



312 PLUM ST., SUITE 700
CINCINNATI, OH 45202
(513) 381-2112

April 3, 2025

ADDENDUM NO. 1
(3 Pages of text, 61 pages of attachments / Total = 64 Pages)

TO THE DRAWINGS, SPECIFICATIONS AND CONTRACT DOCUMENTS FOR:

Fairfield County
Sheridan Center Renovations - Phase1
Comm. No. 2024149.01

Board of Commissioners of Fairfield County Ohio
210 E Main St.,
Lancaster OH 43130

PRE-BID MEETING

1. Pre-Bid Meeting Minutes are attached
2. Pre-Bid Meeting Attendance Sheet is attached

PREBID REQUEST FOR INFORMATION

1. Please provide the finish for the steel angle lintels.
Answer: Steel angle lintels shall be galvanized and painted.
2. Please provide the finish for the SS railings.
Answer: #6 Polish Fine Brush Finish.
3. Please provide the roof height and length of the roof hatch ladder.
Answer: Roof ladder will be provided under the roofing contract.
4. Please provide the size of angles for roof hatch opening.
Answer: Roof ladder will be provided under the roofing contract.
5. Who is responsible for providing and installing the low voltage cabling and equipment for access control?
Answer: Refer to Division 27 Specifications

6. Who is responsible for providing and installing the data cabling and equipment?
Answer: Refer to Division 27 Specifications
7. Who is responsible for providing and installing the A/V cabling and equipment?
Answer: Refer to Division 27 Specifications
8. Will the exterior wall penetrations from the demolished conduits be repaired by the owner?
Answer: Contractor shall patch and repair all vacated interior and exterior penetrations ate existing CMU walls. Contractors shall assume 25 sq. ft. of CMU replacement.

SPECIFICATIONS

1. **SECTION 27 05 00 - Basic Communication Requirements (Issued):**
 - A. Add Section 27 05 00 to the Project Manual.
2. **SECTION 27 05 26 - Grounding and Bonding (Issued):**
 - A. Add Section 27 05 26 to the Project Manual.
3. **SECTION 27 05 29 - Pathways for Communications Systems (Issued):**
 - A. Add Section 27 05 29 to the Project Manual.
4. **SECTION 27 05 53 - Identification (Issued):**
 - A. Add Section 27 05 26 to the Project Manual.
5. **SECTION 27 11 16 - Communications Cabinets Racks Enclosures (Issued):**
 - A. Add Section 27 11 16 to the Project Manual.
6. **SECTION 27 15 00 - Communications Horizontal Cabling (Issued):**
 - A. Add Section 27 15 00 to the Project Manual.
7. **SECTION 27 21 33 – Data Communication Wireless Access Points (Issued):**
 - A. Add Section 27 21 33 to the Project Manual.
8. **SECTION 27 24 23 – Audio Visual Devices (Issued):**
 - A. Add Section 27 24 23 to the Project Manual.
9. **SECTION 27 41 13 - Integrated Audio Visual System (Issued):**
 - A. Add Section 27 41 13 to the Project Manual.

DRAWINGS

1. **SHEET A101A – FIRST FLOOR PLAN (Not Re-Issued):**
 - A. Update Keynotes A4 and A5 to indicate #6 Polish Fine Brush Finish.

2. SHEET A401 – FIRST FLOOR REFLECTED CEILING PLAN (Not Re-Issued):

- A. 7/A401 Roof Access Ladder Detail is provided for reference only. To be provided by owner under separate contract.

End of Addendum No. 1

ATTACHMENTS

SECTION 27 05 00 - Basic Communication Requirements
SECTION 27 05 26 - Grounding and Bonding
SECTION 27 05 29 - Pathways for Communications Systems
SECTION 27 05 53 - Identification
SECTION 27 11 16 - Communications Cabinets Racks Enclosures
SECTION 27 15 00 - Communications Horizontal Cabling (Issued)
SECTION 27 21 33 - Data Communication Wireless Access Points
SECTION 27 24 23 - Audio Visual Devices
SECTION 27 41 13 - Integrated Audio Visual System



CINCINNATI, OH 513.381.2112
COLUMBUS, OH 614.223.2124
BELLEVUE, KY 859.360.1234

PRE-BID MEETING MINUTES

Project: **Fairfield County Sheridan Center Renovations - Phase 1**
Date: March 28, 2025 – 11:00 am
Address: 1550 Sheridan Dr, Lancaster, OH 43130

1.01 Sign-in & Introduction

1.02 Contract Documents are available for download on the Fairfield County website at:
www.co.fairfield.oh.us/bids.

1.03 Sealed bids will be received by:

Jon Kochis, Facilities Director
Board of Commissioners of Fairfield County Ohio
210 East Main Street, Room 300,
Lancaster, Ohio, 43130

Until 2:00 p.m. – local time April 10, 2025

Plainly marked on the outside " Bid for SHERIDAN CENTER RENOVATIONS - PHASE 1"

1.04 Pre-Bid Questions, Substitution Request, Etc:

- A. All pre-bid communication (RFI, substitution requests, clarification requests, etc.) must be received in writing, in accordance with the project manual. Questions will not be answered over the phone.
- B. Questions will be accepted until 2:00 PM local time on April 3, 2025. Questions received after the above deadline may not be answered.
- C. Questions should be e-mailed to: Brock Rossel: brossel@shp.com and Jon Kochis: jon.kochis@fairfieldcountyohio.gov.

1.05 Materials purchased for use or consumption with the proposed work will be exempt from the State of Ohio Sales Tax as outlined in the Spec Section 00 73 01.

1.06 Prevailing wage rates DO apply to this project.

1.07 The project will NOT be seeking LEED certification.

1.08 The probable construction cost estimate for this work is: \$1,647,583 base bid

1.09 Form of Contract – This is a publicly advertised project for a single-prime GC contract, utilizing A101 and A201 Contract Documents (DRAFT documents included in Project Manual)

- A. Retainage: Work - 8% up to 50% of work, Materials – 8% until incorporated into the project

1.10 Milestone Schedule:

- A. April 10, 2025 Submit bid by 2:00pm
- B. April 28, 2025 Contractor mobilized – start work on site
- C. August 15, 2025 Substantial Completion
- D. September 19, 2025 Project Closeout / Final Completion



- 1.11** Project Logistics (interior protection, material handling, contractor parking, storage location & security)
- 1.12** Working Hours / Interruptions
- 1.13** Progress / Coordination Meetings
- 1.14** Drawing Review
 - A. There is (1) Allowance for Structural Reinforcement described in the documents.
 - B. There are (2) Alternates. 1. New Exterior Soffit, 2. New Storefront Openings
- 1.15** Building Tour. If you need to revisit site, email Jon Kochis - jon.kochis@fairfieldcountyohio.gov



March 28, 2025

[illegible]

March 28, 2025

SECTION 27 05 00 – BASIC COMMUNICATIONS REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL

- A. All provisions of the Division 00 and Division 01, apply to all work in Division 27.
- B. The description of the project below is intended to be a summary of the work to be provided under this contract. The Contractor(s) shall refer to all specification sections this Division, as well as, the associated Telecommunications Drawings.
- C. The Communications/Technology package has work (labor and /or materials) to be provided by the General, Electrical, Technology, Plumbing, Fire Suppression or HVAC Contractor or their sub-contractors for communications pathways, grounding, cable tray, etc. The Contractors shall refer to the specifications and drawings for items identified as provided by others on the contract documents and drawings. Understanding that the contractors for Mechanical and electrical work could be sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work. All other items as per these contract documents shall be provided by the Telecommunications Contractor.
- D. Drawings and Specifications are to be considered as supplementing each other and shall be included within the contract documents. Work described on either document shall be provided and incorporated into the project whether or not it is specifically identified on the corresponding document.

1.2 CONTRACT DOCUMENTS

- A. The drawings accompanying these specifications are complementary each to the other and what is called for by one shall be as if called for by both. When a discrepancy exists between the Drawings and the Specifications, whichever has a greater cost in value must be included for bidding purposes. Questions should be submitted prior to bidding for any such discrepancies in order to achieve the correct costs within the bid.
- B. Consult all Contract Drawings that may affect the location of equipment, and cabling and make minor adjustments in location to secure coordination.
- C. Coordinate layout of work with other trades. Make minor adjustments in location required for coordination.
- D. All changes, with the exception of minor adjustments, shall be submitted to the Construction Manager and/or Architect for approval before proceeding with the work.

1.3 PERMITS AND REGULATIONS

- A. Include payment of all permit and inspection fees applicable to the work in this Division. Furnish for the Owner a certificate of approval from the governing inspection agencies, as a condition for final payment.

- B. Work must conform to the National Electrical Code, National Electrical Safety Code and other applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawings and specifications shall govern. Install no work contrary to minimum legal standards.
- C. All electrical work shall be inspected and approved by the local jurisdictional authority.
- D. All electrical work shall be inspected and approved by the Ohio Division of Industrial Compliance who will issue the inspection certificate.
- E. Upon completion of work, the communications contractor shall furnish to the consulting State Architect the certificate of inspection and approval before final payment on contract will be allowed.
- F. Final acceptance of all work will also be subject to the approval of the owner.

1.4 SUMMARY OF WORK

- A. This project provides for the complete installation of various communication systems.
 - B. The scope of the communications work includes furnishing, installing, testing, and warranty of all Communications work, and complete Communications systems shown on the Communication drawings and specified herein.
 - C. Items of labor, material, and equipment not specified in detail or shown on the drawings, but required or necessary for a complete and operational installation of the below systems or work described herein, shall be furnished as if called for by the specifications and the detailed drawings.
 - D. The Electrical Contractor and Telecommunications Contractor shall coordinate all device locations prior to installation.
 - E. Owner personnel training on all systems installed.
 - F. Testing and Commissioning of all systems.
- 1.5 The Work includes work that is primarily electrical in nature and also includes all equipment, cable and terminations associated with systems. Contractor shall utilize conduit runs and boxes installed by electrical contractor. Contractor shall provide face plates on all boxes as required. Contractor shall provide any supplementary systems required to meet the performance requirements of the system as part of the bid.

1.6 MISCELLANEOUS

- A. Administrative and coordination responsibilities for entire project.
- B. Temporary Facilities related to general work as specified in the "Temporary Facilities" section of these specifications.
- C. Patching materials and surfaces disturbed by new work to match adjacent existing materials and surfaces.
- D. Restoration of site disturbed by this work to its original condition.

1.7 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project identification: Project consists of furnishing and installing electronic communications equipment at:

Fairfield County

1550 Sheridan Dr

Lancaster, OH 43130

Architect:

SHP

312 Plum Street STE 700

Cincinnati, Ohio 45202

Technology Designer

Forward Edge

2724 East Kemper Road

Cincinnati, Ohio 45241

1.8 CONTRACTOR USE OF PREMISES

- A. General: Each Prime Contractor shall limit his use of the premises to the work indicated, so as to allow for Owner occupancy and use by the public. The work is to be conducted to provide the least possible interference to the activities of the Owner's personnel, students, other building occupants and the general public. The normal order of county business shall be maintained throughout the duration of the project.
- B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
- C. Owner Occupancy: Allow for Owner occupancy and use by the public.
- D. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- E. Materials and Equipment: do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the area indicated. If additional storage is necessary obtain and pay for such storage off-site.
- F. Vehicles: Lock automatic type vehicles such as passenger cars and trucks and other types of mechanized or motorized construction equipment, where parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

- G. Contractor Use of the Existing Building: Maintain the existing building in a safe and weather tight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into division and Sections using the 27/28-division format and CSI/CSC's "MasterFormat" numbering system.
- B. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project manual are in numeric sequence, however, the sequence is incomplete. Consult the table of contents at the beginning of the Project manual to determine numbers and names of sections in the Contract Documents.
- C. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
- D. Abbreviated Language: Language used in the Specifications and other contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the contract Documents indicates.
- E. Imperative mood and streamlined language are generally used in the Specifications.. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
- F. The words "shall be, " or "shall comply with, " depending on the context, are implied to mean that the equipment or system MUST be configured and/or installed as stated.

1.10 USE OF TECHNOLOGY AND THE INTERNET

- A. This project will take full advantage of the benefits of the internet, e-mail, and other electronic documentation. Contractors are encouraged to use this technology.

1.11 DRAWINGS AND SPECIFICATIONS

- A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word "provide", as used, shall mean "furnish and install". If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.
- B. Make all necessary field measurements to ensure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.
- C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any error, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which

- may be necessary to complete the systems. Having cable pathways and fittings fabricated and delivered in advance of making actual measurements shall not be sufficient because to avoid making offsets and minor changes as may be necessary to install wireways, fittings and equipment.
- D. Where there are quantity discrepancies of equipment shown on drawings and/or specification, the Contractor shall provide the greater quantity.
 - E. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of protecting and concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance with all other trades and report immediately any difficulties which can be anticipated.
 - F. Equipment, ductwork, piping, and communications wiring shall not be installed in the dedicated electrical space above or in the working space required around electrical switchgear, motor control centers or panelboards as identified by NEC 110.26 Spaces about Electrical Equipment-600 Volts Nominal or Less. For equipment rated over 600 volts nominal- 110.32 Work Space about Equipment – 110.33 Entrance and Access to Work Space-110.34 Work Space and Guarding. The Communications Contractor shall caution other trades to comply with this stipulation.
 - G. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decisions shall be final in regard to the arrangement of conduit, etc, where conflict arises.
 - H. Provide offsets in system runs, additional fittings, necessary conduit, pull boxes, conductors, switches and devices required to complete the installation, or for the proper operation of the system. Each contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.
 - I. Should overlap work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under this branch until instructions in writing are received from the Architect.

1.12 ASBESTOS MATERIALS

- A. Abatement, removal or encapsulation of existing materials containing asbestos is NOT included in the Communication Contract. Necessary work of this nature will be arranged by the Owner to be done outside of this construction and remodeling project by a company regularly engaged in asbestos abatement. Such work will be scheduled and performed in advance of work in the construction and remodeling project.
- B. If, in performance of the Communications work, materials are observed which are suspected to contain asbestos, the communications Contractor shall immediately inform the Architect/Engineer who in turn will notify the Owner. Work that would expose workers to the inhalation of asbestos particles shall be terminated. Work may be resumed only after a determination has been made and unsafe materials have been removed or encapsulated and the area declared safe.

1.13 INSPECTION

- A. All work shall be subject to inspection of Federal, State, and local agencies as may be required, and of the Architect and Engineer.
- B. Final inspection certification shall be obtained by the Contractor and given to the Owner

1.14. RECORD DRAWINGS

- A. The Communications Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawings shall be turned over to the Architect. This shall apply particularly to underground and concealed work and to other systems where the installation varies to a degree which would justify recording the change.
- B. All Shop drawings and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list, and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required. Major items of equipment shall consist of not less than the following:
 - 1. Data Cable Distribution Systems
 - 2. Security Management System
 - 3. CCTV System
 - 4. Integrated Telephone System
 - 5. Monitors/TVs
 - 6. Digital Enterprise Media System
 - 7. Interactive AV Equipment
 - 8. Network Electronics
 - 9. Paging Systems
 - 10. Sound Systems
 - 11. UPS Systems
 - 12. Misc. Multi-Media Equipment
- C. Standard NEMA publications on the operation and care of equipment may be furnished in lieu of manufacturer's data where the manufacturer's instructions are not available.
- D. These shall be assembled into indexed PDF files. An index and tabs to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.
- E. O&M Manuals shall contain the following information at a minimum:
 - 1. Copies of all approved shop drawings with the Engineer's stamp.

