

SECTION 27 1000
STRUCTURED CABLE

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section describes the scope of work, standards, products and execution to provide new and complete Voice and Data Backbone Cabling and routing on Oak Grove High School campus of the East Side Union High School District. This project includes the following types of cabling: single and multi-mode fiber (data backbones), Category 6 copper, and Category 3 copper (voice and speaker backbones).
 - 1. Installation of Outside Plant single and multimode Fiber Optic Backbone cabling from the new Building IDF to the Main Distribution Frame (MDF) of the campus.
 - 2. Installation of Outside Plant Category 3 voice backbone cable from the new Building IDF to the Main Distribution Frame (MDF) of the campus.
 - 3. Installation of Inside Plant Category 6 horizontal distribution cable from the new Building IDF to wall and ceiling mounted outlets.
 - 4. Sealing of OSP entrance conduits and all penetrations after cabling is installed.
- B. Furnish, install, and test a complete and functional communications infrastructure system to provide voice, and data communications.
- C. J-hooks, boxes, and supporting hardware needed for pathway systems.
- D. Furnish and install station cabling, faceplates, and jacks for connectivity of voice and data systems.
- E. Furnish and install all racks, equipment grounding to bus bars, and other hardware needed to fully configure the Intermediate Cross connect (IR), and Telecommunications Cross connects (TR), Computer Labs, Instructional areas and Office's for operation of the voice, and data systems described in this Section and shown on the Drawings.
- F. Completely label and test all telecommunication cables and provide test documentation, and as-built drawings.
- G. Furnish and install new fiber from the campus MDF to the new IDF rooms shown on drawings, and provide as-built drawings.
- H. Furnish and install new copper from the campus Voice MC to new Telecom rooms shown on drawings, and provide as-built drawings.
- I. Related Sections:
 - 1. Division 26, General Provisions
 - 2. Division 26, Basic Materials and Methods
 - 3. Division 26, Conduit and Fittings
 - 4. Division 26, Outlet Boxes
 - 5. Division 27, Cable Tray
 - 6. Division 27, Cable Runway
 - 7. Division 27, Audio Visual System
 - 8. Division 28, Digital Video Surveillance System

1.02 SUBMITTAL

- A. Prior to ordering any material, provide six (6) copies of complete brochure information on all products for installation on this project. All brochures and specification sheets shall be bound within a three-ring loose leaf binder and organized in the same manner as the products portion of the specifications. If more than one product is listed on the same page of the brochure or specification sheet submitted, the intended product or part number shall be clearly indicated or highlighted by the Contractor.
- B. Contractor shall submit along with the materials submittal all proposed test procedures and a sample of the printout or test result form as well as a list of all Test Equipment to be used for cable testing. Within two (2) weeks of completion of testing all cabling systems, Contractor

shall submit two (2) copies of the test results as directed in the Testing portion of the Specifications.

