required to make a complete installation (both copper and fiber).
- B. Outside Plant, Copper Cable
 - 1. Approved cable manufacturers for PE 89 type, 50/100/300 multi-pair cable:
 - a. Superior Essex
 - b. General
 - c. Omni Cable
 - 2. Approved cable manufacturers for Category 5e, UTP, 25 pair:
 - a. Belden
 - b. Mohawk
 - c. Superior Essex

- C. Outside Plant, Fiber Optical Cable shall be indoor/outdoor or outside plant "tight buffer" type cable. All fiber not installed in conduit must be armored or installed in inner duct.
 - 1. Strand count shall be as shown on the Drawings.
 - 2. Cable shall be single-mode and/or minimum OM3 50/125-micron multimode cable unless otherwise shown on the Drawings.
 - 3. Fiber must be protected from moisture with a moisture resistant jacket and a filling of water blocking material.
 - 4. Approved cable manufacturers:
 - a. Belden
 - b. BerkTek
 - c. CommScope
 - d. Mohawk
 - e. Superior Essex
 - f. Corning
 - g. OCC

- D. Outside Plant, coaxial cable shall be hard line cable/coax size as shown on the Drawings.
 - 1. Approved cable manufacturers:
 - b. CommScope

- E. Inside Plant, Copper Cable
 - 1. Approved cable manufacturers for 25/50/100 multi-pair Category 3 copper plenum cable:
 - a. Belden
 - b. BerkTek
 - c. CommScope
 - d. Mohawk
 - e. Superior Essex
 - 2. Approved cable manufacturers for 25 PR Category 5e, UTP plenum cable:
 - a. Belden
 - b. BerkTek
 - c. CommScope
 - d. Mohawk
 - e. Superior Essex

- F. Inside Plant, fiber optical cable shall be tight buffer type plenum rated armored cable.
 - 1. Strand count shall be as shown on the Drawings.
 - 2. Cable shall be single-mode and/or OM3 50/125-micron multimode cable as shown on the Drawings.
 - 3. Approved cable manufacturers:
 - a. Belden
 - b. BerkTek
 - c. CommScope
 - d. Corning
 - e. Mohawk
 - f. OCC
 - g. Superior Essex

- G. Inside Plant, coaxial cable shall be RG11 or 0.5" hardline, size as shown on the Drawings.
 - 1. Approved cable manufacturers:
 - a. Belden

- b. CommScope
- c. West Penn

2.08 HORIZONTAL CABLING

- A. Copper Station Cabling from the TR to the work area jack shall be:
 - 1. Category 6, UTP, 4 pair, plenum rated approved manufacturers:
 - a. Belden 3613
 - b. BerkTek LanMark 1000
 - c. Mohawk AdvanceNet
 - d. Superior Essex DataGain Cat 6+
 - 2. Category 6a, UTP, 4 pair, plenum rated approved manufacturers:
 - a. Belden 10GXS13
 - b. BerkTek LanMark 10G2
 - c. Mohawk GigaLAN 10 Reduced Diameter
 - d. Superior Essex 10GainXP
 - 3. Category 6, UTP, 4 pair, OSP rated approved manufacturers:
 - a. Belden OSP6U 0101000
 - b. BerkTek LANmark 6 OSP UTP
 - c. Mohawk LAN-Trak 6 OSP M57622
 - d. Superior Essex CMR/CMX Cat 6
 - 4. Coaxial cable, RG11 or RG6, plenum rated approved cable manufacturers:
 - a. Belden
 - b. CommScope
 - c. West Penn
- B. Copper station cabling from the TR shall be terminated in an eight (8) position Category 6 modular jack using T568B termination for eight (8) position modular jack pair assignments.
- C. Fiber optical station cabling from the TR shall be terminated on LC connectors mounted in fiber duplex jack modules.
- D. Cabling for wireless access point shall be two Category 6a cables with a 25 foot figure 8 service loop for each AP (unless otherwise noted).
- E. Cabling for CCTV indoor Cameras shall be one Category 6 cable with a 10 foot figure 8 service loop for each camera (unless otherwise noted). Contractor may use a direct connect plug for the cameras, but the contractor must use a “modified single connector permanent link” test to test the cable run. The manufacturer must supply a warranty for the direct connect link. Example is Belden REVConnect RJ45 Plug.
- F. Paging speaker cable shall be 18 AWG UTP single pair cable as shown on Drawings.
 - 1. Approved cable manufacturers:
 - a. Belden
 - b. CommScope
 - c. West Penn
 - d. General
- G. Program speaker cable shall be 14 AWG UTP single pair cable as shown on Drawings.
 - 1. Approved cable manufacturers:
 - a. Belden

- b. CommScope
- c. West Penn
- d. General

2.09 MTR AND TR CONNECTIONS

- A. Horizontal Copper station cabling from the TR shall be terminated in an eight (8) position modular jack using T568B termination for eight (8) position modular jack pair assignments.
- B. Patch panels for Category 6 cables shall be:
 - 1. Belden Category 6 KeyConnect 6+
 - 2. Leviton eXtreme 6+
 - 3. Ortronics Category 6
- C. Patch panel for Category 6a cables shall be:
 - 1. Belden Category 6A KeyConnect 10GX
 - 2. Leviton eXtreme 6a
 - 3. Ortronics Category 6a
- D. Patch panel shall be standard or modular type punchdown patch panels.
- E. Fiber Patch Panels shall be LC connectors mounted in fiber duplex jack modules.
 - 1. Belden Fiber - FX UHD
 - 2. Leviton Opt-X Ultra
 - 3. Ortronics 1U Fiber Patch/Splice

2.10 CONSOLIDATION POINTS

- A. Wiring blocks for consolidation points shall be 110-style by Leviton, Ortronics, Belden, or Panduit
- B. Passive, plenum-rated 2' x 2' telecommunications enclosures for consolidation points shall be Leviton Z1000-PC2 or equivalents by Ortronics, Belden, and Panduit.

2.11 WORK AREA OUTLETS

- A. Work area faceplates for flush devices in interior partitions shall be stainless steel.
- B. Work area faceplates for flush devices on concrete block walls shall match others but be "Jumbo" plates.
- C. Work area jacks for Category 6 cables shall be:
 - 1. Belden Category 6+ KeyConnect 6+
 - 2. Leviton eXtreme 6+
 - 3. Ortronics Category 6
- D. Work area jacks for Category 6a cables shall be:
 - 1. Belden Category 6a KeyConnect 10GX
 - 2. Leviton eXtreme 6a
 - 3. Ortronics Category 6a

- E. Wall Phone Plate, stainless steel, single gang, one-port shall be:
 - 1. Belden AX104230
 - 2. Leviton eXtreme 6+
 - 3. Ortronics Category 6
- F. Wireless 2-port surface mount box for connection shall be Leviton 41089-2WP or equivalents by Ortronics, Panduit, and Belden.

2.12 WORK AREA EXTENSIONS TO DEVICE

- A. Patch Cords shall be manufactured and supplied by the manufacturer of the connectivity and shall be rated for the same performance specifications as the cabling and connectivity being utilized.
- B. Unless otherwise indicated on the Drawings, the Contractor shall provide two cables for each work area outlet data jack (one for work area outlet and one for TR) and one cable for each wall phone jack (for TR only). Of the cables provided, the Contractor shall supply 25% of the cables as 3 feet (1 meter), 50% as 10 feet (3 meters), and 25% as 15 feet (5 meters). Refer to the Technology Drawings for any specific quantities and lengths that may override these criteria. Category 6a patch cords shall be used for category 6a connectivity.
- C. Unless otherwise noted, mounting and installing of work area equipment such as computers, phones printers, etc. are not part of the SCC's scope of work under this Specification.