2. Owner's manuals for every item of equipment when available from the manufacturer. These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures or copies of website prints. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting, and product repair/replacement information. The Contractor can supply this information electronically in an indexed PDF format.
3. Communications drawings updated with final as-built information. This shall be in the form of a complete set of Communications drawings with as-built information indicated in color based upon actual field conditions. These must be in electronic format. Hand drawings will not be accepted.
4. System schematic and block diagrams for every system updated with final as-built information. These drawings shall define the exact arrangement of each system including wiring configuration, device locations, and cable types. These shall be submitted in electronic format. Hand drawings will not be accepted.
5. Rack elevations for all systems with rack mounted equipment.

1.16 FINAL INSPECTION AND PUNCH LIST

A. As the time of work completion approaches, the Contractor shall survey and inspect his work and develop his own punch list to confirm that it is complete and finished. He shall then notify the Architect and request that a final inspection be made. It shall not be considered the Architect's or Engineer's obligation to perform a final inspection until the Contractor has inspected the work and so states at the time of the request for the final inspection.

B. Requests to the Architect, Engineer, or Owner for final inspection may be accompanied by a limited list of known deficiencies in completion, with appropriate explanation and schedule for completing these, this is in the interest of expediting acceptance for beneficial occupancy.

C. The Architect and/or Engineer will inspect the work and prepare a punch list of items requiring correction, completion or verification. Corrective action shall be taken by the Contractor to the satisfaction of the Architect and Engineer within 30 days of receipt of the Architect/Engineer's punch list.

1.17 WARRANTY

A. This Contractor shall warrant all workmanship, equipment and material entering into this contract for a period of three (3) years or the period of time as per specific specification division, from the date of approval of certificate of contract completion by the Owner. Refer to General Conditions. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to Owner.

B. This provision is intended specifically to cover deficiencies in contract completion or performance which is not immediately discovered after systems are placed in operation. These items include, but are not limited to replacement of malfunctioning equipment and adjusting special equipment and communications systems to obtain optimum performance.

C. This provision shall not be construed to include maintenance items such as making normally anticipated adjustments or correcting adjustment errors on the part of the Owner's personnel.

D. Provisions of the warranty shall be considered supplementary to warranty provisions under General Conditions.

Part 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and e

quipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.

B. All communications equipment and wiring shall bear the Underwriter's Laboratories, Inc. Label where UL labeled items are available, and shall comply with NEC (NFPA-70) and NFPA requirements.

C. All communications equipment shall bear the Energy Star Label where Energy Star labeled items is available.

2.2 COMPUTER WORKSTATIONS

A. All computer workstations provided under this contract shall utilize the same manufacturer's chipsets, hardware and peripherals. All processors shall be either Intel or AMD. It shall also be required to provide the same manufacturer for specific requirements such as processor speed and base memory.

B. All computer workstations provided under this contract shall be equipped with fully licensed, automated, active anti-virus software. Approved anti-virus software packages shall be Sentinel One. Anti-Virus software must be pre-approved and compatible with Owner's existing software

C. All computer workstations and software packages provided under this contract shall provide required hardware, software and drivers to be fully compatible with Owner's current operating systems, protocols, and communication standards.

D. All computer workstations provided under this contract shall be provided with 1Gbps wired LAN or 802.11ac wireless Ethernet NICs.

2.3 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, EIA/TIA, ASTM, UL, BICSI, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except where the authority having jurisdiction (AHJ) has not yet adopted the latest edition, the edition so recognized shall be used.

2.4 EQUIPMENT SELECTION

A. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufactures of equipment or materials are listed in the specification, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have a the option of selecting between any one of the several specified. All products shall be first quality line of manufacturers listed.

2. Where the words "or approved equal" appear after a manufacturer's name, specific approval must be obtained from the Architect during the bidding period in sufficient time to

be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Where the words "equal to" appear, followed by a manufacturer's name and sometimes a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer's approval.

B. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

C. Before bidding equipment, and again in the preparation of shop drawings, the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated accessories. Also verify that adequate space is available for servicing of the equipment and that required NEC clearances are met.

D. If extensive changes in conduit, equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes by all other trades shall be deemed to be included in the contract.

2.5 SHOP DRAWINGS

A. Shop drawings and descriptive information shall be assembled by each Contractor of equipment and materials furnished in his contract, and submitted to the Architect and/or Engineer for review as stated in the General conditions and Supplementary Conditions. These shall be submitted as soon as practicable and before installation and before special equipment is manufactured.

B. Electronic format- Shop drawings shall be submitted in electronic format utilizing PDF files. The submittal shall be organized by specification section and contain all required information within a PDF document for each specification section. The submittal shall be organized as follows:

1. Primary zip file contains PDF of master transmittal cover page indicating the project name, submitting contractor, contact information and a list of all the sections with titles being submitted. This primary file shall also contain each of the individual section being submitted.

2. Sub PDF file for each specification section organized as follows:

- a). First page – Cover page indicating the project name, submitting contractor, contact information, space for Engineer's stamp.
- b). Page(s) for contractor qualifications and project certifications.
- c). Page(s) for Bill of Materials (BOM) list including part numbers, quantities and references to specification section paragraphs for each part.
- d). Page(s) for manufacturer's data sheets.
- e). Page(s)/Drawing(s) for system diagrams, riser diagrams, block diagrams, etc.
- f). Drawing(s) for floor plans showing equipment locations.

C. Refer to individual system specifications for submittal requirements. At a minimum, shop drawings shall contain the following information.

1. A complete list of materials with model and part numbers and reference to the Part 2 specification paragraph number.
2. Shop drawings including manufacturer's product and cable data sheets specific to the project. Data sheets shall indicate exact model numbers and options specific to the project.
3. Floor plans showing location of all items of equipment. Drawings shall also indicate each location where 120 power is required.
4. Job specific schematic and point wiring diagrams showing all devices, number and size of wires, etc.
5. Contractor qualifications and/or manufacturer's Certifications where specifically specified.
6. System software information, where applicable showing features, representative of the manufacturer or equipment vendor. ascertain conformance with specifications.

D. Any items of equipment which have features an/or functions that deviate from the specifications contained herein, shall have these deviations clearly called out by a separate attachment with the shop drawings specifically listing specification section, the specifications and which has not has this information presented in the shop drawing phase and approved, will be removed and replaced with specification compliant equipment at the contractor's expense. The review of sop drawings by the Architect or Engineer shall not relieve the contractor from responsibility for errors in the shop drawings.

E. Any shop drawing that do not contain the minimum required information outlined herein and as specified elsewhere shall be considered incomplete and will not be reviewed. It is the contractor's responsibility to fully read and understand all requirements for submittals for each section and to carefully and completely adhere to all requirements.

PART 3 – EXECUTION

3.1 TESTING

- A. As each wiring system is completed, it shall be tested for continuity and freedom from grounds.
- B. As each electrically operated system is energized, it shall be tested for function.
- C. The Contractor shall perform megger and resistance tests and special tests on any circuits or equipment when an authorized inspection agency suspects the system's integrity or when requested by the Architect or Engineer.
- D. All signaling and communications systems shall be inspected and tested by a qualified representative of the manufacturer or equipment vendor. Refer to specific sections for required testing of the various systems. Submit electronic copies of reports indicating results in PDF format.
- E. Tests shall be witnessed by field representatives of the Architect or Engineer or shall be monitored by a recorder. Furnish a written record of each system test indicating date, system, test conditions, duration and results of tests. Copies of all test reports shall be included in the O&M manuals.
- F. Instruments required for tests shall be furnished by the Contractor.

3.2 EQUIPMENT CLEANING

- A. Before placing each system in operation, the equipment shall be thoroughly cleaned. Cleaning shall be performed in accordance with equipment manufacturer's recommendations.
- B. Refer to appropriate Divisions for cleaning of other equipment and systems for normal operation.

3.3 OPERATION AND ADJUSTMENT OF EQUIPMENT

- A. As each system is put into operation, all items of equipment included therein shall be adjusted to proper working order.

3.4 OPERATING DEMONSTRATION AND INSTRUCTIONS

- A. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.
- B. The Contractor shall provide the Owner with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.
- C. O&M Manuals shall be submitted, reviewed and approved prior to scheduling of demonstrations.
- D. A minimum of 40 hours shall be allowed for instruction to personnel selected by Owner. This training can be broken down into different increments of time (ex: 10 hours at project completion, 10 hours after 3 months of completion, 10 hours after 6 months of completion, 10 hours at 11 month walk through). Instruction shall be given by certified personnel to county Employees, not contracted maintenance companies. Instructions shall include not less than the following:
 - 1. Show location of items if equipment and their purpose.
 - 2. Review PDF containing instructions and equipment and systems data.
 - 3. Coordinate written and verbal instructions so that each is understood by personnel.
 - 4. Manufacturer's representative for the various special and communications systems shall give separate instructions.
- E. A minimum of 48 hours continuous trouble-free operating time shall be acceptable to prove that the systems function properly.
- F. Note that additional time for training, operating time, etc. may be required per other specification sections and shall be included. This section only establishes minimum requirements.

END OF SECTION

SECTION 27 05 26 - COMMUNICATIONS GROUNDING, EARTHING, AND BONDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial building grounding and bonding requirements for telecommunication infrastructure.
2. Requirements for bonding and communications cabling, equipment, pathways, spaces, and mounting equipment.

B. Related Sections:

1. Section 01 33 00 – Submittal Procedures.
2. Section 26 05 26 – Grounding and Bonding for Electrical System.
3. Section 27 00 00 - Telecommunications.
4. Section 27 05 28 - Pathways for Communication Systems.

1.2 REFERENCES

- A. ANSI/NFPA-70, 2014 National Electrical Code (NEC)
- B. ANSI/IEEE Std. 1100-2005, Recommended Practice for Powering and Grounding Electronic Equipment
- C. ANSI/IEEE Std. C2, 2012 National Electrical Safety Code (NESC)
- D. TIA-607-C Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises
- E. ANSI/TIA-606-B (March 2012) Administration Standard for Telecommunications Infrastructure
- F. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
- G. OSHA Standards and Regulations – all applicable
- H. BICSI 13th TDMM
- I. Local Codes and Standards - all applicable

Anywhere low-voltage cabling Standards conflict with electrical or safety Codes, Contractor shall defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either. Knowledge and execution of applicable codes is the sole responsibility of the Contractor. Any code violations committed at the time of installation shall be remedied at the Contractor's expense. Contractor is responsible to bring any perceived conflicts between project documents and referenced Standards or Codes to the attention of Owner or their agent for resolution.

1.3 SYSTEM DESCRIPTION

- A. Provide a communications bonding and grounding system as described in this document, documents and drawings specific to that project, and in compliance with the above cited Codes, Standards and Agencies.
- B. Comply with the requirement of Code of Practice for Info-Communications Facilities in Buildings.
- C. Comply with the requirement for Section 26 05 26 – Grounding and Bonding for Electrical System.
- D. Bond the following items within, but not limited to, the telecommunications grounding system.
 - 1. All communications system active equipment.
 - 2. All PDU and surge protection equipment.
 - 3. Raised floor systems.
 - 4. Under floor grounding grids (a.k.a. “supplemental bonding grids” or SBGs) for computer or telecommunications rooms.
 - 5. Metallic raceway systems, including metallic cable trays.
 - 6. Communications equipment enclosures (cabinets) or cross-connect frames.
 - 7. Broadband passive devices.
 - 8. Metallic splice cases.
 - 9. Metallic cable screens, armor or shields.
 - 10. All metal cable conduit.
 - 11. Electrical service panels in entrance facilities, telecommunications and equipment rooms.
 - 12. Wall and rack mounted grounding busbars.
 - 13. Exposed building steel that is within 6 feet of equipment racking systems.
 - 14. Building steel extending to earth in outside-plant.
 - 15. All related bonding accessories.

1.4 DESIGN REQUIREMENTS

- A. Quality Assurance
 - 1. Grounding to conform to applicable building codes.
 - 2. Cable and equipment to be installed in a neat and workmanlike manner.
 - 3. Methods of construction that are not specifically described or indicated in the contract documents to be subject to the control and approval of the Owner or their official representatives.
 - 4. Equipment and materials specified shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed.
 - 5. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to written approval by from Owner per the Substitutions Policy listed below.
 - 6. Materials and Methods shall comply in every way with above cited Standards and Codes.
- B. Materials Substitution Policy:
 - 1. Substitution of products for those specified within this document is not allowed without express written permission from the Owner.
 - 2. Should Contractor feel product substitution unavoidable for reasons of logistics or availability, Contractor shall submit to the Owners project representative a request for product substitution in writing no less than 5 business days in advance of bid explaining need for deviation from this specification.
 - 3. Written requests for substitution shall be accompanied by all drawings, specification sheets and engineering documents, as well as third party laboratory performance test results proving equivalent or superior performance in mechanical or electrical function of the product to be substituted.

4. Equal substituted product acceptance must be received in writing from the Owner.
5. Contractor shall be responsible for, and assume all costs for removal and replacement of any substituted materials or products not approved in writing from the Owner. Such costs shall include, but not be limited to labor, materials as well as any penalties or fees for late completion.

1.5 SUBMITTALS

- A. Make submittals in accordance with Section 01 33 00, Submittal Procedures.
- B. Action Submittals:
 1. Shop drawings showing construction details and locations of components, and description and routing of interconnecting cabling.
 2. Manufacturers cut sheets, specifications and installation instructions for additional products (submit with bid).