1.03 QUALITY ASSURANCE

- A. Standards: The contractor will furnish without extra charge any additional material and labor which may be required for compliance with these laws, rules, and regulations, even though the work is not mentioned in these particular specifications.
 - 1. The cable system shall meet the standards set forth in the American National Standards Institute / Electric Industries Association / Telecommunications Industry Association recommended standards EIA/TIA-568-B, -569, -607, and EIA/TIA-TSB 67, 72; EIA/TIA Technical Specification Bulletin 40 for Category 6 wire specifications.
 - 2. All cable installed under this specification shall be Underwriters' Laboratories (UL) listed and certified to pass the appropriate UL test for cable designated for installation in plenum and riser spaces.
- B. The telecommunication cable system shall conform to all applicable local codes and applicable sections of the California Electric Code, NFPA-70-2007.
- C. Fire stopping shall be in accordance with ASTM E 814, ASTM E 136, and UL 1479 as well as Section 300-21 of the National Electric Code.
- D. Other applicable standards. ANSI C2-2004 National Electric Safety Code. UL 497 Electrical Grounding and Bonding Equipment.
 - 1. IEEE 802.3 Carrier Sense Multiple Access With Collision Detection.
 - 2. FCC Rules and Regulations, Part 68.
 - 3. Basic, Uniform, and Standard Building Codes (BOCA, ICBO, SSBC).
 - 4. REA Cable Designations - PE Series Specifications
 - 5. NFPA 101 - Life Safety Code
- E. Conditions: Materials and equipment provided must be new products of manufacturers regularly engaged in the production of such products.
- F. UL Listing: Products must be UL listed where a UL test procedure is applicable.
- G. Telephone system materials and equipment shall be FCC Type-accepted and certified as such by supplier.
- H. Qualifications: The category 6 and fiber cable system required for this project is a Leviton structured wiring system. The contractor must be a Leviton Certified Cable System Contractor (CCS) 45 days prior to bid date and from the Sacramento, Ca. region as specified by Leviton Corporation. The company must have a minimum of three (3) years experience in low voltage installations for voice, and data cabling systems. All personnel performing work on this project must have gone through the Leviton CCS training program as required by Leviton prior to performance of work.
- I. Warranty: Contractor shall provide a Manufacturers warranty covering workmanship and compliance with manufacturers specifications for category 6, cable systems. All repair, including labor and material, shall be made at no cost to the owner during the warranty period. All warranties shall be provided in writing to District prior to acceptance of the cabling system.
- J. Contractor shall have the manufacturers representative provide periodic inspections of the cable system during the installation phase. Inspections will occur:
 - 1. After termination of jacks and before wall plates are installed.
 - 2. After termination of Patch Panels.
 - 3. After termination of fiber cable.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials in manufacturer's standard protective packaging.
- B. Do not remove protective packaging until ready for installation.
- C. Follow manufacturer's instructions for storage & handling.

1.05 CONTRACT DRAWINGS AND SPECIFICATIONS

- A. The intent of the drawings and specifications is to establish the type of system and functions, but not to set forth each item essential to the functioning of the system. The drawings are generally diagrammatic and show approximate location and extent of work. In case of doubt of work intended, it is the responsibility of the Contractor to request instructions from the Engineer or Owner prior to bid. The Contractor shall be responsible for installing a complete functioning system.
- B. Contractor shall review all drawings and specifications before starting the work. Where discrepancies occur, Contractor shall immediately notify Engineer for clarification.

1.06 RECORD DRAWINGS

- A. All drawings shall be submitted in hard copy with all field changes and contractor labeling indicated in red line updates. Upon completion of the project, Contractor shall deliver to Owner documentation of the project to include:
 - 1. As-built telecommunications floor plans of the facility with cable and outlet placement and full labels clearly depicted.
 - 2. As-built elevations of all termination fields describing cable and outlet location labeling scheme. Also any changes to the wall elevations and conduit placements in the Telcom rooms will be recorded on as-built drawings.
 - 3. As-built logical OSP and riser diagram describing connectivity and cable sizes (including copper and fiber) for both telecommunications and grounding cabling systems, and including as-built labeling of all OSP and Riser cables.
- B. Cable test results shall be submitted in hard copy and magnetic format along with viewing software from the tester manufacturer. Hard copy to be bound within loose leaf binder and organized by serving MC or TR, room number of outlet location, and station identifier.

PART 2 PRODUCTS

2.01 GENERAL

- A. The Voice and Data Cabling System is defined as all required equipment and cabling, including hardware, termination blocks, cross-connects, patch panels, patch cords, copper and fiber cabling.
- B. The Contractor shall supply the products as detailed in this specification. If not specified, the Contractor can select products of suitable quality and workmanship. For any products selected by the Contractor, the Contractor is required to submit product documentation including manufacturer's original literature, product specifications and testing reports as previously described.
- C. Equal Product may be considered for substitution for those products specified; however, any equivalent product(s) must be approved by the District IT Low Voltage Systems Representative and must show demonstrated and documented equivalence to the product(s) specified.
- D. All material furnished shall be new and unused. All materials used shall bear the Underwriter's Laboratory, Inc. label -, provided that a standard has been established for the material in question. All products and materials are to be clean, free of defects, and free of damage and corrosion.
- E. The Contractor must provide a 25 year Leviton / Superior Essex/Leviton / Berk-Tek limited lifetime product and performance need to revise with Leviton/Beritek warranty upon completion of this project.