2.13 HANGERS AND SUPPORTS

- A. J-Hooks
 - 1. J-hooks shall be at least 1 inch hook size, minimum.
 - 2. J-hooks shall not be over 4 inch hook size (for locations requiring 100 4-PR Category 6 cables or more, use basket tray).
 - 3. J-hooks shall be manufactured from Spring Steel. Securable to wall, beam, threaded rod, unistrut, or pipe.
 - 4. May utilize multi-tier configuration.
 - 5. J-hooks shall have no sharp edges.
 - 6. Approved J-Hook Manufacturers:
 - a. Cooper B-Line J-hook
 - b. ERICO, type Cable Cat 21 and 32
 - c. Mag Daddy or approved equivalent
- B. Threaded Rods
 - 1. Threaded rod is to be attached to building steel in a permanent manner. Minimum size of threaded rod shall be 3/8.
 - 2. Threaded rods are to be used for J-hook support where required.
 - 3. When used for wire basket or cable tray support, use threaded rods with a hanger trapeze kit or unistrut to form a trapeze type support for the wire basket or cable tray.

PART 3 EXECUTION

3.01 DOCUMENTS

- A. Prepare and supply documents required. See "TESTING" below.

3.02 BACKBONE CABLING INSTALLATION

- A. The SCC shall provide labor, supervision, and materials as required for a complete installation of the backbone cabling system which includes, but is not limited to, the cabling to and from the MTR and to the TR, pulling, supporting, terminating, labeling and testing.
- B. Vertical cable runs shall be supported by split cable grip every 20 vertical feet.

3.03 MTR INSTALLATION

- A. The SCC shall provide labor, supervision, and materials as required for a complete installation of the MTR and cabling.
- B. The SCC shall route incoming cables to proper location by means of ladder racking, cable tray, and/or backboard. Cable shall be routed neatly (vertical/horizontal) with some slack before termination at the proper location.

3.04 TR INSTALLATION

- A. The SCC shall provide labor, supervision, and materials as required for a complete installation of the TR cabling and cabling going to and from the TR.
- B. The SCC shall route incoming cables to proper location by means of ladder racking, cable tray, and/or backboard. Cable shall be routed neatly (vertical/horizontal) with some slack before termination at the proper location.

3.05 HORIZONTAL CABLING INSTALLATION

- A. The SCC shall provide labor, supervision, and materials as required for a complete installation of the horizontal cabling system that includes, but is not limited to, cabling from the TR to the work area, pulling, supporting, terminating, labeling, and testing.
- B. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
- C. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
- D. Each consolidation point (CP) shall serve a maximum of 12 work areas and shall be installed with a minimum of 25% spare terminations. No more than one CP shall be placed in each permanent link. CPs shall be located in fully accessible and permanent locations, a minimum of 50 feet from the TR or MTR.

- E. When CPs are installed in a suspended ceiling or access floor space, the ceiling or floor tile locations should be clearly and permanently marked and identified as containing a CP.
- F. Exception to ANSI/TIA 568-C distance limitations for horizontal category 6 cables. Extending Ethernet and POE Ethernet cabling distances beyond the 100 meter limit is permitted using Ethernet extenders for devices such as CCTV cameras, wireless access points, and IP blue light telephones. The cable must be tested to the extender manufacturer's specifications. Only use this exception where noted on the drawings.

3.06 WORK AREA INSTALLATION

- A. The SCC shall provide labor, supervision, and materials as required for a complete installation of work area that includes, but is not limited to, terminating cable, placing the jacks and modules, faceplates, labeling and testing.
- B. Upon completion of the project, the SCC shall clean work area and leave ready for move-in. He/she shall remove all marks, fingerprints, trash, and other debris from area.

3.07 HANGERS AND SUPPORTS INSTALLATION

- A. Hangers and supports for ladder rack and cable tray shall be supported every 5 feet or less in accordance with ANSI/TIA-569-D. Ladder rack and cable tray shall be supported within 2 feet of every splice and within 2 feet on both/all sides of every intersection. Support ladder rack and cable tray within 2 feet on both sides of every change in elevation. Support ladder rack every 2 feet when attached vertically to a wall.
- B. Threaded rod for support of hooks and/or trays shall be permanently fastened to structural steel.
- C. J-hooks shall be securely fastened to wall, steel, or pipe and shall not be spaced more than 4 feet on center.

3.08 WORK

- A. The SCC shall furnish all materials, labor, and supervision required to install and put into service the structured cabling system specified and shown on the Drawings.
- B. The SCC shall be aware that they must coordinate their work with other trades and lack of access to the job site does not relieve them of the responsibility to complete the work as scheduled.
- C. The SCC shall furnish sufficient manpower and resources to finish the project when scheduled for completion. If required, the SCC will work their crew overtime to meet the completion schedule with no additional compensation.
- D. All work shall be done in a professional manner; equipment installed vertical and horizontal; cables pulled neat and aligned, but allowing slack; cables bundled, but no tie wraps shall be used; use hook and loop straps loosely, do not tighten cable bundle.
- E. All conduits pull boxes, junction boxes, AP enclosures, cables, jacks, modules and other devices shall be labeled.

3.09 CABLE ROUTING

- A. The SCC shall avoid electromagnetic interference (EMI) by routing all structured cabling a minimum of:
 - 1. 4 feet from 480 volt motors and transformers
 - 2. 12 inches from electrical power distribution cables
 - 3. 6 inches from fluorescent lighting
- B. Horizontal cable shall not exceed 90 meters.
- C. Conduits shall have no more than an equivalent of two (2) 90 degree bends allowed in any single run between junction boxes.

3.10 TESTING

- A. The SCC shall provide a copy of the unaltered certification test reports to the Engineer in both hardcopy and electronic format. The Contractor shall also provide a copy of the associated Cable Tester's Database Management Software with unedited soft copy.
- B. Upon completion of the balanced twisted-pair cable installation, the SCC shall perform copper cable certification tests on the complete channel for every cable, included but not limited to:
 - 1. Wire map
 - 2. Length
 - 3. Attenuation
 - 4. Near End Cross Talk (NEXT)
 - 5. Attenuation to Crosstalk Ratio (ACR-F)
 - 6. Propagation Delay and Delay Skew
 - 7. Return Loss
 - 8. Power Sum Near End Cross Talk (PSNEXT)
 - 9. Power Sum Equal Level Far End Cross Talk (PSELFEXT)
 - 10. Insertion Loss
- C. Test shall be performed to published standards, including but not limited to, the latest revisions of ANSI/TIA 568-C, ISO/IEC 11802 and other applicable standards at the time of installation.
- D. All UTP/ScTP field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided to the Engineer for review prior to the start of testing.
- E. All Category 6 permanent links are qualified for linear transmission performance up to 250 MHz and all Category 6a permanent links are qualified for linear transmission performance up to 500 MHz to ensure that high frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.
- F. Upon completion of the coaxial cable installation, the SCC shall perform cable certification tests on every cable including, but not limited to:
 - 1. Direct current loop resistance

2. Impedance
 3. Length
 4. TDR
 5. Noise
- G. Upon completion of the fiber optic cable installation, the SCC shall perform optical time domain reflectometer (OTDR) testing and optical loss testing with a light source power meter on every cable.
- H. In addition to any specific tests mentioned here, the SCC shall perform all required testing and documentation to obtain a fully certified installation from the manufacturer.
- I. As may be required for extended applications warranties by the manufacturer, the manufacturer shall provide site inspection services of the installation in completed and/or in progress. The SCC shall make all necessary arrangements for such site visits.
- J. Upon completion of all installation, termination and testing, the SCC shall review the entire installation with the Engineer and, at the discretion of the Owner, the Owner's authorized representative. At the time of this review, the Contractor shall present the hard copies of all unadulterated test results. The Engineer and Owner will review these test results, assess the installation, and return a written letter of acceptance to the Contractor for the Structured Cabling System.