PART 2 PRODUCTS

2.1 MATERIALS

- A. Telecommunications Bonding Backbone (TBB) Grounding Conductors:
 1. To be bare or insulated copper, of minimum conductor size #6 AWG and sized at 2 kcmil per linear foot up to a maximum size of 750 kcmil. (For details on TBB sizing see "Execution" section at end of this document).
 2. Where un-insulated, to be identified with green tape at termination location.
 3. Labeled in accordance with recommendations set forth in ANSI/TIA-606-B (March 2012) Administration Standard for Telecommunications Infrastructure.
 4. Approved manufacturers:
 1. General Cable
 2. Southwire
 3. Fort Wayne Metals
- B. Two-hole, Long-barrel Copper Compression Lugs for Grounding Conductors:
 1. Meets TIA-607-C requirements for network systems grounding applications.
 2. UL Listed.
 3. Color-coded barrels marked with specified manufacturers' die index numbers for proper crimp die selection.
 4. Have long barrel to maximize number of crimps and provides premium wire pull-out strength and electrical performance.
 5. Have "inspection window" over tongue to visually assure full conductor insertion.
 6. Be tin-plated to inhibit corrosion.
 7. Available with NEMA and BICSI hole-sizes and spacing.
 8. Approved Manufacturers and parts for two-hole compression lugs are as follows:
 1. Panduit-LCC series
 2. Cooper-SB series
 3. Burndy-YA series

C. Split Bolt for Bonding Cable Trays:

1. Made from high strength copper alloy to resist corrosion and provide premium electrical and mechanical performance.
2. Wire range-taking capability minimizes inventory requirements.
3. Nut hex provides correct fit with socket, box, or open end wrenches resulting in proper torquing of electrical connection.
4. Pressure bar provides secure connection on a full range of conductor combinations used with each connector assuring premium wire pull-out strength.
5. UL Listed and CSA Certified with AWG conductor for use up to 600 V and temperature rated 90°C.
6. Available in tin-plated version for bonding to galvanized wire baskets and Flex Tray.
7. Approved Manufacturers and part numbers:
 1. Panduit-SBCT3-C
 2. Burndy-KS22
 3. Cooper-GROUND BOLT

D. Auxiliary Cable Brackets (Conductor Pathway):

1. Used for mounting telecommunications bonding conductors outside of cable tray.
2. Maintain minimum 2" separation between bonding conductors and all other types of cabling per TIA 607-C.
3. Bonds ladder rack, wire basket sections together without drilling holes or applying other split-bolt clamps.
4. Supports grounding conductors in the telecommunications room, allows separation of grounding conductors from other cables.
5. Can be mounted above or below the cable pathway system for flexibility.
6. Meet requirements TIA-607-B.
7. Approved Manufacturers and part numbers:
 1. Panduit-GACB-2
 2. Chatsworth-11268-001
 3. Ortronics-OR-P820527HB

E. Wall-mount Telecommunications Main Grounding Busbars (TMGB) or Primary Busbar (PBB)

1. Meet BICSI and TIA-607-C requirements for network systems grounding applications.
2. Employ BICSI hole spacing to fit 2-hole lugs, (12) pairs of 5/8" and (3) pairs of 1" holes.
3. Be made of high conductivity copper.
4. Should be ¼" thick, 4" high X 12" wide
5. Come with brackets and insulators.
6. Approved wall-mount TMGB/PBB Manufacturers and Part Numbers are as follows:
 1. Panduit-GB4B0612TPI-1
 2. Chatsworth-40153-012
 3. Cooper SBTMBG12

F. Wall-mount Telecommunications Grounding Busbars (TGB) or Secondary Busbar (SBB)

1. Meet BICSI and TIA-607-C requirements for network systems grounding applications.

2. Employ BICSI hole spacing to spacing to fit 2-hole lugs, (6) pairs of 5/16" and (3) pairs of 7/16" holes.
3. Be made of high conductivity copper.
4. Should be 1/4" thick, 2" high X 12" wide
5. Come with brackets and insulators.
6. Approved wall-mount TGB/SBB Manufacturers and Part Numbers are as follows:

1. Panduit-GB2D0008TPI-1
2. Chatsworth-13622-012
3. Cooper-SBTGB

G. Rack mount 19" horizontal busbars:

1. 3/16" thick x 3/4" high and 19" wide.
2. Mounts to standard mounting rails.
3. (8) 6-32 tapped holes and (2) pairs of 5/16" holes.
4. Approved Manufacturers and part numbers for rack mounted busbars are as follows:

1. Panduit-RGRB19U Preferred bolt pattern, other manufactures shall match this pattern.
2. Cooper-SBHB119K
3. Chatsworth 10610-019

H. Armored Cable Grounding Kit:

1. Provides a secure bond to the armor sheath on indoor and indoor/outdoor fiber optic cables at both cassette and enclosure ends.
2. Worm-gear design evenly distributes forces across the armor.
3. Made from steel and/or aluminum material is compatible with common armor for long term reliability.
4. Complies with industry requirements ensuring a high level of reliability and safety.
5. Approved Manufacturers and part numbers are as follows:

1. Panduit-ACG24K
2. 3M-4460-DX
3. Hubbell BC285-SB100

I. Miscellaneous Bonding Accessories:

1. Anti-oxidation Paste (contact aid) For Copper to Copper and Copper to Steel Connections Panduit, Burndy and Cooper
2. Green thread-forming bonding screws for bonding smaller equipment on threaded rack rails through the equipment mounting flange or paint piercing washers.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:

1. This Specification document describes a generic enterprise communications bonding and grounding system for the construction of a complete and functioning grounding system without prior knowledge of the facilities where it will be used. It is the responsibility of the installing contractor to adapt these general guidelines and principles to the requirements of the actual environments where the systems are to be implemented.

2. System shall provide equipment ground connections (bonds) from the premises entrance facility and outside-plant earthing system to each telecommunication room telecommunication ground busbar, through the racking systems to bond the network equipment.
3. Entire grounding link from equipment to earth should be visually verifiable except where hidden by walls, conduit or pathways.
4. Installing contractor shall label all elements of the communications bonding network per guidelines defined in TIA-607-C and ANSI/TIA 606-B.
5. It is the responsibility of the installer to be knowledgeable of all previously cited Standards and Codes and to bring to the attention of the Owner or their agent pertaining to any conflicts or discrepancies to achieve a fully functioning, standards-compliant earthing system.

B. Telecommunications Bonding Backbone (TBB):

1. Bonding and grounding conductors may be insulated or un-insulated and shall not decrease in size as the grounding path moves closer to earth.
2. Connections (bonds) between the telecommunications grounding network and associated electrical panels shall be done by a qualified electrician in accordance with guidelines in TIA 607-C and applicable electrical codes.
3. Bonding Conductors should be continuous and routed in the shortest possible straight line path, avoiding changes in elevation and sharp bends.
4. TBB conductors shall be protected from mechanical damage and built to minimize splicing. Where splicing is unavoidable they shall be done using irreversible compression splices (C-TAPS) built to that purpose.
5. TBB in multi-story buildings with multiple risers (multiple TBBs) shall employ a grounding equalizer (GE) between vertical grounding backbones at the top floor of the building and minimally at every third floor in between to the lowest floor level. The GE shall be no smaller than the largest sized TBB.
6. Routing grounding conductors through ferrous metal conduit should be avoided, but if it is necessary due to building constraints, any grounding conductor running through ferrous conduit longer than 3 feet shall be bonded at the end using appropriately sized HTAP and Conduit grounding clamps as described TIA 607-C using appliances described for that purpose.
7. Conductors used to bond TBB to conduit ends shall be of #6 AWG size or larger.
8. Conductor sizing shall be based upon project specification (drawings and notes) for that installation. These sizes are based on TBB length per TIA 607-C recommendations.

C. Entrance Facilities and Telecommunications Main Grounding Busbar (TMGB):

1. TMGB shall be in the entrance facility, near the electrical panel to which it will be bonded but installed to maintain clearances required by applicable electrical codes.

2. TMGB shall be sized per the anticipated number of bonded connections needed
 3. TMGB shall be cleaned and antioxidant paste applied prior to fastening conductors.
 4. Connectors on TBB which attach to TMGB shall be of two-hole, long-barrel compression lugs.
 5. Building steel within six feet of the communications grounding system should be bonded into the system with appropriate hardware per the TIA 607-C.
 6. All cables containing a metallic shield or armor shall have that shield properly bonded into the communications grounding system using the appropriately sized Armored Cable Grounding Kit.
- D. Telecommunications Rooms and Telecommunications Grounding Busbar (TGB):
1. Each telecommunications room shall have its own TGB to which equipment and dead steel (building steel and support structures) in that room are bonded.
 2. The TGBs shall be sized per the anticipated number of bonded connections that will be needed.
 3. TMGs shall be cleaned and have an antioxidant paste applied to both bonding surfaces prior to fastening conductors.
 4. Connectors on backbone and rack/cabinet bonding conductors which attach to TGB shall be of two-hole, long-barrel compression lugs.
 5. Building steel within six feet of the communications grounding system should be bonded into the system with beam clamps and other hardware appropriate to that purpose.
 6. In smaller Telecommunications Rooms (3-5 racks) it is acceptable to have telecommunications equipment bonding conductors (TEBC) that go directly from each individual rack to the TGB. DAISY CHAINING OF RACKS WILL NOT BE ACCEPTED.
 7. Rack Bonding Conductors (RBC) or above rack row grounds (TEBC) shall be installed to maintain a minimum of 2" separation from all other types of cable - power or communications.
 8. To maintain this segregation of cables some telecommunications rooms may lend themselves to the installation of Auxiliary Conductor Brackets for routing bonding conductors outside of, yet parallel to ladder rack or basket tray.
 9. Bonding conductor support systems like auxiliary brackets shall be spaced no further apart than three foot intervals.
 10. All cables containing metallic shielding or armor shall be properly bonded into the communications grounding system using the appropriately sized Armored Cable Grounding Kit.
 11. Telecommunications Grounding in Small TR—Note in this illustration individual Telecommunications Equipment Bonding Conductors (TEBC) go direct from each rack to the busbar

E. Bonding within Racks and Cabinets:

1. Racks and Cabinets shall be bonded into the communications bonding network with conductors of #6 AWG.
2. Racks, cabinets and similar enclosures shall not be attached serially (daisy-chained) but must have individual RBC into the grounding system.
3. Newly installed racks and cabinets shall have horizontal grounding busbars installed to provide clean bonding landing point for all rack mount equipment. Grounding busbars shall not be isolated from the rack or cabinet.
4. All painted components of racks/cabinets shall be assembled using serrated grounding washers and thread-forming screws to ensure electrical continuity between the different structural components of the rack/cabinet.
5. Larger equipment (chassis switches) with integral grounding terminals or pads shall be bonded to the vertical busbar with equipment grounding kits attached to those terminals and bonding them to the rack-mounted busbars. Anywhere two metallic surfaces are to be bonded; contractor shall clean the contact areas of paint or oxidation using abrasive pads, and apply film of anti-oxidation compound between surfaces prior to bonding.
6. All cable fittings shall be of two-hole compression-type. Mechanical screw-lugs on racking systems will not be accepted and must be removed and replaced at contractor's expense.
7. All screws used to affix compression lugs to rack-mounted vertical busbars shall be of the thread forming type made specifically for electrical bonding.
8. Smaller equipment (servers, TOR switches) not having integral grounding pads must be bonded to the rack through the equipment mounting flanges using green thread-forming grounding screws with serrations under the head to cut through paint, coatings and oxidation that may be present on the equipment flange. Such equipment shall have minimally one grounding screw per piece of equipment.
9. As a condition of employment, any internal or contracting technicians servicing active equipment must be wearing a properly grounded wrist strap to dissipate ESD charges prior to touching any active equipment.

3.2 FIELD QUALITY CONTROL

- A. On installations confined to a single telecommunications room, the installing contractor shall visually verify continuity of communications bonding system from equipment, through racking systems, to overhead or under floor backbone to the wall mounted busbar in that telecommunications room.
- B. Contractor shall further verify the use of all appropriate bonding accessories in the racking systems such as grounding washers, thread-forming grounding screws and the presence of electro-static discharge ports and wrist straps within reach of all equipment to be maintained.
- C. On Greenfield (new) projects involving installation of a building-wide telecommunications backbone, installing contractor is further responsible for visually verifying sizing and sound

installation of the telecommunications bonding backbone including presence of properly sized and installed grounding equalizer conductors between backbones contained in separate risers.

- D. Inspecting Contractor shall verify that any conduit longer than 3 feet through which a grounding conductor passes is properly bonded to the grounding conductor as described in this document.
- E. During inspections contractor, shall verify compliance with all stipulations specified in this document and compliance with all regulatory references (Standards and Codes) cited.
- F. All opens or gaps in the bonding system during final inspections will be recorded in the inspection report and remedied by the contractor at no expense to Fairfield County.
- G. During inspections, contractor shall check all grounding and bonding system conductors and connections for tightness and proper installation, including checking proper dies were used on compression taps and fittings by checking embossed die numbers on those connections.
- H. The Owners may request a test of all bonded connections within the grounding system with a 2 Pole Tester. Resistance tests taken on either side of a compression or exothermic bond shall be less than .2 (2/10 measurement includes margin of error) of one ohm in resistance.
- I. Bonded joints to be tested may be random or individually tagged by a representative of the Owner Contractor shall Test system at bonded points indicated and provide results in Pole Tester report form.
- J. Based upon test results, the Owner reserves the right to request testing on 100% of exothermic and compression bonds within the installed grounding system.
- K. All bonded connections failing the test described above shall be remedied and retested by the installation contractor at contractor's expense.

END OF SECTION

Section 27 05 29 -Pathways for Communications Systems

NON-CONTINUOUS CABLE SUPPORTS FOR HIGH-SPEED TRANSMISSION CABLES
(CAT5E, CAT6, CAT6A AND HIGHER, AND FIBER CABLES)
CABLE-SUPPORT SYSTEMS

PART 1 – GENERAL

1.1 SCOPE

- A. Non-Continuous Cable Support Systems (NCCS)
- B. Multi-tiered assemblies
- C. Non-Continuous Cable Support Systems assemblies from drop wire/ceiling
- D. Non-Continuous Cable Support Systems assemblies from beam, flange

1.2 SUMMARY

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of Non-Continuous Cable Support Systems as described in this specification.

1.3 DEFINITIONS

- A. UTP: Unshielded twisted pair.
- B. ANSI®: American National Standards Institute
- C. ASTM®: American Society for Testing and Materials
- D. EIA®: Electronic Industries Alliance
- E. TIA®: Telecommunications Industry Association
- F. cULus®: Listed by Underwriters Laboratories based on US (United States) standards requirements.

1.4 SUBMITTALS

- A. Submit product data on Non-Continuous Cable Support Systems devices, including attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.

1.5 QUALITY ASSURANCE

- A. Non-Continuous Cable Support Systems and their assemblies shall be listed by Underwriters Laboratories for US standards.
- B. Manufacturer: Company specializing in manufacturing products specified in this section with a minimum of five years documented experience in the industry.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with these specifications, Non-Continuous Cable Support Systems shall be as manufactured by Pentair Caddy (formerly known as ERICO, Inc.), LeGrand Cablofil or Cooper B-Line.