2.02 OUTSIDE PLANT COPPER BACKBONE CABLE

- A. All voice grade cable placed in the outside environment shall be solid, unshielded twisted pair, PE-89, and 24 AWG Outside Plant Cable (OSP). Twenty five pair cable shall be Superior Essex 09-097-9Superior Essex 09-097-922 for speakers. Fifty pair cable shall be Superior Essex 09-100-92Superior Essex 09-100-92 for analog lines and cameras.
- B. The copper twisted pair shall have a mutual capacitance at 1kHz of 83 nF/mile and meet ANSI/ICEA S-84-608 2007.

- C. The cable shall be resistant to mechanical damage, lightning, or and damage from wildlife. The cable shall have a dual shield design with fully flooded shield interfaces.

2.03 BUILDING ENTRANCE PROTECTORS

- A. All OSP balanced twisted pair cable pairs shall be provided with protection at each building with an entrance cable protector panel. Circa Telecom 1880ECA1-50G regardless of the number of pairs required.
- B. The protector panel shall be equipped with a ground lug that will accept a 6 AWG copper bonding conductor.
- C. Each protector panel shall be fully loaded with 5-pin plug-in protector modules 4b1fs-240.

2.04 110-TYPE WIRING BLOCK KIT

- A. The wiring block kit shall support Category 3 applications and facilitate cross connection and interconnection using cross connect wire. Leviton 41MB2-3FT. Each kit shall be provided with a vertical cord manager, Leviton 41880-300Leviton 41880-300..
- B. The wiring block shall be fire retardant, molded plastic consisting of horizontal index strips for terminating 25 pairs of conductors each. The index strips shall be marked with five colors on the high teeth, separating the tip and ring of each pair, to establish pair location. The wiring block shall accommodate 22 through 26-AWG conductors.
- C. The wiring block kit shall include multiple 100 pair blocks, mounting frame, horizontal cord manager and label holder.
- D. Provide C5 clips for ISP feeder terminations only. No station cabling is to be terminated directly onto 110 frames unless otherwise specified by District IT Low Voltage Systems Representative.
- E. Every 110 frame is to be fully loaded with C5 Clips

2.05 RISER RATED BACKBONE CABLE

- A. ISP copper backbone cable shall be solid, twisted pair Category 3, CMRCMP, 24 AWG.Berk-Tek 10032112 50 pair. This cable is to tie the 110 field to the equipment racks.
- B. The copper twisted pairs shall have a mutual capacitance at 1 kHz of 15.7 nF/1000 ft.

2.06 HYBRID FIBER OPTIC BACKBONE CABLE

- A. The fiber optic backbone cable shall be a 12 SM/12MM 62.5 micron outside plant rated composite cable in a loose tube construction with inner and outer jackets and corrugated steel armor. Berk-Tek OPAD12B024-012CB3510/25012AB0403.
- B. The 62.5/125 micron multimode fiber shall have a maximum attenuation of 3.4 dB/km at 850 nm, and 1.0 dB/km at 1300 nm. This fiber shall be ISO/IEC 11801 OM1.
- C. Provide Leviton 36" 12 strand break out kits 49887-12L.

2.07 FIBER OPTIC PANELS AND MODULES

- A. Low Profile 2U combination panel shelves, Leviton OPT-X-5R2UH-S06 with 4 metal blank plates at each end Leviton 5F100-BLK. The panel shelf shall be available in a 2U height fully enclosed shelf, with integrated front cable management trough included. The shelf shall be equipped with hinged front doors for easy access, front cable management trough, top cover panel, standard water-tight cable entry conduit connectors for OSP cable, and blank labels for identifying fiber terminations.
- B. Fiber modules shall be loaded with fiber optic adapter panels. Leviton 5F100-12P for multimode, and 5F100-12Z for Singlemode. Modules must be from the same manufacturer as the fiber shelf.
- C. LC Fiber Optic connectors shall utilize a pre-radiused zirconia ferrule and anaerobic adhesive for fiber alignment. Leviton 49990-MDL for multimode, and 49990-SDL for Singlemode.
- D. All the fiber strands must be installed in the panels straight through.