3.11 WARRANTY

- A. The SCC shall provide a minimum twenty (20) year extended Product and Applications Warranty on parts and labor from the Connectivity Manufacturers (certified Contractor Program).

END OF SECTION

SECTION 27 41 33 – VIDEO DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SCOPE

- A. Furnish and install a broadband, coaxial based, video distribution system as shown on the Drawings and herein described. Provide all accessories as necessary for a complete and functional system.
- B. The system consists of a broadband RF distribution network operating between 5 MHz and 1000 MHz with return video operating between 5 MHz and 36 MHz from all outlets allowing for local origination and re-broadcast over the distribution system.
- C. The system shall include, but not be limited to all cable, amplifiers, filters, patch panels, patch cards, converters, tap-offs, multi-plexors, couples, resistors, traps, equalizers, converters, combiners, splitters, and hardware.

1.02 ACCEPTABLE CONTRACTORS

- A. Refer to Section 27 15 00, "Voice/Data Communication/Audio/Video Wiring System."

1.03 QUALITY ASSURANCE

- A. Refer to Section 27 15 00, "Voice/Data Communication/Audio/Video Wiring System."

1.04 SUBMITTALS

- A. For Review:
 - 1. Product Data Sheets of all components
 - 2. Wiring diagrams
 - 3. Network Distribution Rack Layouts
 - 4. Sample of test data form for both data and fiber
 - 5. Submit as separate section in the submittal book, a certificate of completion of installation and service training from the structured cabling system manufacturer, and proof of certified dealer status for the structured cabling solution being supplied.
 - 6. Submit as a separate section of the submittal book, resumes of the key staff assigned to this project, listing their experience and qualifications, including BICSI certificates showing successful completion of RCDD and Certified Installer examination.
 - 7. Other qualifications listed in these specifications.
- B. To be included in Record and Information Manuals:
 - 1. One (1) copy of each approved submittals
 - 2. One (1) copy of marked up prints showing data locations for Owner and another copy in Record and Information Manuals
 - 3. Test results

PART 2 PRODUCTS

2.01 BROADBAND AMPLIFIERS

- A. Amplifiers shall have 30 dB gain, 5 MHz to 1000 MHz range, deliver 5 dam to 10 dBmv at all video outlets, 10 dB slope control, integral return filter module, continuous 15 dB attenuation adjustment, built in 120 volt power supply.
- B. Blonder – Tongue BIDA 1000A-30 or equal by Drake or Toner

2.02 LOW PASS FILTER

- A. Filter shall block above 750 MHz, feature six (6) pole resonator, and four (4) resonator trip circuit.
- B. Blonder-Tongue or equal by Drake or Toner

2.03 SPLITTERS

- A. Splitting devices shall be used in the system as required. These units shall be housed in a rugged aluminum case equipped with flanges to permit mounting on any flat surface and shall meet FCC radiation specifications. All units shall have a frequency response from 5 MHz to 1,000 MHz.
 - 1. Two-way splitters shall have a maximum splitting loss of 4.2 dB.
 - 2. Three-way splitters shall have a maximum splitting loss of 6.8 dB.
 - 3. Four-way splitters shall have a maximum splitting loss of 8.0 dB.
 - 4. Eight-way splitters shall have a maximum splitting loss of 12.0 dB.
 - 5. All splitting loss maximums at 1,000 MHz.
- B. Blonder-Tongue SXRS series or equal by Drake or Toner

2.04 TAPS

- A. Directional coupler taps shall be provided as required for signal distribution. The taps shall be fully shielded and in compliance with FCC radiation rules. The taps shall be available in isolation values up to 35 dB. Frequency response through any port shall be from 5 MHz to 1,000 MHz and provide 120 dB RFI Shielding with built-in grounding block.
- B. Directional coupler-type taps shall be provided as required for signal distribution. The taps shall be fully shielded and in compliance with FCC radiation rules. All connections to the unit shall be by standard "F" type connectors. The taps shall be available in isolation values from 4 dB to 35 dB.
- C. Provide required for number of taps with the appropriate tap value per the requirements of the actual cable quantities and distances installed.
- D. Taps shall be Blonder Tongue SRT-2A, SRT-4A, or SRT-8A or equal by Drake or Toner.

2.05 EQUALIZERS

- A. The system shall provide for a reverse tilt of no more than 3 dB differential. Line equalizers shall be rated to 1000 MHz. The frequency response shall be within 0.7 dB. EQ values shall be available for 3 db, 6 dB, 9 dB, and 12 dB. Provide LE-550 series from Blonder-Tongue or equal by Drake or Toner

2.06 TERMINATING RESISTORS

- A. Terminating resistors with 75-ohm impedance shall be installed at unused ports and feeder line ends. Terminating resistors shall be designed to cover the frequency range from 5 MHz to 1000 MHz with a minimum return loss of 25 dB at UHF and 30 dB across the VHF band.

2.07 TRAPS

- A. High-Q traps shall be installed where required for the rejection of interfering carriers. Traps shall have an input and output impedance of 75 ohms and connection shall be made through standard "F" type connectors. The minimum carrier reflection, when synchronously tuned, shall be 40 dB.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install all equipment as shown in accordance with Manufacturer's instructions and industry standards.
- B. Provide attenuators, amplifiers, tap-offs, etc. as required for a complete, balanced, functional system.
- C. Label all inputs and outputs at all equipment connections. Follow similar labeling scheme as required by data network cabling drops.
- D. All coaxial cable shall be grouped and bundled in a neat fashion and secured to cable tray or J-hooks with tie-wraps every five (5) feet.
- E. Provide adequate separation between conductors of different signal levels to prevent cross talk. Where cables must cross, cross at 90-degree angles.

3.02 TESTING

- A. Align and balance the system in accordance with manufacturer's recommendations and for optimum performance.
- B. Conduct a complete and thorough testing of the system in accordance with industry standards. Submit written results for each drop location as a part of the close-out documents.

3.03 EQUIPMENT DEMONSTRATION

- A. After all system tests have been completed, schedule an instruction period with the Owner. Include a 2-hour session. Instruction to be provided by Manufacturer's authorized field technician.
- B. Instruction shall include:
 - 1. Location of all components of the system and explanation of their function
 - 2. Demonstration of equipment
 - 3. Maintenance and repair procedures
 - 4. Programming procedures
 - 5. Review of documents in Record and Information Manuals
- C. Division 27 Contractor shall have all participants sign the Certificate of System Completion in Section 26 00 99, "Requirements for Contract Completion."
- D. Training sessions shall be recorded and two copies provided to Owner in digital format.

3.04 WARRANTY OF WORK

- A. The Division 27 Contractor shall warrant all materials, equipment, and workmanship for a period of one (1) year from date of completion. Refer to Section 27 00 00.