2.2 REFERENCES

A. ASTM B633 Standard Specification for Electro-Deposited Coatings of Zinc on Iron and Steel

ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

B. ASTM A109 Standard Specification for Steel, Strip, Carbon, Cold-Rolled

ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy Hot-Rolled and Cold-Rolled

A653 G60-Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip process

ASTM A682 Standard Specification for Steel, Strip, High-Carbon, Cold-Rolled, Spring Quality

C. ASTM B117 Standard Method of Salt Spray (Fog) Testing

ASTM D610 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces

D. ANSI/TIA 568 Commercial Building Telecommunications Cabling Standard, current revision level.

E. ANSI/ TIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces, current revision level.

F. NFPA® 70 National Electrical Code®

G. BICSI TDMM 13th Edition

2.3 NON-CONTINUOUS CABLE SUPPORT SYSTEMS

A. Non-Continuous Cable Support Systems

1. Non-Continuous Cable Support Systems shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables per ANSI/TIA 568.0-D;

2. Non-Continuous Cable Support Systems shall have flared edges to prevent damage while installing cables.

3. Non-Continuous Cable Support Systems shall have a cable retainer to provide containment of cables within the hanger.

4. Non-Continuous Cable Support Systems shall be rated for indoor use in non-corrosive environments.

5. Offered in 1", 2" and 4" sizes.

6. Acceptable Cable Support Hook manufacturers and part numbers: PENTAIR CADDY CAT16HP, CAT32HP, & CAT64HP, B-Line BCH-16, BCH-32 & BCH-64 and Cablofil CJ21, CJ32 & CJ64.

B. Multi-Tiered Field Assembled Non-Continuous Cable Support Systems assemblies

1. Multi-tiered Non-Continuous Cable Support Systems assemblies shall be used where separate cabling compartments are required. Assemblies may be created by joining the

Non-Continuous Cable Support Systems via a tree-mounting bracket. Assemblies can be made single-sided for wall-mount applications or single/double sided for ceiling/beam/threaded rod suspended applications. The assembly is rated for indoor use in non-corrosive environments.

2. Acceptable Multi-Tier Brackets manufacturers and part numbers: Pentair Caddy J-Hook Tree series, Cooper B-Line Multi-Tier Cable Fasteners series and Cablofil CJ-SB series

C. Factory Assembled Multi-Tier Non-Continuous Cable Support Systems assemblies

1. Multi-tiered Non-Continuous Cable Support Systems assemblies shall be used where separate cabling compartments are required. Multi-tier assemblies are available for specific applications including wall mount, ceiling mount, threaded rod mount, and beam/flange mount. The beam/flange mount assembly includes a beam clamp rated to hold the weight of any of the multi-tier configurations. Assemblies are available in 1, 2, 3, & 4 tier double-sided and 2, 3, & 4 tier in single-sided configurations. The assembly is rated for indoor use in non-corrosive environments.

D. Non-Continuous Cable Support Systems assemblies from smooth or threaded drop rod or wire

1. Fastener to rod/wire with one Non-Continuous Cable Support Systems, jobsite assembled; rated for indoor use in non-corrosive environments.

2. Acceptable hook clip (batwing) manufacturers and part numbers: products: Pentair Caddy CATHPxZ34, Cooper B-Line BCHxx-W2 and LeGrand Cablofil W.

3. Attaching the above assemblies to a wire supporting the ceiling grid is not allowed per NEC 300.11

E. Non-Continuous Cable Support Systems assemblies from beam, flange

1. Fastener to beam or flange with one Non-Continuous Cable Support Systems rated for indoor use in non-corrosive environments.

2. Acceptable flanges (Hammer-on, beam clamp, etc.) manufacturers and part numbers:

Pentair Caddy, (Hammer-on) CATHP24SM, CATHP58SM, CATHP912SM, CATHP24, CATHP58, CATHP912 (Beam Clamp) CATHPBC, CATHPBC200

Cooper B-Line (Hammer-on) BCH21-U-2-4, BCH21-U-5-8, BCH21-U-9-12, BCH32-U-2-4, BCH32-U-5-8, BCH32-U-9-12, BCH64-U-2-4, BCH64-U-5-8, BCH64-U-9-12, (Beam Clamp) BCH21-C442A, BCH32-C442A, BCH64-C442A,

LeGrand Cablofil (Hammer-on) CJFMP, HOK24, HOK58, ACHOK24 (Beam Clamp) ACSSB, SSBC

*****NOTE for the part numbers above: Pentair Caddy nor LeGrand Cablofil include Hooks in their part number, flange and beam clamps only, field assembly required Cooper B-line includes J-Hooks with the flange already attached.***

2.4 Non-Continuous Cable Support Systems Base Material

A. Base material of the Non-Continuous Cable Support Systems shall be metal. Composite cable supports are not allowed.

3.1 INSTALLATION

- A. Installation and configuration shall conform to the requirements of the current revision levels of ANSI/ EIA/TIA Standards 568 & 569, NFPA 70 (National Electrical Code), applicable local codes, and to the manufacturer's installation instructions.
- B. Install cables using techniques, practices, and methods that are consistent with Category 5e or higher requirements and that supports Category 5e or higher performance of completed and linked signal paths, end to end.
- C. Install cables without damaging conductors, shield, or jacket.
- D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer or by TIA 568.
- E. Pull cables without exceeding cable manufacturer's recommended pulling tensions or outlined in TIA 569. Use pulling means that will not damage media.
- F. Do not exceed load ratings specified by manufacturer.
- G. Follow manufacturer's recommendations for allowable fill capacity for each size of the Non-Continuous Cable Support Systems.

ANSI is a registered trademark of the American National Standards Institute.

ASTM is a registered trademark of the American Society for Testing and Materials.

cULus is a registered trademark of Underwriters Laboratories, Inc.

EIA is a registered service mark of Electronic Industries Alliance.

NFPA is a registered trademark of the National Fire Protection Association.

TIA is a registered service mark of the Telecommunications Industry Association.

END OF SECTION

SECTION 27 05 53 – IDENTIFICATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. All provisions of the Division 00 and Division 01, apply to all work in Division 27 and Division 28.

1.2 SUMMARY

- A. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served. Cables shall be tagged at both ends and at each point where the cable is administered.
- B. Structured Cabling System
- C. Telephone System
- D. Classroom Sound Enhancement System
- E. Audio/Visual Equipment
- F. Digital Educational Management System
- G. Network Electronics
- H. Wireless Local Area network
- I. Sound Reinforcement System
- J. Intercom System
- K. Clock System
- L. Security System

1.3 EQUIPMENT IDENTIFICATION

- A. Identify all the following items with laminated plates:
 - 1. Equipment cabinets
 - 2. Equipment racks
 - 3. Wall Mounted Cabinets
- B. Nameplate shall indicate service organization and cable type.

1.4 Quality Assurance

- A. All components shall be supplied by the system manufacturer and/or approved for use by manufacturer.
- B. Sleeves shall be UL listed.
- C. Communications pathways and support equipment shall be closely coordinated with other trades to provide adequate access, appropriate clearances and required separation between systems.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Nameplates shall be laminated phenolic with black surface and white core.
- B. The lettering shall be Condensed Gothic with space between the lines equal to the width of the letters.
- C. The lettering on the plate shall indicate the name of equipment, the specific MER/TR the equipment is being served from, and any other reference data pertinent to the operation.
- D. Names and numbers shall coincide with those listed on the drawings or issued in an addendum or bulletin after bid.

PART 3 – EXECUTION

3.1 STRUCTURED CABLING SYSTEM

- A. The Contractor shall be responsible for labeling all supplied telecommunications equipment, cable etc. in accordance with the guidelines as described herein.
- B. The end of each cable, each jack, patch panel, cross-connect and rack/cabinet/backboard etc..., be labeled utilizing a permanent labeling system. Hand written labels **WILL NOT BE ACCEPTED.**
- C. All labeling and recording shall be approved by the Owner prior to application.
- D. System tests shall reference the final labeling.

3.2 TELEPHONE SYSTEM

- A. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served.
- B. Cables shall be tagged at both ends and at each point where the cable is administered.
- C. The contractor shall be responsible for generating and programming the labeling for telephone extension information within the software.
- D. All labeling and recording shall be approved by the Owner prior to application.

3.3 CLASSROOM SOUND ENHANCEMENT SYSTEM

- A. Label all cable lengths at each end and record the same on record drawings.
- B. Clearly and permanently label all jacks, controls and connections with permanent laminated plastic labels or by engraving and filling mounting plates, unless otherwise noted.
- C. Attach laminated plastic labels with contact cement.
- D. Embossed or printed label tape, and press-on or lift-off lettering systems **will not be accepted.**
- E. All labeling shall be completed prior to final system inspections.
- F. If permanent labels cannot be furnished prior to final system testing, temporarily label all controls with write-on tape.

3.4 AUDIO/VISUAL EQUIPMENT

- A. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served.

- B. Cables shall be tagged at both ends and at each point where the cable is administered.
- C. All labeling and recording shall be approved by Owner prior to application.

3.5 DIGITAL EDUCATIONAL MANAGEMENT SYSTEM

- A. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served.
- B. Cables shall be tagged at both ends and at each point where the cable is administered.
- C. All labeling and recording shall be approved by the Owner prior to application.

3.6. NETWORK ELECTRONICS

- A. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served.
- B. Cables shall be tagged at both ends and at each point where the cable is administered.
- C. The contractor shall be responsible for applying a permanent label to each fiber/copper patch cable to indicate source and destination. This label shall indicate patch panel and port at switch side and switch panel port at patch panel side.
- D. Fiber jumpers utilized to serve uplinks to remote switches shall be labeled with closet and switch on chassis side and fiber port in chassis on switch side.
- E. All labeling and recording shall be approved by the Owner prior to application.
- F. Provide a printed, computer generated record of each connected port in each switch.
- G. Label shall indicate data jack label, port and switch label and closet label.

3.7 WIRELESS LOCAL AREA NETWORK

- A. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served.
- B. Cables shall be tagged at both ends and at each point where the cable is administered.
- C. All labeling and recording shall be approved by the Owner prior to application.
- D. Provide a printed, computer generated record of each connected port in each switch.
- E. Label shall indicate AP served port and switch label and closet label.

3.8 SOUND REINFORCEMENT SYSTEM

- A. Label all cable lengths at each end and record the same on record drawings.
- B. Clearly and permanently label all jacks, controls and connections with permanent engraved laminated plastic labels or by engraving and filling mounting plates, unless otherwise noted.
- C. Attach laminated plastic labels with contact cement.
- D. Embossed or printed label tape, and pressed-on or lift-off lettering systems will not be accepted.
- E. All labeling shall be completed prior to final system inspections.
- F. If permanent labels cannot be furnished prior to system testing, temporarily label all controls with write on tape.

3.9 INTERCOM SYSTEM

- A. Label all cable lengths at each end and record the same on record drawings.
- B. Clearly and permanently label all jacks, controls and connections with permanent engraved laminated plastic labels or by engraving and filling mounting plates, unless otherwise noted.
- C. Attach laminated plastic labels with contact cement.
- D. Embossed or printed label tape, and pressed-on or lift-off lettering systems will not be accepted.
- E. All labeling shall be completed prior to final system inspections.
- F. If permanent labels cannot be furnished prior to system testing, temporarily label all controls with write-on tape.

3.10 CLOCK SYSTEM

- A. Clearly and permanently label all jacks, controls and connections with permanent engraved laminated plastic labels or by engraving and filling mounting plates, unless otherwise noted.
- B. Attach laminated plastic labels with contact cement.
- C. Embossed or printed label tape, and pressed-on or lift-off lettering systems will not be accepted.
- D. All labeling shall be completed prior to final system testing.
- E. If permanent labels cannot be furnished prior to system testing, temporarily label all controls with write-on tape.

3.11 NAMEPLATES

- A. Nameplates shall be secured with screws, one on each end.

END OF SECTION

SECTION 27 11 16 - COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 This specification section details the racks, UPSs, environmental monitoring, and other various accessories required for the installed copper, fiber optic, and technology systems.

1.2 SUMMARY

Section Includes:

1. Rack and cabinet power management
2. Rack Systems.
3. Cable Runway systems.

1.3 DEFINITIONS

- A. EIA: Electronic Industries Alliance.
- B. BICSI: Building Industry Consulting Service International.
- C. TIA: Telecommunications Industry Association.
- D. ANSI: American National Standard Institute.
- E. LAN: Local area network.
- F. RCDD: Registered Communications Distribution Designer.

1.4 REFERENCES

- A. ANSI/TIA-568-D.0 Generic Telecommunications Cabling for Customer Premises, 2015
- B. ANSI/TIA-569-D Telecommunications Pathways and Spaces, 2015
- C. ANSI/TIA – 568-D.1 Commercial Building Telecommunications Cabling Standard, 2015.
- D. ANSI/NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling.
- E. ANSI/TIA-942-A Telecommunications Infrastructure Standard for Data Centers, 2014.
- F. ANSI/TIA – 606-B Administration Standard for Telecommunications Infrastructure, 2012.
- G. ANSI/TIA – 607-C Generic Telecommunications Bonding and Grounding (Earthing) For Customer Premises, 2015.
- H. ANSI/NFPA 70 – National Electric Code, 2008, 2014.

1.5 ACTION SUBMITTALS

Product Data: For each type of product.

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of bonding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

1.6 INFORMATIONAL SUBMITTALS

Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.7 QUALITY ASSURANCE

Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.

1. Installation Supervision: Installation shall be under the direct supervision of Certified Technician], who shall be present when work in this Section is performed at construction site.
2. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 RACK AND CABINET POWER MANAGEMENT ACCESSORIES

A. Power Distribution to be installed for each open-frame rack supplied:

1. Approved manufacturer and part numbers for 120V Single-Input Vertical/Horizontal Power Strip:
APC AP7530, Tripp Lite PDUMNV20, and CPI P1-1C0A5
 - a. Single-Phase, 120 VAC
 - b. 20 Amp
 - c. (1) NEMA L5-20P plug
 - d. (24) NEMA 5-20R Outlets.

B. Power Distribution to be installed for each cabinet supplied:

1. Approved manufacturer and part numbers for 208V PDUs: APC AP7541, Eaton EBA110-10 and Chatsworth (CPI) L1-1FOE3, or equivalent by Tripp Lite:
 - a. Vertical Power Strip Mounting Hardware Kit.
 - b. Minimum of (30) C13 and (6) C19 plugs
 - c. NEMA L6-30P or L14-30P input
 - d. Black

2.2 RACKS

- A. For each IDF/TC provide the following data rack(s) in the quantities indicated on the drawings.

B. Standard 4 post frame. Approved manufacturer and part numbers: Chatsworth Products (CPI) 15213-E03, APC AR203A, and Eaton SB838084CFB

Capacity: 2,000 lb.

1. 44 to 48 U
2. 19" Rail width
3. Mounting Channels: Front and rear square mounting holes.
4. Approx. Size:
7 feet high by 23.5 inches wide in black.

C. Cable Management: Approved manufacturers: Chatsworth (CPI), Leviton and Panduit

1. Black
2. Snap on or hinged covers

2.3 WALL-MOUNTED EQUIPMENT RACK

- A. Subject to compliance with requirements, provide heavy duty wall-mount equipment rack for existing metal building structure.
- B. Approved manufacturer and part number: Chatsworth Products (CPI); 15320-X24 or equivalent by Cooper or APC
 3. 12-24 roll-formed threads on 5/8"-5/8"-1/2" (15.9 mm -15.9 mm -12.7mm) spacing, both sides.
 4. Made of high-strength, lightweight aluminum
 5. Rack-mount spaces are marked and numbered
 6. Depth: 24"
 7. Width: 19" EIA
 8. Height: 20 RU (rack units)
 9. Capacity: 350 lb.