2.08 UTP STATION CABLE

- A. UTP Station cable shall consist of 4-pair Category 6, 23 AWG thermoplastic insulated conductors. All station cabling in plenum rated areas must have a minimum cable sheath rating of CMP. (All systems consist of CAT6 cabling)
- B. Type "A" stations receive 4 cables per outlet, type "B" stations receive 2 cables per outlet, type "C" receive 1 cable for a wall phone location and type "D" receive two cables per wireless outlet location.
 - 1. This cable must meet parameters of the Cat 6 Cable TIA/EIA-568B and CAT 6 Permanent Link TIA/EIA-568B Commercial Building Telecommunications Wiring Standard.
 - 2. Input Impedance - 100 Ohms +/- 15% at 1-100 MHz
 - 3. ACR at 250 MHz shall be a minimum of 8.7 dB/100m.
 - 4. PS NEXT at 250 MHz shall be a minimum of 39.3 dB/100m.
 - 5. Insertion loss at 250 MHz shall be a maximum 32.6 dB/100m.
 - 6. Data station cable jacket shall be blue, Superior Essex 66-240-2 Bertek part numberBerk-Tek 11074694.
 - 7. Wireless cable jacket shall be green, Superior Essex 66-240-5 Bertek part numberBerk-Tek 11074895.

2.09 COMMUNICATIONS OUTLET TERMINATIONS

- A. T568B eight position, 8-conductor RJ45 jacks with 110 style rear termination. These terminations shall meet or exceed the requirements of the Cat 6 Cable TIA/EIA-568B and CAT 6 Permanent Link TIA/EIA-568B Commercial Building Telecommunications Wiring Standard.
 - 1. Four Pair data station cables in surface wall boxes shall be terminated on blue jacks, Leviton 61110-RL6. Provide a minimum of four type "B" and one type "C" outlet in each class room.
 - 2. Four pair cables for wireless outlets in ceiling mounted boxes shall be terminated on green jacks, Leviton 61110-RV6. Provide a minimum of one type "D" outlet in each class room.
 - 3. Four pair cables for camera outlets shall be terminated on yellow jacks, Leviton 61110-RY6. (refer to surveillance camera section)
 - 4. Four pair cables for intrusion panel IP connectivity shall be terminated on gray jacks, Leviton 61110-RG6. (refer to intrusion section)
 - 5. Four pair cables for speakers shall be terminated on purple jacks, Leviton 61110-RP6. (refer to paging section)
- B. Universal faceplates that will accept the jack of the connectivity solutions shall be used throughout this project. Material shall be stainless steel. Leviton 43080-1S2 2 ports and 1S4 4 ports.
- C. Wall phone faceplates to be provided under this scope shall accept the jacks used on this project. Leviton 4108W-1SP. The wall plate must have 8" clearance from center to all sides in order to correctly support the wall phone. Wall phone plate must be installed at ADD ADA height adjacent to classroom entryway.
- D. Wireless face plates shall be Leviton Quick Port 2 Port Face Plate 41080-2IP. Refer to Type "D" Wireless location detail.

2.10 COPPER PATCH PANELS

- A. High density unshielded twisted pair termination panels with space for 48 8P8C modules. Panels shall mount in a standard 19 inch equipment rack with universal hole spacing and allow for independent installation and removal of jack modules. Rear cable management bar shall be included with each patch panel. Cable termination modules shall be included as needed to complete the installation. All unused ports shall be covered with black blank modules. Provide 20% additional patch panels for future growth for all systems.
 - 1. Modular jack panels shall be 48 ports in a 2RU space. Leviton 49255-H48 for CAT6 cabling.
 - 2. 2RU space 48 port patch panel Leviton 69586-U48 with 110 termination on the rear of panel shall be used for ISP rack to 110 frame backbone ties.