END OF SECTION

SECTION 27 41 50 – FLAT-PANEL TELEVISION

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Contractor shall comply with Section 27 00 00, "Division 27 - Communications Introductory Statement" of Division 27 Specifications.
- B. This document describes the minimum flat panel display requirements. The Contractor shall endeavor to provide the same brand of display/monitor for **each type** of units throughout this project regardless of picture size. Locations and quantities per **Equipment Matrix**

1.02 SCOPE OF WORK

- A. A complete flat panel display as shown on the Drawings and as specified herein. Provide all accessories and equipment necessary for a complete operational system.
- B. The Contractor is hereby, specifically, made aware that this work is to be completed near the end of the project. Installing the flat panel display ahead of schedule will subject them to the possibility of damage. It shall be the Contractor's responsibility to see that the flat-panel televisions are protected and in undamaged condition when turned over to the Owner.
- C. The Contractor shall provide a satisfactory wall mounting unit or cart rated for the flat panel display brand and weight.
- D. The Contractor shall supply knowledgeable staff for installing, testing, programming, and adjusting the flat panel display such that they have the picture quality/color intended and to the satisfaction of the Owner.
- E. The Contractor shall supply one submittal package with all information required.

1.03 QUALITY ASSURANCE

- A. All equipment shall be UL listed and labeled in accordance with applicable NEMA and ANSI Standards.
- B. Flat-panel televisions shall meet industry standards, be new and in the original carton, and shall be handled and installed in a professional manner.

1.04 OPERATION

- A. The flat panel displays shall have local controls and adjustments as well as a remote control unit.
- B. The flat panel displays shall be rated suitable for daily operation consisting of powered on for at least ten hours per day.

1.05 SUBMITTALS

- A. For Review:
 - 1. Product data sheets.

2. Wiring diagrams
- B. To be included in Record and Information Manuals:
1. One copy of each approved submittal.
 2. Certificate of System Completion.
 3. Certificate Equipment Receipt.

1.06 MANUFACTURERS

- A. Digital Signage Display
1. Infocus
 2. NEC
 3. LG
 4. Planar
- B. Flat Panel Display
1. LG
 2. NEC
 3. Samsung
- C. 6-Point Touchscreen Display
1. Infocus
 2. Planar
 3. Sharp
 4. 3m
- D. Touchscreen Display and Whiteboard
1. Infocus
 2. NEC
 3. Samsung
 4. Planar
- E. Interactive Touchscreen Monitor with Video Conferencing
1. Infocus MondoPad
 2. NEC
 3. Sharp
 4. Tote Vision
- F. Monitor Wall Mount
1. Chief LSTU
 2. Peerless
 3. Mustang
- G. Monitor Cart
1. VFI
 2. Chief
 3. Infocus Lift Assist
- H. Digital Signage Media Player
1. BrightSign XD1230
 2. Kramer KDS-MP1

3. Extron

PART 2 PRODUCTS

2.01 DIGITAL SIGNAGE DISPLAY

- A. Flat Panel Monitors for Digital Signage and Menu Board.
- B. This specification shall cover flat-panel color television with diagonal size 40" to 44"
 - 1. The flat panel monitors shall have a minimum of two HDMI inputs.
 - 2. The lowest resolution acceptable shall be 1920 x 1080p.
 - 3. Refresh Rate minimum 120 Hz
 - 4. The flat panel display shall have built in speakers.
 - 5. 10-point capacitive touch display
 - 6. Include all requirements for wall mount of display.
 - 7. Mount all devices on wall to meet ADA compliance
 - 8. **Display in portrait or landscape mode**
- C. Basis for Design: Infocus JTouch DigiEasel. Equivalent by NEC, Planar or LG

2.02 FLAT PANEL DISPLAY

- A. Flat Panel Monitors for Display or Gaming
- B. This specification shall cover flat-panel color television with diagonal size 55" - 65"
 - 1. The flat panel monitors shall have a minimum of two HDMI inputs.
 - 2. The lowest resolution acceptable shall be 1920 x 1080p.
 - 3. Refresh Rate minimum 120 Hz
 - 4. The flat panel display shall have built in speakers.
 - 5. Minimum 2 year manufacture warranty on all displays
 - 6. Include all requirements for wall mount of display.
 - 7. Mount all devices on wall to meet ADA compliance
- C. Basis for Design: LG 55LF5700, LG 65LF5700. Equivalent by NEC and Samsung

2.03 TOUCHSCREEN DISPLAY

- A. Touchscreen Flat Panel Monitors for Presentations.
- B. This specification shall cover Touchscreen Displays with diagonal size 65"
 - 1. The Touchscreen Displays shall have a minimum of four HDMI inputs.
 - 2. The lowest resolution acceptable shall be 1920 x 1080p.
 - 3. Refresh Rate minimum 120 Hz
 - 4. Wireless share devices software
 - 5. Minimum 6 point touch
 - 6. Built in speakers.
 - 7. Minimum 2 year manufacture warranty on all displays
 - 8. Include all requirements for wall or cart mount of display.
 - 9. Mount all devices on wall or cart to meet ADA compliance

C. Basis for Design: Infocus JTouch displays. Equivalent by Sharp, Planar or 3m

2.04 TOUCHSCREEN DISPLAY AND WHITEBOARD

A. Touchscreen Flat Panel Monitors for Presentations.

- B. This specification shall cover Touchscreen Displays with diagonal size 65”
1. The Touchscreen Displays shall have a minimum of four HDMI inputs.
 2. The lowest resolution acceptable shall be 1920 x 1080p.
 3. Refresh Rate minimum 120 Hz
 4. Built-in Digital Whiteboard
 5. Wireless share devices software
 6. Built-in Browser
 7. Multipoint touch
 8. Built in speakers.
 9. Minimum 2 year manufacture warranty on all displays
 10. Include all requirements for wall or cart mount of display.
 11. Mount all devices on wall or cart to meet ADA compliance

C. Basis for Design: Infocus JTouch displays. Equivalent by NEC, Planar or Samsung

2.05 INTERACTIVE TOUCHSCREEN MONITOR WITH VIDEO CONFERENCING

A. Interactive Touchscreen Monitor with Video Conferencing Presentations and Collaborations.

- B. This specification shall cover Touchscreen Displays with diagonal size 55”- 70”
1. The Touchscreen Displays shall have a minimum of two HDMI inputs.
 2. The lowest resolution acceptable shall be 1920 x 1080p.
 3. Refresh Rate minimum 120 Hz
 4. Built-in Digital Whiteboard with multi-touch
 5. Wireless share devices software
 6. Built-in Browser
 7. Video conferencing with camera and microphone
 8. Built in speakers.
 9. Wireless keyboard and mouse
 10. Include all requirements for wall or cart mount of display.
 11. Mount all devices on wall or cart to meet ADA compliance

C. Basis for Design: Infocus MondoPad. Equivalent by NEC, Sharp or Tote Vision

2.06 MONITOR WALL MOUNT

A. Display mount shall be a thin wall mount to meet ADA requirements where necessary and tilt mounts in all other locations

1. Ada Compliant mounts shall be Chief LSTU fixed display mount. Equivalents by Peerless and Mustang

B. Electric Lift Mount

1. Accommodates up to a 90” monitors (265lbs)
2. 20” travel actuator for height adjustment

3. Cable push button remote
4. Cable management
5. Basis for design: Audio Visual Furniture LFT7000-WM

2.07 MONITOR CART

- A. Electric Lift Cart
 1. Accommodates up to a 90" monitors (265lbs)
 2. 20" travel actuator for height adjustment
 3. Cable push button remote
 4. Cable management
 5. Basis for design: Audio Visual Furniture LFT7000
- B. Manuel Micro-Adjustable Mobile Cart
 1. Single person height adjustment
 2. Capable of supporting Screens from 42" to 70"
 3. Cable management
 4. Large rolling casters
 5. Basis for design is the Chief LPAU

2.08 DIGITAL SIGNAGE MEDIA PLAYER

- A. The Digital Signage Media Player shall be a fully functional media player for delivering streaming video content and offer multi-zone layouts for bulletin board looping display. The primary function will be to display live CCTV camera feeds and Bulletin Board content to the mounted monitors.
 1. Ability to deliver full HD1080P video playback
 2. Support looping video and network content playback
 3. Deliver multi-zone and full screen layouts supporting video, images, text tickers, and RSS media feeds
 4. Network enabled for:
 - a. Updating content from a remote location
 - b. Live Text and integration with networked databases
 - c. IP streaming from IP cameras supporting the RTSP unicast streaming protocol
 5. Supply and install one (1) media player with each Flat screen Monitor.
 - a. Connect to TV with HDMI cable
 - b. Connect to network with Cat 6 patch cord
 6. Basis for Design Brightsign XD1132

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install flat screen television panes where shown on the Drawings and specified.
- B. Coordinate with the General Contractor that mount plates have been installed behind the sheetrock to support the weight of the television wall mount bracket and flat-panel television.