2.4 CABLE RUNWAY SYSTEMS

- A. Material: Steel
- B. Inside width: 18 inches
- C. Straight section rung spacing: 6-12 inches
- D. Furnish manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.
- E. Runway shall be ladder type with 1-1/2 inch or 2 inch stringer height with welded rungs. Stringer siderail shall conform to the minimum chemical and mechanical properties of ASTM A36 structural steel.
- F. Color: Black powder coat

PART 3: EXECUTION

3.1 INSTALLATION OF FLOOR MOUNTED EQUIPMENT CABINETS

General: Comply with NECA 1.

- A. Install and adjust to position all cabinet/frame accessories including thermal management accessories, vertical cable managers, vertical power managers and equipment-mounting rails, using the manufacturer's installation instructions prior to baying and/or placing the cabinet for attachment to the building and before installing any rack-mount equipment into the cabinet.
- B. Shelves, horizontal cable managers and filler panels (rack-mount accessories), if used, may be installed after the cabinet is placed.
- C. When attached to the structural floor, the installer shall provide installation hardware.
- D. When used in a multi-cabinet bay, cabinets shall be attached side-by-side using included baying kits per the manufacturer's instructions.
- E. Attach overhead ladder rack or cable tray to the ceiling or the top of the cabinet. A 3" minimum clearance between the top of the cabinet and the bottom of the ladder rack/cable tray shall be maintained. Ladder rack/cable tray shall be positioned so that it does not interfere with hot air exhaust through the cabinet's top panel. Use radius drops where cable enters/exits the ladder rack/cable tray.

3.2 GROUNDING

Install grounding in accordance with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

- A. Attach a bonding conductor sized as defined in TIA-607-C and as defined by local code or the authority having jurisdiction (AHJ) between the Bonding Busbar and the cabinet.
- B. Attach the bonding conductor to the cabinet using a ground terminal block per the manufacturer's installation instructions. The installer shall provide the bonding conductor and other necessary hardware required to make the connections between the cabinet and the Bonding Busbar.

3.3 INSTALLATION OF FLOOR MOUNTED EQUIPMENT RACKS

Assemble racks per manufacturer's instructions. Verify that equipment mounting rails are sized properly for rack-mount equipment before attaching the rack to the floor.

All racks must be attached to the floor in four places using appropriate floor mounting anchors. When placed over a raised floor, threaded rods should pass through the raised floor tile and be secured in the structural floor below. Racks shall be grounded to the bonding busbar using appropriate hardware provided by the contractor. The bond will meet local code requirements and will be approved by the Authority Having Jurisdiction (AHJ).

Ladder rack may be attached to the top of the rack to deliver cables to the rack. The rack shall not be drilled to attach ladder rack. Use appropriate hardware from the ladder rack manufacturer.

The equipment load will be evenly distributed and uniform on the rack. Place large and heavy equipment towards the bottom of the rack. Secure all equipment to the rack with equipment mounting screws. In seismic areas, secure equipment to shelves with additional bracing.

- A. Accessory Equipment Mounting Rails: Equipment must be attached to the equipment mounting rails and must not exceed the accessory equipment mounting rails load capacity. Verify that the rack has sufficient load capacity for the accessory equipment mounting rails and equipment.
- B. Shelves: Equipment placed on the shelf must fit completely within the shelf surface and must not exceed the shelf load capacity. Verify that the rack has sufficient load capacity for the shelf and equipment.
- C. Cable Runway Mounting Bracket: Install per manufacturer's instructions.

END OF SECTION 27 11 16

SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

Part 1 GENERAL

1.1 SECTION INCLUDES

- A. Horizontal (distribution) communications wiring and connecting hardware from Telecommunications Room (TR) to Telecommunication Outlets (TO).

1.2 RELATED REQUIREMENTS

- A. Section 27 05 26 – Grounding and Bonding for Communications Systems.
- B. Section 27 05 28 – Pathways for Communications Systems.
- C. Section 27 10 00 – Structured Cabling.
- D. Section 27 11 00 – Communications Equipment Room Fittings.
- E. Section 27 13 00 – Communications Backbone Cabling.
- F. Section 27 16 00 – Communications Connecting Cords, Devices, and Adapters.

1.3 REFERENCE STANDARDS

- A. ANSI/TIA-492.AAAC-B – Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class 1a Graded-index Multimode Optical Fibers (OM3/OM4). Current Edition
- B. ANSI TIA-492.CAAB – Detail Specification for Class Iva Dispersion Un-shifted Single-Mode Optical Fibers with Low Water Peak. Current Edition
- C. ANSI/TIA 526 – OFSTP-19 Optical Signal-to-Noise Ratio Measurement Procedures for Dense Wavelength-Division Multiplexed Systems.
- D. ANSI/TIA-568-C.0 – Generic Communications Cabling for Customer Premises.
- E. ANSI/TIA-568-C.1 – Commercial Building Communications Cabling Standard Part 1: General Requirements.
- F. ANSI/TIA 568-C.2 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards
- G. ANSI/TIA 568-C.3 – Optical Fiber Cabling Components Standard
- H. ANSI/TIA-569-C – Commercial Building Standard for Telecommunications Pathways and Spaces.
- I. ANSI/TIA-606-B – Administration Standard for the Commercial Telecommunications Infrastructure.
- J. ANSI/JSTD-607-C – Commercial Building Bonding and Grounding (Earthing) Requirements for Telecommunications.
- K. NFPA 70 – National Electrical Code (NEC).
- L. BICSI – TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM)

1.4 PRE-INSTALLATION MEETINGS

- A. Convene pre-installation meeting 2 weeks before start of installation of communications horizontal cabling.
- B. Require attendance of parties directly affecting work of this section, including Contractor, Architect, installer, and manufacturer's representative.
- C. Review materials, installation, field quality control, labeling, protection, and coordination with other work.

1.5 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit manufacturer's product data sheets, including installation instructions verifying that materials comply with specified requirements and are suitable for intended application.
- C. Installer's Project References: Submit installer's list of successfully completed communications horizontal cabling projects, including project name and location, name of architect, and type and quantity of communications horizontal cabling installed.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer regularly engaged, for past 10 years, in manufacture of communications horizontal cabling of similar type to that specified.
- B. Installer's Qualifications:
 - 1. Contractor must hold a Manufacturer's Installation, Partnership or Integration Certification before, during, and through completion of the approved system installation of which they bid. This is so a 25-year warranty can be offered by the contractor. Supporting documentation will be required as part of the submittal.
 - 2. Responsible for workmanship and installation practices in accordance with Manufacturer's Program.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.
 - 4. Protect materials during storage, handling, and installation to prevent damage.

1.8 WARRANTY

- A. The horizontal communications cabling system installed shall be eligible for coverage by a minimum 25-year Limited Warranty to the end user.
 - 1. Horizontal channels shall be completed with factory-terminated copper and/or fiber optic patch cords in order to be eligible for the applicable Warranty with performance guarantees.
 - 2. Approved product shall be listed on the most recent version of the applicable data sheets for each technologies solution.
- B. Installer/Integrator shall provide labor, materials, and documentation in accordance with the approved solutions requirements necessary to ensure that the Owner will be furnished with a minimum 25-year Limited Warranty.
- C. The installed structured cabling system shall provide a warranty guaranteeing installed performance above the ANSI/TIA 568-C requirements for Cat 5e, Cat 6, and/or Cat 6A cabling systems.

1. Standards-compliant channel or permanent link performance tests shall be performed in the field with a manufacturer's approved certification tester in the appropriate channel or permanent link test configuration.
- D. Necessary documentation for warranty registration shall be provided to the manufacturer by the installer (within 10 days) following 100 percent testing of cables.
 1. Submit test results to the manufacturer, in the certification tester's original software files.
 2. Installer shall ensure that the warranty registration is properly submitted, with all required documentation within 10 days of project completion.
 3. Contractor/ Integrator must adhere to the terms and conditions of the respective manufacturer's warranty programs.
- E. Installer shall ensure that the Owner receives the manufacturer issued project warranty certificate within 60 calendar days of warranty registration.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Leviton/Berk-Tek
- B. Ortronics/Superior Essex
- C. Panduit.
- D. General Cable
- E. Belden

2.2 SYSTEM DESCRIPTION

- A. Horizontal Distribution Subsystem: Intra-building twisted-pair and fiber optic communications cabling connecting Telecommunication Rooms (TRs) to Telecommunication Outlets (TOs) located at individual work areas.
 1. Where **2D** is shown on the drawings (2) Cat 6 cables shall be supplied.
 2. Where **WAP** is shown on the drawings (1) Cat 6A cable shall be supplied.
 3. Where **TV** is shown on the drawings (2) Cat 6 cables shall be supplied as well as HDMI cabling as detailed in section 27 24 23 and 27 41 13.
 4. Where **AV** is shown on the drawings (2) Cat 6 cables shall be supplied as well as HDMI cabling as detailed in section 27 24 23 and 27 41 13.
 5. Where **AVC** is shown on the drawings (1) Cat 6 cable shall be supplied as well as HDMI cabling as detailed in section 27 24 23 and 27 41 13.
 6. Where **P** is shown on the drawings (1) Cat 6 cable shall be supplied as well as HDMI cabling as detailed in section 27 24 23 and 27 41 13.
 7. Where **SC** is shown on the drawings (1) Cat 6 cable shall be supplied.
- B. Horizontal Cabling: Combination of the following types of cables from TR to TO:
 1. Category 6 (100-Ohm, 4-pair, unshielded twisted pair)
 2. Category 6A UTP
 3. 850 nm Bend-insensitive Laser Optimized 50/125 µm OM4
- C. Communications Horizontal Cabling System: Includes cables, jacks, patch panels, connecting blocks, patch cords, fiber connectors, fiber adapter plates, fiber enclosures, jumpers, and necessary support systems, such as cable managers and faceplates.
- D. Cables shall adhere to the following color specification, installed cables, jacks, and patch cables shall all be color coordinated.

Data/Voice – Blue (Cat 6)

Wireless – Orange (Cat 6A)
CCTV/VAPE – Yellow (Cat 6)
Clock – Green (Cat 6)
PA/Audio – Black (Cat 6)
Backbone – Gray (Cat 6)

- E. Cables: Route through conduit, cable trays, spaces below raised floors, open ceiling areas, non-ventilated spaces above ceiling tile, and through plenum air-handling spaces above ceiling tile.
- F. Furnish and install all materials necessary for a complete and working communications horizontal cabling system.

2.3 STATION CABLING - All Cat 6 Cabling will have a divider/separator between pairs in the cable.

Cat6

- 1. Cat6 Gray CMP
 - a. Berk-Tek LANmark 1000: 11091087
 - b. Superior Essex DataGain: 66-240-3B
 - c. Panduit TX6000: PUP6004IG-W
 - d. Belden 3613 0081000
- 2. Cat6 Yellow CMP
 - a. Berk-Tek LANmark 1000: 10032090
 - b. Superior Essex DataGain: 66-240-6B
 - c. Panduit TX6000: PUP6004YL-W
 - d. Belden 3613 0041000
- 3. Cat6 Blue CMP
 - a. Berk-Tek LANmark 1000: 10032094
 - b. Superior Essex DataGain: 66-240-2B
 - c. Panduit TX6000: PUP6004BU-W
 - d. Belden 3613 D151000

Cat6A

- 1. Cat6A Orange CMP
 - a. Berk-Tek LANmark-10G2:
 - b. Superior Essex 10 Gain: 6A-272-DB
 - c. Panduit: PUP6AM04XX-UG
 - d. Belden 10GXS13 0031000
- 2. Cat6A Green CMP
 - a. Berk-Tek LANmark-10G2: 10137694
 - b. Superior Essex 10 Gain: 6A-272-5B
 - c. Panduit: PUP6AM04XX-UG (Special Order)
 - d. Belden 10GXS13 0051000

OM3- Fiber

- 1. OM3- 2 Fiber MM fiber for outdoor cameras
 - a. Berk-Tek- ICP002EB3010/25-I/O(BLA) OM3
 - b. Superior Essex- W4002NG01 OM3
 - c. General Cable- BE0021ANU.BK OM3
 - d. Belden FD3D002P9

2.4 MODULAR JACKS FOR WORKSTATION OUTLETS AND TELECOMMUNICATIONS ROOM

A. Category 6A Modular Jacks

1. 8-position modular jack, Category 6A, IDC terminals, T568A/B wiring scheme.
2. Each jack identified as Cat6A
3. Color Offerings: Green and Orange
4. Plenum rated for above ceiling use.
5. Approved Manufacturers and part numbers.
 - a. Leviton Atlas: 6AUJK-RV (Green), 6AUJK-RO (Orange)
 - b. Panduit TX6A: CJ6X88TG-GR (Green), CJ6X88TG-OR (Orange)
 - c. Ortronics Clarity HD: OR-HDJ6A-45 (Green), OR-HDJ6A-43 (Orange)
 - d. Belden RVAMJKUOR-S1(Orange), RVAMJKUGN-S1(Green)

B. Category 6 Modular UTP Jacks:

1. 8-position modular jack, Category 6, IDC terminals, T568A/B wiring scheme.
2. Each jack identified as CAT 6.
3. Color Offerings: Blue, Yellow, Gray, Black, Green, and White.
4. Approved Manufacturers and Part Numbers:
 - a. Leviton Extreme: 61110-RL6 (blue), 61110-RY6 (Yellow), 61110-RG6 (Gray), 61110-RW6 (White)
 - b. Panduit Mini-Com: CJ688TGBU (blue), CJ688TGYL (Yellow), CJ688TGIG (Gray), CJ688TGWH (White),
 - c. Ortronics High Density Clarity: OR-HDJ6-36 (blue), OR-HDJ6-44 (Yellow), OR-HDJ6-78 (Gray), OR-HDJ6-88 (White),
 - d. Belden, RV6MJKUBL-S1(Blue), RV6MJKUYL-S1(yellow), RV6MJKUGY-S1(Gray), RV6MJKUEW-S1(White)

2.5 WORK AREA OUTLETS

A. Approved recessed stainless steel wall phone plates manufacturers and part numbers:

1. Single gang
 - a. Leviton: 4108W-1SP
 - b. Ortronics: OR-403STJ2P
 - c. Panduit: KWP6P4
 - d. Belden AX102006

NOTE: Ortronics HD jacks require a bezel (part number: OR-HDJTJA20) to fit into the faceplates.

B. Approved Flush-Mounted Stainless Steel Faceplates with Identification Windows manufacturers and part numbers:

1. 1-port single-gang plate.
 - a. Leviton: 43080-1L1
 - b. Ortronics: OR-403STJ11
 - c. Panduit: N/A
 - d. Belden AX104230
2. 2-port single-gang wall plate.
 - a. Leviton: 43080-1L2
 - b. Ortronics: OR-403STJ12
 - c. Panduit: CPFL254
 - d. Belden AX104231
3. 4-port single-gang wall plate.