- B. Patch Cords: The Contractor shall provide Leviton Leviton bootless / snagless patch cords for both station and IDF equipment end. Counts Patch cord counts to support cable total drop counts build out of all low voltage systems terminated on patch panels. Lengths and colors are as follows:
 - 1. 8' Blue patch cord Cat 6 bootless / snagless
 - 2. 7' Blue patch cord Cat 6 bootless / snagless
 - 3. 6' Green patch cord Cat 6 bootless / snagless
 - 4. 6' Yellow patch cord Cat 6 bootless / snagless
 - 5. 6' Grey patch cord Cat 6 bootless / snagless
 - 6. 6' Purple patch cord Cat 6 bootless / snagless
 - 7. 6' Orange patch cord Cat 6 bootless/snagless
- C. Fiber Patch Cords : The contractor shall provide and install (4) duplex each SM & MM fiber patch cords, not to exceed 15 meters each and will not introduce a loss greater than 1.0 dB, including connectors. The contractor shall confirm actual length and connector types with the District IT Low Voltage Systems representativeRepresentative.
- D. Cross-connects: Each IDF and MDF receives one CPI 11435-719 Cable Reel with four reels of Superior Essex cross-connect wire. One 1k roll of white/blue 02-001-13 for voice analog, one 1k roll of yellow/blue 02-002-13 for speakers, one 1k roll of red/blue 02-053-13 for stationary cameras and one two pair red/blue, red/orange 02-221-13.

2.11 WIRE MANAGEMENT

- A. Horizontal and Vertical cable managers shall be capable of managing cables on the front and rear of a standard 19 inch equipment rack. Horizontal managers shall have pass through holes that incorporate integral bend radius control and fingers with rounded edges. Hinged covers shall allow access to the cable pathway without having to remove the cover from the wire manager. Install horizontal wire managers above and below each patch panel.
 - 1. Horizontal cable manager 2U high, Chatsworth 30530-719.
 - 2. Vertical cable managers shall be Chatsworth 30095-703.

2.12 LABELS

- A. The contractor shall provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels must be of high quality that will endure heat, water, and time.
- B. Shall meet the legibility, defacement, exposure, and adhesion requirements of UL 969.
- C. Shall be pre-printed using a mechanical means of printing.
- D. Where used for cable marking, provide vinyl substrate with a white printing area and a clear "tail" that self-laminates the printed area when wrapped around the cable. The cable marking should be immediately visible and be within two inches from the termination point.
- E. Where insert type labels are used, provide clear plastic cover over label.
- F. Copper patch panel labeling shall be completed with adhesive labeling kit specifically designed for the panel, Leviton 49257-QHD.
- G. Labeling P-touch font size 4MM bold, black on White, 3/8" labeling tape on all work stations, panels and devices. Contractor must provide labeling samples for approval before labeling of the systems is performed.
- H. A round Avery label green in color Product Number: 5463 and a station label utilizing the same font size as on work station face plate must be installed on ceiling grid below each wireless cable location for identification. See type "D" Wireless Location Detail.
- I. Devices shall be numbered consecutively and separate for each type of workstation/system. Refer to Work Station Details and Floor Plan Device Numbering Example for additional information.