- C. Mount flat panel display on wall bracket, unit shall be permanently mounted, vertical and horizontal to floor and walls.
- D. Connect all cabling in a neat and orderly fashion so they are not exposed around the edges of the display.
- E. Assemble carts and install monitors as needed.
- F. **Install owner provided Ipad Mini's in Brackets supplied by owner in locations indicated on drawings.**

3.02 TESTING

- A. Provide a complete functional test of all components in accordance with manufacturer's recommendations.
- B. Operate system for a minimum of seven (7) consecutive days with no problems before claiming contract completion.
- C. Provide, at no charge to the Owner, up to four (4) hours of training and operation instructions.

3.03 EQUIPMENT DEMONSTRATION

- A. After all system tests have been completed, schedule an instruction period with the Owner.
- B. Instruction shall include:
 - 1. Location of all components of the system, connections of all cabling and explanation of their function.
 - 2. Demonstration of equipment.
 - 3. Reset, maintenance, and repair procedures as well as contact for warranty work.
 - 4. Programming procedures.
 - 5. Review of documents in Record and Information Manuals.
- C. **Provide minimum 2 hour training for each location on the function of all monitors including, but not limited to, touch screen, whiteboard, conferencing or other pertinent features. Training may be made by manufacture over a webinar or similar means.**
- D. Provide the required copies of all Drawings, literature information manuals and guarantee information to the Owner in the Project Information Manual upon completion of the project.

END OF SECTION

SECTION 27 41 70 – MULTI-PURPOSE ROOM AUDIO/VIDEO EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. Furnish and install audio-video equipment for the projectors as shown on the Drawings and as specified herein. Provide all accessories and equipment as necessary for a complete system. Locations and quantities per **Equipment Matrix**
- B. Projector, screen, and sound will be controlled by a control system with panels mounted on wall.
- C. System inputs include the HDMI/VGA wall plates, and wireless microphone systems with handheld microphones and lavalier belt pack and microphones in **Auditorium and Branch Meeting Rooms only**.

1.02 QUALITY ASSURANCE

- A. All equipment shall be UL listed and labeled in accordance with applicable NEMA and ANSI Standards.
- B. Audio/Video systems shall meet industry standards and professional practice.

1.03 SUBMITTALS

- A. For Review:
 - 1. Product data sheets.
 - 2. Wiring diagrams and floor plans
- B. To be included in Record and Information Manuals:
 - 1. One copy of each approved submittal.
 - 2. Certificate of System Completion.
 - 3. Certificate Equipment Receipt.

1.04 MANUFACTURERS

- A. Video Projector
 - 1. Canon
 - 2. NEC
 - 3. Infocus
- B. Projector Mount
 - 1. Peerless
 - 2. Premier
 - 3. Chief
- C. Projector Screen
 - 1. Da-lite
 - 2. Stewart Filmscreen
 - 3. Draper

- D. AV Equipment Controls
 - 1. Crestron
 - 2. Extron
 - 3. AMX

- E. Wireless Presentation Gateway
 - 1. Crestron
 - 2. Infocus
 - 3. Internal to display devices

- F. Audio/video Rack and Accessories
 - 1. Middle Atlantic
 - 2. Atlas Sound
 - 3. Lowell.

- G. AV Inputs
 - 1. Extron
 - 2. Crestron
 - 3. AMX
 - 4. Atlona

- H. Audio
 - 1. Biamp
 - 2. Ashly Sound
 - 3. BSS
 - 4. JBL
 - 5. Shure
 - 6. Audix
 - 7. Audio-Tech
 - 8. Williams Sound
 - 9. Listen technologies
 - 10. Sennheiser

PART 2 PRODUCTS

2.01 PROJECTORS

- A. The commons video projector shall use 3 chip, 3LCD technology and have the following features:
 - 1. Minimum of 6000 ANSI lumens
 - 2. RJ-45 LAN terminal
 - 3. LCD technology
 - 4. Resolution: Native 1920 X 1200 UXGA
 - 5. Interchangeable lenses
 - 6. Infrared remote control
 - 7. Audio output that shall be switched with the active input

- B. Basis for design: Canon WUX5000 with the following Lenses:
 - 1. Meeting Rooms Wide zoom lens

- C. All projectors should be installed using manufacture approved ceiling or wall mounting materials.

2.02 PROJECTOR MOUNT AND ENCLOSURE

- A. Projector mount and mounting hardware to complete installation
 1. Projector cage for protection when mounting in the gym area
 2. Coordinate mount on site with installed movable partition
 3. Mount in a way to clear all pendant fixtures to completely fill projection screen
 4. Provide all mounting hardware and cord extensions to conceal cable inside the pipe or a plastic type wrap to conceal all cables around pipe.
 5. Mount projector at elevation to avoid conflicts with lights
 6. Equivalents by Display Devices, Premier Mounts or Chief
- B. Peerless PRGS-UNV-W projector mount, downpipe, and Peerless ACC556 with equivalents by Premier or Chief

2.03 PROJECTOR SCREEN

- A. Electrically Operated Projector Screen
 1. Electrically operated, UL and ULC listed, retractable, heavy duty, with rigid metal roller and motor housed within the roller. Tab guide cable tensioning system to maintain even, lateral tension and hold viewing surface flat. The bottom end of fabric for the screen will to be inserted into a custom aluminum slat bar with added weight to provide vertical tension on the screen surface.
 2. Single motor, UL and ULC certified, 3-wire permanently lubricated reversal-type, attached to header, with preset adjustable limit switches to automatically stop viewing surface in UP or DOWN position. Includes automatic thermal overload protection, integral gears, capacitor, and electric brake to prevent coasting
 - a. Voltage, Frequency: 115 V, 60 Hz
 - b. HDTV format
 - c. Limit Switches: Preset and adjustable to automatically stop viewing surface in UP or DOWN position.
 - d. Housing: Inside metal roller.
 - e. Screen Case: Designed to receive mounting hardware and sized to suit projection screen.
- B. Basis for design is Da-Lite Cosmopolitan® Electrol with the following screen sizes:
 1. Meeting Rooms in 4 Branches -137” Diagonal
 2. Main Library Auditorium - 164” Diagonal
 3. Main Library 2nd Floor Carnegie Board Room, Life Skills and 1st Floor Meeting Room – 130” Diagonal.

2.04 AV EQUIPMENT CONTROL

- A. Wall Mounted Touchscreen Controller
 1. 7” Active matrix TFT color display minimum 800x480 resolution
 2. POE Ethernet controller with required power injector if required
 3. Custom graphic related to the project with a layout meeting the owner’s full needs for easily controlling all devices.