- a. Leviton: 43080-1L4
 - b. Ortronics: OR-403STJ14
 - c. Panduit: CFPL4S4
 - d. Belden AX104232
4. 6-port single-gang wall plate.
- a. Leviton: 43080-1L6
 - b. Ortronics: OR-403STJ16
 - c. Panduit: CFPL654
 - d. Belden AX104233

NOTE: Ortronics HD jacks require a bezel (part number: OR-HDJTJA20) to fit into the faceplates.

C. White Plastic Surface-Mounted Outlet Boxes with ID Windows:

- 1. 1-port
 - a. Leviton: 41089-1WP
 - b. Ortronics: 404-HDJ1
 - c. Panduit: CBX1WH-A
 - d. Belden AX105352-EW
- 2. 2-port
 - a. Leviton: 4S089-2WP
 - b. Ortronics: 404-HDJ2
 - c. Panduit: CBX2WH-AY
 - d. Belden AX105353-EW
- 3. 4-port
 - a. Leviton: 4S089-4WP
 - b. Ortronics: 404HDJ4
 - c. Panduit: CBX4WH-AY
 - d. Belden AX 105354-EW
- 4. 6-port
 - a. Leviton: 41089-6WP
 - b. Ortronics: 404HDJ6
 - c. Panduit: CBXF6WH-AY
 - d. Belden AX 105355-EW

2.6 PATCH PANELS

A. Approved Modular Insert-Style Patch Panel Manufacturers and part numbers:

- 1. 24-port, 1RU, flat metal, patch panel, empty.
 - a. Leviton: 49255-H24
 - b. Ortronics: OR-PHAHJU24
 - c. Panduit: CPP24WBLV
 - d. Belden AX103114
- 2. 48-port, 1RU high-density, flat metal, patch panel, empty.
 - a. Leviton: 49255-Q48
 - b. Ortronics: OR-PHDHJU48

- c. Panduit: CPP48HDWBLY
 - d. Belden AX 103121
3. 48-port, 2RU, flat metal, patch panel, empty.
- a. Leviton: 49255-H48
 - b. Ortronics: PSDHJu48
 - c. Panduit: CP48BLY
 - d. Belden AX103115

2.7 PATCH CORDS

A. Category 6A Modular Patch Cords:

- 1. Category 6A UTP patch cord, 4pair stranded wire construction
- 2. Color Offerings: Green and Orange
- 3. Approved Manufacturers and Part Numbers

- 1) Leviton: 6AS10---X
- 2) Ortronics: OR-MC6A---XX
- 3) Panduit: UTP6ASD---XX
- 4) Belden CA211---xxx where xxx is the appropriate color and length code

LEVITON NOTE: Replace – with footage 03, 05, 07, 10, and X with the following color G=Green, and ?=Orange (special order)

ORTRONICS NOTE: Replace – with footage 03, 05, 07, 10, and X with the following color 05=Green and=Orange MC6Axx-03

PANDUIT NOTE: Replace – with footage 3, 5, 7, 10, and X with the following color GR=Green, and OR=Orange

BELDEN NOTE: replace --, 06=blue, 09=white, 00=black, 04=yellow, 08=gray replace xxx with footage 003, 005, 007, 010

B. Category 6 Modular Patch Cords:

- 1. Category 6 UTP patch cord, 4-pair, stranded wire construction.
- 2. Color Offerings: Blue, White, Black, Yellow and Gray
- 3. Approved Manufacturers and Part Numbers:

- 1) Leviton: 6D460---X
- 2) Ortronics: OR-MC6---xx
- 3) Panduit: UTPSP-XXY
- 4) Belden C6011-XXX where xxx is the appropriate color and length code

LEVITON NOTE: Replace – with footage 03, 05, 07, 10, and X with the following color L=Blue, E=Black, Y=Yellow, S=Gray and W=White

ORTRONICS NOTE: Replace – with footage 03, 05, 07, 10, and X with the following color 06=Blue, 00=Black, 04=Yellow, 08=Gray and 09=White

PANDUIT NOTE: Replace – with footage 3, 5, 7, 10, and X with the following color BU=Blue, BL=Black, YL=Yellow, GY=Gray and IW=White

BELDEN NOTE: replace --, 06=blue, 09=white, 00=black, 04=yellow, 08=gray replace xxx with footage 003, 005, 007, 010

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive communications horizontal cabling.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION – GENERAL

- A. Install communications horizontal cabling in accordance with manufacturer's instructions, ANSI/TIA-568-C.0, ANSI/TIA-568-C.1, ANSI/TIA-569-C, BICSI TDMM, and NFPA 70.
- B. Field Terminated Copper and Fiber Optic Patch Cords and Jumpers: Not allowed.
- C. Copper Patch Cords and Fiber Jumpers: Manufactured by Leviton Network Solutions.
- D. Install cables after building interior has been physically protected from weather and mechanical work likely to damage cabling has been completed.
- E. Ensure cable pathways are completely and thoroughly cleaned before installing cabling.
- F. Inspect installed conduit, wireway, cable trays, and inner duct.
- G. Clean additional enclosed raceway and inner duct systems furnished.
- H. Provide protection for exposed cables where subject to damage.
- I. Abrasion Protection:
 - 1. Provide abrasion protection for cable or wire bundles which pass through holes or across edges of sheet metal.
 - 2. Use protective bushings to protect cables.
- J. Cable Ties and Other Cable Management Clamps:
 - 1. No more than hand tightened Velcro.
 - 2. Fit snugly, but not compress, crimp, or otherwise change physical characteristics of cable jacket or distort placement of twisted-pair components.
 - 3. Replace cables exhibiting stresses due to over tightening of cable management devices.
 - 4. Use plenum-rated Velcro cable ties in plenum spaces.
 - 5. Velcro wraps are preferred over cable ties for all cable bundles.
- K. Where possible, route cables in overhead cable trays and inside wire management systems attached to equipment cabinets and racks.
 - 1. Use Velcro, plastic ties or ducts to restrain cabling installed outside of wire management systems on racks or in cabinets.
 - 2. Cable Trays: Do not exceed 50 percent fill.
- L. Pull Cord:
 - 1. Nylon, 1/8-inch minimum.
 - 2. Co-install with cables installed in conduit.
- M. Cable Raceways: Do not fill greater than ANSI/TIA-569-B maximum fill for particular raceway type.
- N. Support horizontal cables at a maximum of 48-inch (1.2 to 1.5-m) irregular intervals if J-hook or trapeze system is used to support cable bundles.
- O. Do not allow cables to rest on acoustic ceiling grids, plumbing pipes, or electrical conduits.
- P. Bundle horizontal distribution cables in groups of no more than amount of cables designed for by cable support manufacturer, based on cable OD and weight.
- Q. Fire-Sprinkler System:

1. Install cables above fire-sprinkler system.
2. Do not attach cables to fire-sprinkler system or ancillary equipment or hardware.
3. Install cable system and support hardware so that it does not obscure valves, fire alarm conduit, boxes, or other control devices.

R. Do not attach cables to ceiling grid or lighting fixture wires.

S. Install appropriate carriers to support cabling, where support for horizontal cables are required.

T. Replace before final acceptance, cables damaged or exceeding recommended installation parameters during installation.

3.3 INSTALLATION – UNSHIELDED TWISTED-PAIR CABLES

A. Install unshielded twisted-pair cables in accordance with manufacturer's instructions.

B. Install cables in continuous lengths from origin to destination, without 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 enclosure intended and suitable for the purpose.

D. Cable Minimum Bend Radius and Maximum Pulling Tension:

1. Do not exceed bend radius for UTP = 4 X Cable OD, FTP = 4 X Cable OD.
2. Install unshielded twisted-pair cables so that there are no bends smaller than 4 times cable outside diameter at any point in the run and at the termination field.
3. Pulling Tension on 4-Pair UTP Cables: Do not exceed 25 ft.lb. for 4-pair UTP cable.

E. Separation from Power Lines: Provide following minimum separation distances between pathways for copper communications cables and power wiring of 480 volts or less:

1. Open or Nonmetal Communications Pathways:

- a. Electric motors, fluorescent light fixtures, and unshielded power lines carrying up to 3 kVA: 12 inches.
- b. Electrical equipment and unshielded power lines carrying more than 5 kVA: 36 inches.
- c. Large electrical motors or transformers: 48 inches.

2. Grounded Metal Conduit Communications Pathways:

- a. Electrical equipment and unshielded power lines carrying up to 2 kVA: 2-1/2 inches.
- b. Electrical equipment and unshielded power lines carrying from 2 kVA to 5 kVA: 6 inches.
- c. Electrical equipment and unshielded power lines carrying more than 5 kVA: 12 inches.
- d. Power lines enclosed in grounded metal conduit (or equivalent shielding) carrying from 2 kVA to 5 kVA: 3 inches.
- e. Power lines enclosed in grounded metal conduit (or equivalent shielding) carrying more than 5 kVA: 6 inches.

3.4 INSTALLATION – UNSHIELDED TWISTED-PAIR TERMINATION

A. Coil cables to house cable coil without exceeding manufacturers bend radius.

1. In hollow wall installations where box eliminators are used, store excess wire in wall.
2. Store no more than 12 inches of UTP and 36 inches of fiber slack.
3. Loosely coil excess slack and store in ceiling above each drop location, when there is not enough space present in outlet box to store slack cables.

B. Dress and terminate cables in accordance with ANSI/TIA-568-C.0, ANSI/TIA- C.1, BICSI TDM, and manufacturer's instructions.

C. Terminate 4-pair cables on jack and patch panels using T568-B or T568-A wiring scheme.

- D. Pair Untwist at Termination: Do not exceed 12 mm (1/2 inch).
- E. Bend Radius of Horizontal Cables:
 - 1. Not less than 4 times OD of UTP cables.
 - 2. Not less than 4 times OD of FTP cables.
- F. Maintain cable jacket to within 25 mm (1 inch) of termination point.
- G. Neatly bundle cables and dress to their respective panels or blocks.
 - 1. Feed each panel or block by individual bundle separated and dressed back to point of cable entrance into rack or frame.

3.5 INSTALLATION – OPTICAL FIBER CABLES

- A. Place fiber optic cables to maintain minimum cable bend radius limits specified by manufacturer or 15 times cable diameter, whichever is larger.
- B. Use care when handling fiber optic cables.
 - 1. Carefully monitor pulling tension so as not to exceed limits specified by manufacturer.
- C. Do not splice horizontal fiber optic cables.

3.6 FIELD QUALITY CONTROL

- A. Cables and Termination Hardware: Test 100 percent for defects in installation and verify cabling system performance under installed conditions in accordance with ANSI/TIA-568-C.0.
 - 1. Verify all pairs of each installed cable before system acceptance.
 - 2. Defects in cabling system installation, including but not limited to cables, connectors, patch panels, and connector blocks shall be repaired or replaced to ensure 100 percent useable conductors in all cables installed.
- B. Test all cables in accordance with this specification section, ANSI/TIA-568-C.2, and ANSI/TIA-568-C.3 standards, and manufacturers instructions
 - 1. If any of these are in conflict, bring discrepancies to the attention of the Architect for clarification and resolution.
- C. Cables, Jacks, Connecting Blocks, and Patch Panels:
 - 1. Verify all pairs of each installed cable before system acceptance.
 - 2. Defects in cabling system installation, including but not limited to cables, connectors, patch panels, and connector blocks shall be repaired or replaced to ensure 100 percent useable conductors in all cables installed.
- D. Testing Unshielded Twisted-Pair Cables: **(NOTE: Permanent Link Test results are recommended, and are the expected norm – unless patch cords that will remain installed at the work area and cross-connect are also being tested, in which case Channel Test results would be expected and accepted).**
 - 1. Test twisted-pair copper cable links for continuity, pair reversals, shorts, opens, and performance as specified.
 - a. Additional testing is required to verify Category performance.
 - b. Test horizontal cabling using approved certification tester for Category 6A, Category 6, and Category 5e performance compliance in accordance with ANSI/TIA-568-C.2.
(NOTE: Appropriate Fluke, Agilent, Ideal, or JDSU certification testers may be used).
 - c. Category 6A shall conform to ANSI/TIA-568-C.2 for augmented Category 6 to 500 MHz.

2. Follow ANSI/TIA-568-C.2.
3. Basic Tests Required:
 - a. Wire map.
 - b. Length (feet).
 - c. Insertion loss (dB), formerly attenuation.
 - d. NEXT (Near end crosstalk) (dB).
 - e. Return loss (dB).
 - f. ELFEXT (dB).
 - g. Propagation delay (ns).
 - h. Delay skew (ns).
 - i. PSNEXT (Power sum near-end crosstalk loss) (dB).
 - j. PSELFEXT (Power sum equal level far-end crosstalk loss) (dB).
4. Test Category 6A by auto test to 500 MHz.
 - a. Alien Crosstalk (AXT) testing and AXT test results are NOT required by Leviton or Berk-Tek for warranty of a Category 6A system. (**Note:** AXT testing may be required by the customer, in which case these tests WOULD have to be performed).
5. Test Category 6 by auto test to 250 MHz.
6. Provide test results in approved certification testers original software format on CD, with the following minimum information per cable:
 - a. Circuit ID.
 - b. Information from specified basic tests required.
 - c. Test Result: "Pass" or "Fail".
 - d. Date and time of test.
 - e. Project name.
 - f. NVP.
 - g. Software version.
7. An occasional asterisk-Pass (*Pass) will be up to the manufacturer's discretion whether it is accepted by the, but rework of these links should be done in an attempt to achieve clean "Pass" results prior to submission of test results.
8. To receive Manufacturer's Warranty for the project, submit software copy of test results, in original tester software format, to the Owner and to the Manufacturer.
9. Submit fully functional version of tester software for use by the Owner in reviewing test results.
10. Report in writing to the Owner immediately, along with copy of test results, failed test results that cannot be remedied through re-termination (as in the case of reversed or split pairs).

3.7 LABELING

- A. All labeling is to be in accordance with ANSI/TIA-606-B and manufacturer's instructions.
- B. Label horizontal cables using machine-printed label at each end of cable at approximately 12 inches from termination point and again at approximately 48 inches from termination point.
 1. Handwritten Labels: Not acceptable.
- C. Label patch panel ports and TO ports with cable identifier.
- D. Labels: Denote TO ID and unique cable number for that TO, i.e. A-001-A for cable number 1, A-001-B for cable number 2, and so forth.
 1. Owner may provide specific labeling requirements. Coordinate with the Owner.
- E. Note labeling information on as-built drawings.

3.8 PROTECTION

- A. Protect installed communications horizontal cabling from damage during construction.