2.13 CABLE SUPPORT HARDWARE AND MISCELLANEOUS MOUNTING EQUIPMENT

- A. Miscellaneous Equipment shall be provided and installed by the Contractor as described below and on the drawings. Mounting hardware and accessories typically required to provide a complete and working installation but not listed in these specifications shall be provided and installed by the Contractor.
- B. Plywood Backboard: The Contractor shall provide fire-rated, A/C grade, void free, $\frac{3}{4}$ "x4'x8' plywood. To reduce warping, fire rated plywood should be kiln dried to a maximum moisture content of 15%. Plywood shall be securely fastened to the wall. Plywood shall be painted with two coats of white paint. The Contractor shall not paint over the fire rating stamp. The plywood is to be mounted vertically and is to cover all walls of the IDF.
- C. Service loop mounts: The Contractor shall provide service loop mounts for management of the fiber and copper service loops at both ends. Leviton Storage Rings for OSP riser backbone cabling shall be provided. The Contractor shall provide a service loop equal to the maximum length allowable so as to not exceed a total of 50 feet of exposed cable from building entrance to termination. One Leviton Storage Rings 48900-OFR must be provided for each OSP cable and 48900-1FR.
- D. Fabric Innerduct: The Contractor shall install 3 cell fabric innerduct in all sections of conduit, Maxcell or equal. Installation must follow manufacturer's installation requirements, using recommended installation tools. Fabric Innerduct size shall match manufacturer recommended maximum size per conduit ID.
- E. Backboard Cable Management shall be provided and placed by Contractor on all telecommunications backboards to provide effective routing of all telecommunications cabling. Contractor shall utilize D-rings, wire distribution spools, and cable clamps as required for a neat and organized installation.
- F. Equipment racks and any other telecommunications equipment requiring grounding shall be bonded to the nearest ground bar using industry standard grounding connectors or lugs as recommended by the respective equipment manufacturer.
- G. Rack mounted power distribution unit shall be a 19 inch wide 20 amp 125V horizontal unit with eight 5-20R receptacles and a standard 10 foot power cord with 5-20P straight blade plug, Geist RCURN082-102D20ST5-OD to be installed in the MDF/IDF.
- H. Add two dedicated 20 Amp 5-20R each, four-plex power receptacles per rack. The receptacles are to be supported 6" above the ladder rack where as not to impede with the vertical manager pathways.
- I. Add one dedicated 20 Amp 5-20R each, four-plex power receptacle for the intrusion panel and one convenienceconvenience outlet at standard height location to be determined. All electrical work in the IDF must be approved by the District's Low Voltage Systems Representative prior to installation.
- J. An electrical sub-panel is to be installed in the IDF that houses only the circuits for that room. Location of this sub-panel is to be confirmed with the District's Low Voltage System Representative before installation.
- K. J-hook Assemblies: Contractor is responsible for maintaining the maximum fill guidelines and spacing requirements as shown on the accompanying project plans. Contractor shall provide and install additional J-hook assemblies as required to meet these requirements.
- L. J-hook horizontal cable supporting hardware shall be UL listed. The J-hook(s) shall provide a broad base for proper cable support, thereby reducing stress and bending of cabling.
 - 1. Contractor shall attach appropriate J-hook fasteners for wall, stud, beam, or flange mounting to the supporting structure. Fasteners shall be spaced a maximum of 5' apart, and no more than 4' from the final outlet destination or turn point as shown on the accompanying project drawings.
 - 2. Acceptable Product: Caddy CableCat Clips and Caddy supporting hardware, or approved equivalent.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Contractor shall give notice to all agencies requiring advance notification and comply with all regulations specified by all governing agencies having jurisdiction over the performance of the work.
- B. Contractor shall coordinate with and abide by the construction schedule and sequencing as dictated by the General Contractor on the project. Storage and staging areas within the job site shall be as dictated by the General Contractor.
- C. The contractor shall provide all labor, materials, equipment, tools, utilities and services necessary for the proper execution and completion of the telecommunications cabling system.