4. Program system onto Network to be controlled from web interface or app on portable device
5. Basis-of-Design: Crestron TSW-752 with equivalents by Extron or AMX

B. AV Control Processor

1. Unidirectional RS-232 and IR port for universal display control
2. Supports above touchscreens
3. Supports secure industry standard communications protocols
4. Three bidirectional RS-232 serial ports with software handshaking
5. Basis-of-Design: Crestron CP3N with equivalents by Extron or AMX

2.05 WIRELESS PRESENTATION GATEWAY

A. A wireless presentation gateway is a device that allows you to share your digital content through the projector or monitor wirelessly.

1. Cast your device's screen wirelessly to the display via MiraCast (on most Windows and Android devices) or Airplay (Apple devices)
2. Connect to your display via HDMI
3. Connects to network via RJ45 or WiFi
4. Basis for design: Crestron Airmedia,

2.06 AUDIO/VIDEO RACK AND ACCESSORIES

A. 35 RU Wall Mount Equipment rack shall be EIA compliant 19" wall mount rack 16-gauge steel, phosphate pre-treated and finished in a black textured powder coat.

1. Rackrail shall be constructed of 11-gauge steel with tapped 10-32 mounting holes in universal EIA spacing with black e-coat finish and marked rack spaces
2. Rack shall be constructed to swing open for component cabling access, center section shall pivot for either left or right opening.
3. Rack shall have a rear knockout panel with 1/2", 3/4", 1", 1-1/2", 2" and 3" electrical knockouts installed in base, and a rear knockout panel with 1/2", 3/4", 1", 1-1/2", 2" and 3" electrical knockouts, four Decora® cutouts, and BNC knockouts for UHF/VHF antennas installed in top.
4. Large laser knockout on back pan shall have a 12-1/2" x 12-1/2" cutout for electrical pull-box.
5. Fan knockouts on top and bottom shall allow for installation of up to four 4-1/2" fans.
6. Fill all blank spaces with blank panels
7. Rear rack rails
8. Vented Front door
9. Basis for design: Middle Atlantic Products (map) or equivalent by Atlas Sound or Lowell.

B. Provide a drawer that includes a liner and keyed lock or standard with four RU drawers for storage. Basis for design: Middle Atlantic D4 or equivalent by Lowell and Atlas Sound

C. Provide rackmount power 20A with Surge. Basis for Design: Middle Atlantic PD-920R-SP or equivalent by Lowell.

2.07 AV INPUTS

A. AV Plate

1. Transmitter Plate on wall
 - a. Transmits HDMI or analog video, audio, and bidirectional RS-232 and IR up to 330 feet over a shielded CATx cable recommended by manufacturer.
 - b. HDMI and VGA inputs
 - c. Supports computer and video resolutions up to 1920x1200, including 1080p/60 Deep Color and 2K
2. Receiver at Projector
 - a. Receives video with embedded audio, bidirectional RS-232 and IR, and Ethernet up to 330 feet over a shielded CATx cable recommended by manufacture
 - b. Scales HDMI, DVI, RGB, HD component video, and standard definition video received from XTP devices
 - c. Selectable output rates from 640x480 to 1920x1200, including 1080p/60 and 2K
 - d. Compatible with CAT6 shielded twisted pair cable
3. AV Plate shall be Extron DTP HDMI 4K 230 Rx. Use Shielded Cat 6 cable to connect. Equivalents by Creston, AMX, Atlona

2.08 AUDIO

A. Digital Signal Processor (DSP)

1. Systems shall utilize Ethernet and NexLink digital audio linking to cascade units together
2. Units shall have IP and RS-232 Control and fully integrated controls to control system
3. Inputs and outputs shall be analog, with internal 24-bit A/D & D/A converters operating at a sample rate of 48 kHz.
4. All internal processing shall be digital (DSP). NexLink connections shall allow sharing of digital audio within multi-unit systems.
5. Available system components shall include (but not be limited to) various forms of: mixers, equalizers, filters, crossovers, dynamics/gain controls, routers, delays, remote controls, meters, generators, and diagnostics.
6. Control via dedicated software screens, Ethernet communications and third-party RS-232 control systems.
7. Logic Box for I/O of external sources.
8. Volume 8 for control of input sources. Mechanically label the controller and program to only control sources associated with the state of the room.
9. The DSP shall be Nexia CS and accessories as required. Equivalents by QSC, or BSS Audio
10. Basis-of-Design: Biamp NEXIA digital signal processor to fill all I/O requirements as shown on the drawings. Equivalents by Ashly Sound or BSS

- B. The Ceiling mounted speakers shall be one drop-in speaker consisting of one 6-1/2 inch Kevlar-reinforced 165 mm (6.5 in) woofer 25 mm (1 in) compression driver with 150 Watts Power Handling. Basis of Design: JBL Control 26C/T or equivalents by Community, or Electro-Voice.

Items Below (C, D, E, F) for Meeting Rooms in Branches and Auditorium in Main Library Only

- C. Wireless Microphone (for Meeting Rooms in braches and Auditorium in Main)
1. Includes ULX2/SM58 handheld transmitter, WL185 lavalier microphone, ULX1 body pack transmitter, ULXS4 standard diversity receiver, tie clip, microphone clip, grip/switch cover, screwdriver, 2 zipper bags, power supply, 2 batteries (9V), and user guide.
 2. Include two sets of spare batteries for systems for every transmitter
 3. Coordinate all frequencies within and outside the space and verify clear channels for all units.
 4. Wireless system shall be clear of all noise and intermittent sounds
 5. Rackmount kit
 6. Basis-of-Design: Shure ULXS124/85 Handheld and Lavalier Combo Wireless Microphone. Equivalents by Audix, and Audio Technica 4000 Series
- D. Wireless Microphone Antenna Distribution System (for Meeting Rooms in braches and Auditorium in Main)
1. Include all patch cables to connect systems to wireless receivers and remount mount antennas
 2. Mount or remote mount antennas as necessary for 100% coverage of the shown space.
 3. Coordinate combiner frequency with all used frequencies used on system
 4. Wireless system shall be clear of all noise and intermittent sounds
 5. Basis-of-Design: Shure UA845SWB Wideband UHF Antenna Distribution System with quantities as shown on the drawings. Equivalents by Audix and Audio Technica
- E. Microphone input plates. (for Meeting Rooms in braches and Auditorium in Main)
1. Stainless steel custom input plate as shown on drawings by Proco, Whirlwind or Liberty.
 - a. Plate shall be engraved with 1/8" lettering
 - b. Solder type Nuetrak or Switchcraft inputs jacks as shown
 - c. Mount level and plumb
 - d. Unbalanced Input Transformer as necessary for stereo unbalanced inputs. Basis of Design is RDL TXJ2. Unbalanced stereo inputs to summed balanced mono output mounted in box behind plate.
- F. Wireless transmitting system to meet the ADA requirements for assisted listening inside the space. (for Meeting Rooms in braches and Auditorium in Main)
1. A microprocessor-based unit with a transmitting range of up to 1,000 feet.
 2. Shall have 17 wideband channels operating on 72.1–75.9 MHz
 3. Shall be supplied with top mount 39" whip antennas mounted for full coverage of the listening area
 4. Sixteen Williams PPA R37 receivers per room.
 5. The receiver shall be a body-pack style and include a detachable belt-clip for hands free operation.
 6. The receiver shall have a 3.5 mm stereo/mono jack to accommodate stereo or mono low impedance earphones, headphones, and neck loops.
 7. The receiver shall have access to 17 preset wideband channels between 72-76 MHz.
 8. Headphones for each receiver and Williams NKL003 neck induction loops for 25% of the receivers (total of four units per room).
 9. Two full sets of spare batteries for all receivers.
 10. Proper signage for space near rack.
 11. Basis-of-Design: Williams Sound PPA T45 Equivalent by Listen Technologies or Sennheiser

2.09 WIRE AND PATCH CABLES

- A. Speaker cable shall be plenum 16 AWG UTP single pair cable as required on drawings WestPenn 25225B. Equivalents by Commscope, General, or Belden
- B. Microphone cable shall be plenum 22 AWG shielded twisted pair as required on drawings WestPenn 25291B. Equivalents by Commscope, General, or Belden
- C. Low voltage control cable shall be plenum 4 conductor 22 AWG shielded twisted pair as required on drawings WestPenn 25357B. Equivalents by Commscope, General, or Belden
- D. CAT6A for video transmission- Superior Essex 10Gain XP Category 6A non-continuous shielded Cat-6A or equivalent by Belden or Berk-Tek.
- E. Minimum 10' Patch cables for all input plates to connect owner equipment.