END OF SECTION

SECTION 27 21 33 – DATA COMMUNICATION WIRELESS ACCESS POINTS – ALTERNATE 14

PART 1 – GENERAL

1.1 GENERAL

- A. All materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials used shall be of the same manufacturer, model, and quality, unless otherwise specified.
- B. All material and equipment shall be procured, stored, transported, connected, used, cleaned, adjusted, and placed in service as recommended by the manufacturers, or as indicated in their published literature, unless specifically herein specified to the contrary.
- C. All technicians that perform work on this project shall do so only after reading the issued specification sections and reviewing the associated project drawings.
- D. All work shall be performed by competent personnel and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- E. All equipment shall be sourced through manufacturer approved means and channels, the sourcing of like-new or otherwise questionable (ie. Gray-market) equipment for use is strictly prohibited. All equipment shall carry an intact and honorable manufacturer warranty in addition to any warranty provided or implied by the installer/integrator.
- F. The Contractor shall provide as-built drawings detailing the locations of all equipment installed as part of the system described herein.
- G. The Contractor must demonstrate to the Owner and Engineer that the system is complete and complies with all operational requirements set forth in the plans and specifications. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the Engineer.

1.2 VALIDATION AND QUALITY ASSURANCE

- A. Wireless system shall be designed for full building coverage and to assure ubiquitous high density coverage for an average of 25-30 users per AP in educational areas and standard high density coverage throughout the remainder of the building.
- B. Design Wireless System with 30% growth factored into total system capacity.
- C. Design shall allow for additional bandwidth growth and shall be capable of limiting the bandwidth used by each device.
- D. Wireless system shall provide minimum of -65 dB signal level and minimum 36dB SNR at all locations in building for 802.11ac coverage.
- E. Wireless system shall provide a minimum of 7 Mbps throughput per user.
- F. Installation and/or implementation contractor shall validate coverage and SNR levels throughout the entire facility by conducting a post installation validation survey. If additional equipment is required to meet the -65 dB requirement the equipment, licensing, and installation shall be provided by the installing integrator.

PART 2 – PRODUCTS

2.1 WIRELESS ACCESS POINTS

- A. Access points shall be installed in the meeting room, office, and general locations indicated on the floorplans
- B. Wireless access points shall at a minimum be capable of mimicking all SSIDs and in-use features of installed wireless in other areas of county such that identical services can be provided and client devices can interoperate between new facilities and existing facilities without intervention.
- C. Access points shall be managed by a hosted or cloud controller and shall be designed in a manner such that the access points can provide full operation (minus reporting and configuration changes) in the event that the cloud/managed controller is offline or otherwise inaccessible.

- D. The cloud/hosted controller based wireless access points shall provide the following minimum features:
 - a. Operating Frequencies:
 - i. 2400 - 2483.5 MHz
 - ii. 5150 - 5725 MHz
 - iii. 5925 - 7125 MHz
 - b. Supported Data Rates:
 - i. 802.11be (WiFi 7)
 - 1. 7.3 Mbps to 11.4 Gbps (MCS0 - MCS13 NSS1/2/3/4, EHT 20/40/80/160/240/320)
 - ii. 802.11ax (WiFi 6)
 - 1. 7.3 Mbps to 4.8 Gbps (MCS0 - MCS11 NSS1/2/3/4, HE 20/40/80/160)
 - iii. 802.11ac (WiFi 5)
 - 1. 6.5 Mbps to 3.4 Gbps (MCS0 - MCS9 NSS1/2/3/4, VHT 20/40/80/160)
 - iv. 802.11n
 - 1. 6.5 Mbps to 600 Mbps (MCS0 - MCS31, HT 20/40)Two Autosensing 10/100/1000 Base-T Ethernet ports or a minimum of one multi-rate 2.5/5Gb port.
 - c. Uplink type:
 - i. 10 GbE with backward compatibility to 1 GbE
 - d. All standard mounting hardware included
 - i. Provide additional mounting hardware as required for proper installation
 - e. Desktop, ceiling, and wall mount capable
 - f. Provide external antennas if required for correct RF propagation
 - g. Internal antennas
- E. Provide licensing, hardware warranty, advance replacement, and support for a minimum of 3 years from date of installation.
- F. Provide not less than 5% additional access points, or a minimum of 2 (whichever is greater) for customer shelf stock.
- G. Acceptable Manufacturers: Ubiquiti
- H. Design Basis: Ubiquiti Enterprise E7

PART 3 – INSTALLATION

3.1 INSTALLATION

- A. Coordinate switch and wireless configurations with owner, technology consultant, and additional contractors as appropriate to ensure proper functionality of all systems such as VoIP, CCTV, WLAN, HVAC, and others.
- B. Access points shall be labeled with room of installation and data cable label
 - a. Labels shall be neatly placed and readable from ground level when access point is installed within 12ft of ground level
 - b. Corresponding AP hostname shall be configured on the access point to match the label
- C. Coordinate IP address assignment with owner, technology consultant, and additional contractors as appropriate to ensure proper functionality of all system such as VoIP, CCTV, WLAN, HVAC, and others.
- D. Wireless controller shall have a password assigned and configured so that password is required to alter configuration
 - a. Coordinate password with owner, if none provided ensure password meets generally accepted guidelines for a strong password
- E. Wireless channels should be configured for 20MHz channels in both the 2.4GHz and 5GHz bands.
- F. Installation, connectivity, and configuration shall meet all applicable owner and manufacturer guidelines

3.2 CLOSE OUT DOCUMENTATION

- A. Provide two 3-ring binders to the owner at the completion of the project, binder shall be printed (no hand-written aspects), tabbed (printed tabs) and include the following documentation:
 - a. Floor plans detailing where network electronics are installed and what their intended purpose is (ie. WLAN, data, VoIP, CCTV)
 - b. Floor plans depicting the static channel plan
 - c. Spreadsheet of all products, serial numbers, and IP addresses

- d. Spreadsheet that cross references switch port name, location, and number with access point and installed location.
- e. Any passwords generated (unless provided by owner) and configured on devices
- f. Datasheets for all products
- g. Include any other relevant "as-built" information

END OF SECTION 27 21 33

SECTION 27 24 23 – AUDIO VISUAL DEVICES

PART 1 – GENERAL

1.1 GENERAL

- A. All materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials used shall be of the same manufacturer, model, and quality, unless otherwise specified.
- B. All material, and equipment shall be procured, stored, transported, connected, used, cleaned, adjusted, and placed in service as recommended by the manufacturers, or as indicated in their published literature, unless specifically herein specified to the contrary.
- C. All technicians that perform work on this project shall do so only after reading the issued specification sections and reviewing the associated project drawings.
- D. All work shall be performed by competent personnel and executed in a neat and skillful manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- E. All equipment shall be sourced through manufacturer approved means and channels, the sourcing of like-new or otherwise questionable (ie. Gray-market) equipment for use is strictly prohibited. All equipment shall carry an intact and honorable manufacturer warranty in addition to any warranty provided or implied by the installer/integrator.
- F. The Contractor shall provide as-built drawings detailing the locations of all equipment installed as part of the system described herein.
- G. The Contractor must demonstrate to the Owner and Engineer that the system is complete and complies with all operational requirements set forth in the plans and specifications. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the Engineer.

1.2 QUALITY ASSURANCE

- A. All equipment shall be UL listed.
- B. All equipment and Installation Practices shall comply with the latest BICSI® Telecommunications Distribution Methods Manual (TDMM).

1.3 SYSTEM WARRANTY

- A. The Audio visual systems and software shall be warranted by the contractor for a period of two (2) years from date of substantial completion. Provide advanced replacement for all electronics for the two (2) year period.

1.4 SMALL CONFERENCE ROOM A/V SPECIFICATIONS

- A. Each conference room shall be equipped with an interactive television for display and interactivity.
- B. Each small conference room shall have 4 input/output locations.
 - a. The "AV" input location shall have the following characteristics:
 - i. 1 HDMI input
 - 1. Shall transmit HDMI from input plate to television over HDBase-T
 - ii. 2 data drops from technology closet (both shall be PoE+)
 - iii. 1 RJ45 input for USB connectivity to the interactive television
 - b. The "TV" input location shall have the following characteristics:
 - i. 2 data drops from technology closet
 - ii. 1 RJ45 output for USB connectivity to the interactive projector
 - iii. 1 HDMI output
 - 1. Shall receive HDMI from input plate to television over HDBase-T
 - c. The "2D" location shall have the following characteristics:
 - i. 2 data drops from technology closet (both shall be PoE+)

- C. USB 1.1 Boosters shall be provided for USB extension over Category 5 wiring.
- D. Each small conference room shall be Microsoft Teams Room Compatible using a reasonably sized Microsoft certified video and audio conferencing solution such as the Logitech MeetUp 2 for Teams Rooms.

PART 2 – PRODUCTS

2.1 INTERACTIVE TELEVISIONS

- A. As indicated on the drawings classrooms shall be provided with the following interactive television mounted on the wall with a mount rated for the weight and application:
 - a. Viewsonic IFP6552 or equivalent by Sharp, Newline, or Cleartouch:
 - i. 65-inch 4K display with multi-point capacitive touch technology.
 - ii. Brightness: 400 nits
 - iii. Viewing angle: +- 88 degrees (all directions)
 - iv. Content is interactive, bright and crisp in any light.
 - v. Easily access HDMI and USB ports on the front of the display.
 - vi. Include: HDMI Male/Male cable and USB cable for interactivity.
 - b. Mount shall be manufactured by display manufacturer, Peerless, Ergotron, or Chief and shall have the following additional specifications:
 - i. Ability to mount a 32" to 75" display
 - ii. Support for standard VESA Mounting Patterns
 - c. Three (3) year manufacturer warranty

2.2 USB OVER CATx CABLE BOOSTER EXTENDER

- A. Each classroom shall be supplied with a USB over RJ45 converter pair to allow interactivity with the display to take place from the teacher device on the other side of the room.
- B. Devices shall have the following characteristics:
 - a. Host side:
 - i. 1 USB 1.1 or better
 - ii. 1 RJ45
 - b. Device side:
 - i. 1 USB 1.1 or better
 - ii. 1 RJ45
 - c. Powered via USB (no external adapter required)
 - d. Capability to extend a USB 1.1 signal up to 150ft over category cable
 - e. 1 year warranty
- C. Supply any necessary USB or Catx patch cables required to complete solution.
- D. Provide no less than 2 of each component as shelf spares for owner use at a later date.
- E. Design spec: C2G USB 1.1 over CAT5 super booster extender

PART 3 – INSTALLATION

3.1 INSTALLATION

- A. All wiring shall be neatly done and secured properly with Velcro
- B. All displays shall be wired, organized, and wire managed identically. All HDMI and other input cables shall be plugged into consistent inputs such that instructions can be provided to the whole building and be consistent and predictable.
- C. All cables must be managed and secured, cables must never be permitted to rest on the floor.
- D. All solutions above shall be complete and include all required accessories to operate.
- E. Any required hardware, software, or accessories to perform regular periodic maintenance or configuration must be supplied with all of the above solutions.

3.2 CLOSE OUT DOCUMENTATION

- A. Provide two 3-ring binders to the owner at the completion of the project, binder shall be printed (no hand-written aspects), tabbed (printed tabs) and include the following documentation:
 - a. Floor plans detailing where electronics are installed and what their intended purpose is.
 - b. Spreadsheet of all products, serial numbers, and IP addresses (if applicable)

AUDIO VISUAL DEVICES

- c. Any passwords generated (unless provided by owner) and configured on devices
- d. Datasheets for all products
- e. Include any other relevant "as-built" information

3.3 TRAINING

- A. Provide two (2) hours of training for the owner of the system described herein.
- B. The contractor shall show the owner all main connection points for the system, and explain the function of the system and each major component type.
- C. The contractor shall instruct the owner in any maintenance requirements and procedures to be followed when new equipment is added to the system in the future.
- D. Provide information on all systems including all applicable test results in the owners and operators manuals.
- E. Training shall be video recorded and supplied to the owner on a USB flash disk to accompany the manuals and close out documents.
- F. Contractor shall obtain a sign-off form from the owner that they have received adequate training for the equipment. The contractor shall submit this form with their as-built information to be delivered to the owner.
- G. Owner has the right to waive or reduce training requirement provided such request is made in writing

END OF SECTION 27 24 23

SECTION 27 41 13 INTEGRATED AUDIO VISUAL SYSTEM

PART 1 – GENERAL

1.1 GENERAL

- A. All materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials used shall be of the same manufacturer, model, and quality, unless otherwise specified.
- B. All material, and equipment shall be procured, stored, transported, connected, used, cleaned, adjusted, and placed in service as recommended by the manufacturers, or as indicated in their published literature, unless specifically herein specified to the contrary.
- C. All technicians that perform work on this project shall do so only after reading the issued specification sections and reviewing the associated project drawings.
- D. All work shall be performed by competent personnel and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- E. All equipment shall be sourced through manufacturer approved means and channels, the sourcing of like-new or otherwise questionable (ie. Gray-market) equipment for use is strictly prohibited. All equipment shall carry an intact and honorable manufacturer warranty in addition to any warranty provided or implied by the installer/integrator.
- F. The Contractor shall provide as-built drawings detailing the locations of all equipment installed as part of the system described herein.
- G. The Contractor must demonstrate to the Owner and Engineer that the system is complete and complies with all operational requirements set forth in the plans and specifications. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the Engineer.

1.2 SYSTEM INTENT

- A. The goal of the Integrated A/V system is to provide the owner the ability to hold large events and provide audio amplification of spoken voice or program audio as well as visual elements via large format projection screen.
- B. In addition to large events, the goal of the system would be to provide both music and voice sound reinforcement for both day to day operations as well as larger presentations.
- C. The whole system shall be simple to operate from a single location.
- D. The system shall have the ability to input an audio only source via 3.5" "aux" input jack or an A/V source via an HDMI signal with embedded audio.
 - a. System shall also include an MP3/WMA player and an AM/FM radio.
- E. The system shall incorporate Microsoft Teams Rooms functionality to allow for video conferencing capabilities.
- F. The projector and dual screens shall have the capability to be mirrored or to display separate content on the projector vs the dual screens.