2.10 PRICED OPTIONS

- A. Contractor shall provide a solution for **Tele/conferencing** integration into the local sound system for rooms with Tele/Conference indicated on equipment matrix.
 - 1. Ceiling mounted microphones in all rooms except auditorium
 - 2. Provisions for 2 wireless handheld microphones in auditorium dedicated to the Tele/conference
 - 3. Telephone dial for Tele/conference programmed into the Crestron Touchscreen
- B. Contractor shall provide a solution for Video conferencing integration into audio and video systems for rooms with **Video Conferencing** indicated on equipment matrix.
 - 1. For CEO Meeting Room (Room 2088), conferencing system may be built into the display monitor

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install Video Equipment and cable as shown on the Drawings in accordance with manufacturer's written instructions.
- B. Mount displays, speakers, and other equipment in accordance with manufacturer's written instructions.
- C. All wall mount devices shall be stainless steel in finish. If full stainless is not an option, white devices with stainless steel cover plates.

3.02 TESTING

- A. Complete functional test of all components in accordance with manufacturer's recommendations.

- B. Operate system for a minimum of seven (7) consecutive days with no problems before claiming contract completion.

3.03 WARRANTY

- A. Warranty against defects in material and workmanship in the mounting and the interconnection of permanently installed equipment. This workmanship integration warranty shall be valid for one (1) year. The warranty begins on the date of the Owner's acceptance of system completion. The integrator shall cover the expense of removing, shipping or re-installing serviced equipment. Warranty service by the manufacturer for parts and labor is typically performed at the manufacturer's facility. Damage proven to be caused by natural phenomenon, such as flooding, fire, tornado, earthquake, unstable atmospheric conditions, will not be required. This warranty shall not cover consumable items such as batteries or lamps; these are normal use items which are to be replaced by the customer as needed.
- B. The integrator will honor all manufacturer's warranty terms extending beyond the duration of the first year. The integrator will include all warranty service and pass the cost of shipping and handling, etc. directly through to the owner. This additional labor beyond one (1) year will not be covered and will be negotiated between the owner/integrator.

3.04 EQUIPMENT DEMONSTRATION

- A. After all system tests have been completed, schedule an instruction period with Owner. Instruction to be performed by manufacturer's authorized field technician. All training sessions shall be recorded and electronically turned over with O&M manuals.
- B. Eight (8) hours of training shall be for general users of the system and may be broken up into multiple sessions as coordinated through the construction team and owner. Training shall include a detailed instruction booklet of basic usage of the system. This booklet shall include detailed instructions and photographs of actual touch panel screen shots and field mounted equipment. Supply enough documentation for all attendees and leave spare manuals in the rack storage drawer.
- C. Four (4) hours of detailed training for technical staff which is dedicated to technical staff usage and cover common maintenance items and thorough explanation of the system functionality. At this time a copy of half size drawings shall be turned over to the owner directly as well as an electronic copy of the O&M manuals and pdf drawings. Instruction shall include:
 - 1. Location of all components of the system and explanation of their function
 - 2. Demonstration of equipment
 - 3. Maintenance and repair procedures
 - 4. Programming procedures
 - 5. Review of documents in Record and Information Manuals
- D. Perform a one year follow-up preventive maintenance call. At this time, the integrator will:
 - 1. Full functional checkout of the entire system
 - 2. Recalibration of all audio levels
 - 3. Software and firmware upgrades as required by manufacture and then fully test all system components and controls

4. Verify all touch panels controls are still working as originally installed

END OF SECTION

SECTION 27 51 13 – PAGING SYSTEM

PART 1 GENERAL

1.01 REQUIREMENTS

- A. The Contractor shall comply with Section 27 00 00, "Division 27 - Communications Introductory Statement" of Division 27 Specifications.

1.02 SCOPE OF WORK

- A. Division 27 Contractor shall furnish and install a complete Paging System as shown on the Drawings and specified herein. Provide all accessories and equipment as necessary for a complete system. This applies to the **four branches**. **The Main library does not get a paging system in this project.**

1.03 QUALITY ASSURANCE

- A. Electrical systems shall be UL listed and labeled.

1.04 SUBMITTALS

- A. For Review:
 - 1. Product data sheets of all components
 - 2. Wiring Diagrams
- B. To be included in Record and Information Manuals:
 - 1. One (1) copy of each approved submittal
 - 2. Certificate of System Completion
 - 3. Certificate of Equipment Receipt

1.05 SYSTEM OPERATION

- A. The zone paging system shall be designed for direct connection to loop start and ground start trunks, to PBX or KEY paging ports which supply DTMF capability, and to analog T/R lines. The unit shall allow total system amplifier power of up to 250W.
- B. The unit shall include flanges with keyhole slots for wall-mounted installation. Operation shall require a 12V (1.5A) DC power supply. A suitable power supply shall be provided (PCMPS2 power supply).
- C. The system shall consist of the appropriate modules as specified and shall be registered under Part 68 of FCC rules.
- D. Momentary tones shall be placed through the system when a contact closure is received from the master clock system.

1.06 MANUFACTURERS

- A. The equipment specified herein and shown on the Drawings is based upon a Bogen PCM 2000. Telecor and Rauland shall be considered equivalents. The intent is to establish a standard of quality, function, and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds all standards set forth in these Specifications. Products of other manufacturers will be considered, providing their products equal or

exceed the quality specified; and they can provide products of the type, function, size, arrangement, and configuration required.

PART 2 PRODUCTS

2.01 ZONE PAGING SYSTEM MODULES

- A. All modules shall be designed for wall-mounted installation. All modules shall be equipped with a ribbon cable and connector and power cable with connector to permit them to be interconnected to each other. The face plates of each module shall be finished in black, with each control connector clearly labeled in white. Each face plate shall have knockouts to facilitate cable and wire dressing. All connections shall be made using a small regular screwdriver or common jacks (RJ11 or RCA).
- B. Telephone Interface Module. The module shall provide for telephone interface selection via built-in DIP switches. It shall include a volume control for tone and BGM source, and RJ11 jacks for night ringer, telephone line, and override. A connector block, using screw terminal connections, shall be provided for BGM source, and two (2) C-form relay contact sets. A power-on LED indicator shall be provided to indicate power-applied status.
- C. Central Processing Module. One P module shall be provided for the first nine (9) zones in the system. The module shall provide for satellite system identification via built-in DIP switches. It shall include a locking program/run selector switch (with program LED), satellite data link RCA jack, and 12V DC power source jack. A connector block, using screw terminal connections, shall be provided for paging amplification connection, low-power and high-power BGM connections, emergency/shift change signal activation, AUX contact closure, and 12V DC power source connection. A power-on LED indicator shall be provided to indicate power-applied status.
- D. A talkback module (PCMTBM) shall be included to the system to provide hands-free talkback capability. Only one talkback module is required regardless of the number of zones or satellite systems on the PCM2000 system.
- E. The Zone Paging System shall supply the following features and functions:
 - 1. Simultaneous high-power and low-power paging. Total system high-power audio capacity of 250W.
 - 2. A minimum of three paging zones and maximum zone capacity of ninety-nine (99) paging zones. The system shall be expandable in groups of three zones.
 - 3. Up to 32 field-programmable paging zone groups, each consisting of 1 to 99 zones.
 - 4. Field programmable Night Ringer Zone Group, consisting of from 1 to 99 zones. This feature shall be activated by high-voltage ring signal or contact closure.
 - 5. Field programmable Emergency/Shift change Zone Group, consisting of from 1 to 99 zones. This feature shall require activation by a customer-supplied contact closure, and sound a user-selected tone. The user shall have the choice of no tone (allowing use of outside tone source), tone burst (1-7 second duration, user-selected), single chime, or quad beep.
 - 6. Emergency All-Facility Page Override. This feature shall be activated through a loop start trunk or through contact closure and dry audio input. It shall override the normal paging features of the system, sound a user-defeatable alert tone in all zones, and open an audio channel for a voice page.

7. Background music assigned per zone and local background music sourcing capability.
 8. Field programmable Code Call Zone Group, consisting of from 1 to 99 zones. The user shall have the choice of pattern or echo code calls, and repeat functions.
 9. Two (2) C-form relay contact sets for activating external equipment. The contacts shall change state when the unit is activated.
 10. Capability of providing uninterrupted background music to all zones not being paged.
 11. Non-volatile RAM shall be included to allow for retention of programming information during power interruptions
 12. Screwdriver-adjustable volume control of confirmation, pre-announce, error, and shift change/emergency-call tones.
- F. VOIP tie-in module enabling access from the phone system to the paging system. The interface is designed to use an existing analog zone controller with a TAM interface. Coordinate with supplied phone system contractor for compatible product.

2.02 EQUIPMENT RACK AND ACCESSORIES

A. RACK

1. Mount paging system components into 4 post rack provided by structured cabling installer.
 - a. Provide Middle Atlantic RSH4S custom shelves for all not rack mountable products and monitors mounted in rack.
 - b. Fill all rack spaces including open tops with matching blank panels. All custom shelves and blank panels shall be of similar finish and the same color. There shall be no empty open spaces in the front of the rack for a neat completed installation.
 - c. Use Middle Atlantic HP screws with nylon washer. All screws in the front of the rack are to be this type unless the environment requires HG Rust Proof Screws.

B. POWER

1. Middle Atlantic PD-2420SC-NS Vertical Slim Power Strips as required to power all units inside rack and provide 20% spare outlet capacity for future use. Plug vertical strips into surge unit as required. Equivalents by Atlas and Lowell

C. PAGING UPS

1. Middle Atlantic Products model UPS-S1500R UP.
 - a. Rackmount UPS shall have a nominal output of 120V. Rackmount UPS shall have a capacity of 1500 VA and 900 W.
 - b. Rackmount UPS shall have surge suppression that utilizes a clean line-to-neutral design that does not pass noise contamination to ground.
 - c. Rackmount UPS shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years; battery shall be warrantied for a period of 2 years
 - d. Equivalent by Atlas Sound, Liebert, Emerson, and APC

2.03 SPEAKERS

A. Horns

1. Horns shall be 15 watt rated re-entrant trumpets with a frequency range of 275 Hz to 14 kHz. Units shall be beige baked enamel of 9 inch diameter and 12 inch long LEAD WIRE and tilt and swivel mounting bracket. Horn shall have five (5) power taps,

capable 70 or 25 volt operation. Quam QH16T or equivalent by Telecor, Bogen, and Rauland

B. Surface Mount Speakers

1. Speakers shall be 8 inch diameter, dual cone, 15 watt rated, 8 ohm, with 10 ounce ceramic magnet. Frequency response shall be 50 Hz to 12 kHz. Matching transformer shall be dual voltage with six (6) tap settings.
2. The loudspeaker system shall be an interior grade, surface mount assembly in a 16 gage steel enclosure with 22 gage perforated steel baffle; finish shall be white baked epoxy hybrid. The loudspeaker shall be 8" O.D. The voice coil shall be 19 mm (0.75 in) O.D.; the loudspeaker cone shall be constructed of molded paper fiber. The magnet type shall be BeFe ceramic; weight shall be 4.8 oz., nominal.
3. The loudspeaker shall be a QUAM SYSTEM 1 or equivalent by Atlas, Telecor, Rauland, Bogen

C. Drop In Ceiling Tile Speakers

1. The speaker is complete, UL Listed, shallow depth, lightweight, 1' x 2' ceiling tile replacement loudspeaker system consisting of an 8C5PAX - 8" O.D. dual cone loudspeaker with a 5 oz. magnet and a TBLU - 5W-25/70V transformer. Molded fiber enclosure is 617 CID. Powder coated steel baffle with standard perforation and three (3) seismic tie-off points. The cable clamp and one (1) 24" "T" rail are included. No assembly required.
2. Shall be Quam System 5 lay in speaker or equivalent by Rauland, Atlas Sound, Telecor, or Bogen

D. Wall Mount Speakers

1. Speaker is a complete loudspeaker system consisting of an 8C5PAX - 8Ω O.D. dual cone loudspeaker and a TBLU - 5W 25/70V transformer mounted on a BS8W - square, screw mount, steel baffle with a slanted, steel, open back, surface mount enclosure with White powder coat finish.
2. Shall be Quam System 3 or equivalent by Rauland, Atlas Sound, Telecor, or Bogen

E. VC Volume Controls

1. Speaker with integrated volume controls as indicated on the drawings.
2. Shall be Quam or equivalent by Rauland, Atlas Sound, Telecor, or Bogen

F. V Wall Mount Volume Control

1. Volume Control is a UL Listed, single-gang, 20W, ten-step, continuous rotary, audio level attenuator with an OFF position. Stainless steel faceplate with debossed, paint filled positions and a white knob.
2. Shall be Quam QC10Classic with Kit#99 white knob or equivalent by Rauland, Atlas Sound, Telecor, or Bogen

2.04 MISCELLANEOUS

- A. Speaker cable shall be twisted pair, 2 conductor, 18 gauge stranded copper, West Penn 25224B or equivalent by General, Belden, Commscope, Proco.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Division 27 Contractor shall install Paging System as shown on the Drawings in accordance with Manufacturer's written instructions.
- B. Provide conduit stub ups from each outlet location to above accessible ceiling space. Provide continuous conduits across exposed areas or areas of inaccessible ceilings. Provide conduits between isolated areas of accessible ceilings to provide a continuous pathway for wiring from main equipment location to each device.
- C. Wiring shall be run along building lines and supported by bridle rings every five (5) feet.
- D. Provide 120 volt power to sound equipment rack.
- E. Provide speakers with integral volume controls in all enclosed offices.

3.02 TESTING

- A. Provide a complete functional test of all components in accordance with Manufacturer's recommendation.
- B. Operate system for a minimum of seven (7) consecutive days with no problem before claiming completion.
- C. Refer to Section 26 08 40, "Electrical Tests, Adjustments, Inspection."

3.03 EQUIPMENT DEMONSTRATION

- A. After all system tests have been completed, schedule an instruction period with the Owner. Instruction to be provided by Manufacturer's authorized field technician.
- B. Instruction shall include:
 - 1. Location of all components of the system and explanation of their function
 - 2. Demonstration of equipment
 - 3. Maintenance and repair procedures
 - 4. Programming procedures
 - 5. Review of documents in Record and Information Manuals
- C. Division 27 Contractor shall have all participants sign the Certificate of System Completion in Section 26 00 99, "Requirements for Contract Completion."

END OF SECTION