PART 2 – PRODUCTS

2.1 EQUIPMENT RACK

- A. Design Basis: Lowell LWR-1619 or equivalent by Legrand or Middle Atlantic
- B. Equipment rack shall have the following specifications:
 - a. Wall mounted
 - b. 19" Standard rack mounting rails with:
 - i. EIA rack mount pattern
 - ii. Capability to accommodate 15-20RU of components
 - iii. Black, powder coated steel
 - iv. Threaded for 10-32 Screws
 - c. 16" usable depth
 - d. Passive ventilation openings
 - e. Lockable door

- f. 175lb minimum equipment capacity

2.2 INPUT LOCATIONS

- A. Three input locations shall be provided, one on either side of the room, one at the rear of the room.
- B. Two additional HDMI input locations shall be provided in the equipment rack for fixed devices such as a signage controller or other source.
- C. Each input should have at least one HDMI.
- D. Input panels shall transmit signals back to presentation switcher over digital medium such as HDBaseT or have other protections in place to assure signal fidelity back to the DSP and audio and video distribution equipment.
- E. Coordinate faceplate color with interior designer
- F. Manufacturers 3-year parts and labor warranty

2.3 MICROPHONE SYSTEMS

- A. A professional quality wireless microphone system shall be provided that provides at least (2) handheld wireless microphones, (1) lapel microphone, and (1) wireless gooseneck microphone for podium usage.
- B. All four microphones shall be able to operate independently and simultaneously.
- C. Microphone receiver shall feature:
 - a. Dual channel receivers within 1U rack space.
 - b. XLR connectors with switchable mic/line output level
 - c. Audio and RF LED meters with peak indicator
 - d. Intuitive front panel LCD menu and controls with lockout feature
 - e. RF cascade ports allow distribution of RF signal to another unit
 - f. Remote mountable antennas
 - g. Up to 64 MHz tuning range
 - h. Optimized scanning to automatically find, prioritize, and deploy the cleanest frequencies to transmitters
- D. Receiver antennas shall be remote mounted within the meeting room space, located for optimum operation and properly protected from the hazards present within the space (balls, theft, vandalism, etc).
- E. Handheld transmitter shall feature:
 - a. Lithium-ion rechargeable battery pack that provides over 12 hours of battery life
 - b. External charging contacts for docked charging
 - c. Transmitter Mute Mode
 - d. Backlit LCD with easy to navigate menu and controls
 - e. Metal construction
 - f. Interchangeable and replaceable microphone cartridges.
 - g. Zippered bag or carrying case.
- F. Gooseneck and lapel transmitter shall feature:
 - a. Rechargeable batteries that provide up to 9 hours of runtime
 - b. Configurable Mute button
 - c. Low latency
 - d. Compatible microphone suitable for the space and application.
- G. Design Specification: Shure ULXD4D, ULXD2/SM58, ULXD8 (with compatible gooseneck) or equivalent by Electrovoice, Audio Technica, or Sennheiser.

2.4 DIGITAL SIGNAL PROCESSOR

- A. The Digital Signal Processor shall be a 4 – input, 8 – output minimum digital audio processor.
- B. It shall perform all the necessary functions between the mixer pre-amplifier and the power amplifier(s).
- C. Configuration of the DSP shall be accomplished by a drag-and-drop Graphical User Interface, and processors shall be able to be placed anywhere in the signal path.
- D. The matrix mixer allows any or all inputs to be routed to any or all outputs with additional controls for levels and polarity. The DSP shall store up to 128 configurations that can be recalled using simple contact closures, MIDI, or RS232 commands.
- E. The primary interface for the DSP shall be a Windows-based software program that mimics the functional block diagrams used in sound system design. Processing blocks in the DSP shall be able to be applied in any order, to any input or output. Processing blocks shall be able to be copied and pasted to duplicate processors across multiple channels, and shall also be able to be linked for more efficient stereo or global control.
- F. The DSP shall allow for the configuration(s) to be designed, saved to disk, and loaded at the job site for easy set up. The DSP shall also allow real-time design changes, so processing blocks can be added, removed or changed during system tuning.

- G. The DSP shall have security options to allow complete lock of the system to prevent undesired tampering, or to restrict user access to certain parts of the system.
- H. Minimum performance specifications shall be as follows:
 - a. FREQUENCY RESPONSE - 20 Hz to 20 kHz +1, -3 dB.
 - b. DYNAMIC RANGE - 100 dB minimum, A-weighted, 20 Hz to 20 kHz.
 - c. SAMPLING RATE - 48 kHz. Digital Signal Processing - 32-bit floating-point Resolution.
 - d. POLARITY - Input to Output: non-inverting (inverting optional).
 - e. IMPEDANCE - Input: 10 k ohms, Output: 120 ohms.
 - f. INPUT CLIPPING LEVEL - +26dBu minimum.
 - g. OUTPUT CLIPPING LEVEL - +22 dBu minimum, +2 dBu minimum with 20 dB pad engaged.
 - h. TOTAL HARMONIC DISTORTION - < 0.05% at 1kHz, +4 dBu, 20 Hz to 20 kHz.
 - i. PROPAGATION DELAY FROM INPUT TO OUTPUT - <1.5 ms (Processing blocks add no latency.)
 - j. ANALOG AUDIO INPUTS - 4 line level analog inputs, with Euro-block connectors, Operation level defaults to +4 dBu, software switchable to -10dBv, 24-bit, 48 kHz A to D conversion, +26 dBu input clipping level @ 1% THD.
 - k. ANALOG AUDIO OUTPUTS - 8 line level analog outputs, with Euro-block connectors, Operation level defaults to +4 dBu, software switchable to -10dBv, 24-bit, 48 kHz D to A conversion, +22 dBu output clipping level @ 1% THD (+2 dBu with 20 dB pad).
 - l. CONTROL PINS - Voltage Supply: 5 Vdc, 100 mA (total), Logic output current sinking ability: 500mA.
 - m. OPERATING VOLTAGE - 100-240 Vac, 50/60 Hz (auto-switching).
- I. DSP may be integrated with mixer if performance requirements are met.

2.5 CONTROL PANELS

- A. Provide two (2) control panels for selecting the operating mode of the student dining sound system.
 - a. Locate (1) control panel at the equipment rack for remote control of A/V system
 - b. Locate (1) control panel in provided rough-in on the stage.
- B. Control panel shall be touchscreen and fully customizable
- C. Provide input switching and volume level changes as required for proper operation of each mode
- D. Additional control panel features:
 - a. 5-8" capacitive touchscreen with minimum 800x480 resolution and 16 million colors
- E. Manufacturers 3-year parts and labor warranty

2.6 POWER AMPLIFIERS

- A. Suitable additional amplification shall be provided to provide sufficient amplification levels for the size, type, and quantity of speakers specified for the space.
- B. Amplifier shall be 70V monaural and powered by 100-240 VAC, 50-60 Hz
- C. Amplifier shall be integrated with control system for power and level adjustment.
- D. Variations from spec shall be approved by technology designer as required.
- E. Manufacturers 3-year parts and labor warranty

2.7 SPEAKERS

- A. Speakers shall feature a minimum 8" woofer and 1" tweeter
- B. Speakers shall be Recessed Flush Mounted Ceiling Loudspeakers in hard ceiling spaces.
 - a. Paint speakers to match ceiling color
 - b. Design basis JBL Control 227
- C. Speakers shall be Pendant loudspeakers in open ceiling spaces
 - a. Design basis JBL Control 67 P/T
- D. Speakers shall have a neat and finished appearance.
- E. Speakers shall feature the following minimum specifications:
 - a. Full range power limiter protecting the tweeter, woofer, and crossover
 - b. 78 Hz – 16 kHz frequency response
 - c. 90W RMS continuous pink noise power handling.
- F. Sufficient numbers of speakers shall be provided to ensure adequate volume levels and coverage within the space. Quantity and locations on plans are an estimate only.
- G. Manufacturers 5-year parts and labor warranty
- H. Coordinate color with interior designers.

2.8 MEDIA PLAYER

- A. 1 RU multi-format media player shall be supplied with the capability to play:

INTEGRATED AUDIO VISUAL SYSTEM

- a. CD's
- b. MP3's
 - i. Bitrate: 32 to 320 kbps and VBR
 - ii. Sampling Frequency: 44.1 kHz
- c. WAV Files
 - i. Bitrate: 16-bit
 - ii. Sampling Frequency: 44.1 kHz
- d. Bluetooth audio
- e. Media from an SD card
- f. Audio from a line-in source
- B. Additional features include
 - a. IR or Serial RS-232 control
 - b. Super-fast loading, slot-in CD player
 - c. Supports removable USB thumb and HDDs, SD/SDHC cards
 - d. Wireless audio playback from tablets and smartphones via Bluetooth
 - e. Selectable Power-On-Play mode automatically plays USB, SD or CD tracks when powered up — simply turn it on
 - f. Up to 100 foot (30m) wireless Bluetooth range
 - g. Plays CD-DA, MP3, WAV, and AAC files
 - h. 3.5mm (1/8-inch) input for audio playback of any audio device with a 3.5mm output
 - i. AM/FM Tuner
 - j. RCA and balanced XLR audio outputs
 - k. Random, repeat, and single play playback modes
 - l. Remembers up to 8 Bluetooth devices for simple switching of wireless audio sources
 - m. 1RU chassis with removable rack ears
 - n. 100-220v switching power supply
- C. Media Player control shall be integrated with touchscreen control specified within this section.
- D. Design basis: Denon DN-300Z

2.9 POWER DISTRIBUTION

- A. Provide one (1) sequential power controller and four (4) 15 amp quad outlet with relay control.
- B. Provide auxiliary power strips as required to provide sufficient outlets for all equipment with 2 spare outlets per circuit.
- C. Separate signal processing and power amplification circuits, with one circuit for signal processing, and three circuits for power amplification.
- D. Provide four un-switched outlets inside rack.
- E. Design Basis Power Controller – Atlas Sound ECS-204, Lowell ACR-SCS4-1509 or Furman PS-8R Series II.

2.10 MIXER/PREAMP

- A. Provide an 8 input by 1 output mixer preamplifier for the Student Dining sound system
- B. The microphone mixers shall provide 8 microphone or line level inputs, one aux input and at least one line level, balanced output.
- C. All input and output connectors shall be Phoenix or XLR-type connectors. Each input shall have an input gain trim adjustment control on the rear panel and the adjustment range shall be 40 dB. Each input shall have a rear panel mic/line selector switch. Each input shall have a front panel low cut or high pass switch. All 8 inputs shall have phantom power compatibility. The rear panel shall contain a common on/off switch for the phantom power to all inputs. Each input's line input circuitry shall prevent phantom power on that input when in line level mode.
- D. The output circuitry shall be of the active balanced, cross-coupled design. The output shall be capable of at least +26dBV balanced output levels.
- E. The microphone mixer shall contain an output limiter circuit. The limiter shall have a threshold adjustment range of 20dB, from -10dB to +10dB levels. A front panel on/off switch shall be provided.
- F. Mixer may be integrated within DSP if performance requirements are met.

2.11 LARGE FORMAT PROJECTOR

- A. The projector shall have 16000 ANSI Lumens minimum, provide 4K native resolution, one button auto sizing for image inputs up to and including UXGA resolution, 10,000:1 contrast resolution, 30" to 300" diagonal image, 16:9 aspect ratio, 4' to 38' throw distance and digital keystone correction.
- B. Projector shall be NTSC compatible and at a minimum provide the following inputs: (1) HDMI in, (1) DVI in, (1) VGA in, (1) Stereo analog audio in (either 3.5mm or RCA), (1) RJ-45 LAN port, (1) HDBaseT port.

- C. Supply the projector with following accessories: wireless I/R remote control and serial control cable (unless integration being performed through other means).
- D. Projector shall support appropriate lens for projecting a 96" x 154" image on a screen approximately 133" away from projector.
- E. Laser light source
- F. Manufacturer claim of 20,000 maintenance free hours
- G. Provide manufacturers three (3) year parts and labor warranty.
- H. Approved Manufacturers: – Sony, Panasonic, or Epson that meet or exceed the above minimum specifications.

2.12 LARGE FORMAT NON-INTERACTIVE LCD PANELS

- A. As indicated on the drawings the meeting room shall be provided with the following non-interactive televisions mounted on either side of the stage:
 - a. Viewsonic CDE9830 or equivalent by Sharp or Newline:
 - i. 98-inch 4K display with multi-point capacitive touch technology.
 - ii. Brightness: 300 nits
 - iii. Viewing angle: +- 88 degrees (all directions)
 - b. Three (3) year manufacturer warranty
- B. Provide suitable mount rated for the application.

2.13 PROJECTION SCREEN

- A. Stage
 - a. Surface material: Matte White
 - b. Diagonal size: 182"
 - c. Image/Viewable area: 96" x 154"
 - d. Top blackdrop: 12"
 - e. Electrically operated up and down
 - f. Screen control to be integrated with system control
 - g. Design Basis: Da-Lite Tensioned Large Advantage
 - h. Acceptable manufacturers: Dalite, Draper, others by approval

2.14 HEARING ASSISTANCE SYSTEM

- A. Provide a hearing assistance system that complies with ADA requirements
- B. Transmitter shall be rack mounted with a factory rack mount bracket. System shall consist of a 216 MHz FM transmitter, remote mounted antennas, belt pack receivers, and any required accessories to be complete and functional.
- C. Coordinate and provide separate frequencies for each sound system in the school. Operate in the narrow frequency allocations provided for hearing assistance equipment.
- D. Provide the quantity of (25) twenty-five receivers with lightweight headphones needed to comply with this OBC requirement based upon occupancy load. Include a spare pair of ear foams for each headset. Include (6) six hearing-aid compatible receivers.
- E. Complete systems by Williams, Phonic Ear, or Listen Technologies shall be considered equal.

PART 3 – INSTALLATION

3.1 INSTALLATION

- A. All wiring shall be neatly done and secured properly with Velcro or zip ties
 - a. Zip ties shall be used when wiring is intended to be non-movable, Velcro should be used when wiring is intended to be handled by system operators.
- B. All cables must be managed and secured, cables must never be permitted to rest on the floor.
- C. Antenna placements should be such that wireless microphones can be used reliably in all areas of the student dining room.
- D. Coordinate wireless microphone frequencies with other wireless microphones in the facility and local sources of interference.
- E. All solutions above shall be complete and include all required accessories to operate.
- F. Any required hardware, software, or accessories to perform regular periodic maintenance or configuration must be supplied with all of the above solutions.
- G. All visible equipment colors and placement shall be coordinated with architects, interior designers, and other trades to ensure that nothing is visually offensive or impedes the functions of another trade's workmanship.

Customer shall not be liable for any costs to move, repaint, remount, or otherwise correct issues in contradiction of this statement.

3.2 CLOSE OUT DOCUMENTATION

- A. Provide two 3-ring binders to the owner at the completion of the project, binder shall be printed (no handwritten aspects), tabbed (printed tabs) and include the following documentation:
 - a. Floor plans detailing where electronics are installed and what their intended purpose is.
 - b. Spreadsheet of all products, serial numbers, and IP addresses (if applicable)
 - c. Any passwords generated (unless provided by owner) and configured on devices
 - d. Datasheets for all products
 - e. Include any other relevant "as-built" information

3.3 TRAINING

- A. Provide eight (8) hours of training for the owner of the system described herein.
- B. The contractor shall show the owner all main connection points for the system, and explain the function of the system and each major component type.
- C. The contractor shall instruct the owner in any maintenance requirements and procedures to be followed when new equipment is added to the system in the future.
- D. Provide information on all systems including all applicable test results in the owners and operators manuals.
- E. Training shall be video recorded and supplied to the owner on a USB flash disk to accompany the manuals and close out documents.
- F. Contractor shall obtain a sign-off form from the owner that they have received adequate training for the equipment. The contractor shall submit this form with their as-built information to be delivered to the owner.
- G. Owner has the right to waive or reduce training requirement provided such request is made in writing

END OF SECTION 27 41 13