3.02 INSTALLATION METHODS

- A. Contractor is required to adhere to the following parameters whether or not Contractor and/or others have placed existing equipment. Contractor will notify the owner of any of the following requirements that cannot be met prior to bid or ordering of materials.
- B. General: Install an infrastructure cabling system as detailed by the contract drawings, details, and specifications.
- C. The maximum length of horizontal cabling from nearest closet to an outlet shall not exceed 295 feet as per EIA/TIA 568. Contractor will notify The owner prior to commencement of any installation not meeting the 295-foot maximum distance limitation.
- D. Contractor will place all station cables in the ceiling area on Contractor supplied and installed wire hangers or in floor spaces and raceways. Contractor also will assess whether or not the ceiling space is a plenum air return, which shall dictate the use of the listed plenum type, or PVC type cable required in the materials specification section. The cables will be routed to the TC located on the first floor, utilizing cable tray. Station cables must be strapped every 5 feet with tie straps in J-Hooks provided by the Contractor; strapping to any other wires (e.g., lighting, ceiling grid, etc.) is not permitted. Cable splicing at any point of a station cable is unacceptable. When cables are routed in non-ceiling spaces, such as below raised flooring, the Contractor will still assess whether or not the space is a plenum air return and pull the appropriate cable type.
- E. In hard wall (wallboard) or V wall type construction where accessible, Contractor will install a wall board adapter or equivalent, which will support mounting of the faceplate necessary for the jacks. This will eliminate the need for an electrical box (in-wall junction box) to accommodate the communications outlet.
- F. Cables will be run vertically in 1.25" (inch) dedicated EMT conduit inside the wall and into the ceiling space. Once in the ceiling space, the cable will be routed to the closest cable tray. Cables shall be routed to their closest TR utilizing the shortest path possible, while still following EIA/TIA standard guidelines. Station cables outside of cable tray must be strapped to tie wires with J-Hooks every 5 feet provided by Contractor; strapping to any other wires (e.g., lighting, ceiling grid, etc.) is not permitted.
- G. UTP cabling must conform to a 6-foot separation requirement from main power panels, switch gear and/or starter motors.
- H. All power feeds crossing the path of the UTP cables at right angles must be a minimum of 6 inches in distance from the UTP cables.
- I. Cables shall be run cable tray in corridors wherever possible in order to avoid furniture and work areas so that access to the cables is unencumbered.
- J. The cables shall be placed at a minimum of 6 inches above the ceiling.
- K. The cables are to be run so as to maximize accessibility. Contractor will notify the owner in the event this requirement cannot be met.

- L. Debris, boxes, leftover cables, and trash must be removed from construction sites upon completion of work. No debris or work material may be left in areas that have student access unless the affected area is marked with cones, tape, or temporary fencing.
- M. Contractor shall pull conductors together where more than one is being installed in a raceway. Cable bundles in raceways, in suspension systems, or on wallboards must be tie wrapped every 5 feet. There must be an independent system supporting the cable system. Cable bundles tied to the lighting-ceiling grid will not be permitted. Station wire cannot be attached to electrical conduit, gas or sprinkler piping, or other code-restricted items.
- N. No cabling is allowed to rest on any ceiling tile or suspension system. Cable shall be kept 30 inches away from any heat source; i.e., steam valves, etc.
- O. Cables shall be pulled free of sharp bends or kinks, twists, or impact damage to the sheath.
- P. Cables shall not be pulled across sharp edges. Cables shall not be forced or jammed between metal parts, assemblies, etc.
- Q. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems must be maintained.
- R. Insulation shall be removed to expose shielding and conductors to the exact length required by manufacturer for proper termination of plugs and pins. Plugs and pins, upon termination, shall not be damaged in any way.
- S. All communications racks must be properly anchored to walls and floors and grounded to building ground grid (not to water pipes, etc.).
- T. Cable splicing will not be permitted in any horizontal cable run.
- U. Contractor shall install system using tools and equipment specifically designed for the installation tasks. Use installation practices that ensure the highest quality installation. Perform all cutting, splicing, pulling and termination of cables using equipment specifically designed for each purpose.
- V. Install tie wraps using a tension controlling cutting device. Tension shall not exceed that which is specified by the manufacturer of the cable. Tie wraps and other securing hardware shall be rated as required for the installation environment.
- W. Where multiple conduits are being used, fill one conduit to its maximum fill ratio before going onto the next conduit. Wherever possible, leave as many spare conduits available as possible.
- X. All cables requiring lubrication for installation in conduits shall be continuously lubricated during the pulling-in process. Maximum pulling tensions specified by the cable manufacturer shall not be exceeded. Monitor cable-pulling tension with a mechanical tension-indicator.
- Y. All new conduit will not exceed a 40% fill rate. All spare conduits or conduits filled with less than the maximum allowed fill ratio shall have a pull string installed and left for future installation of cable. Clearly label as "pulling line" indicating To/From.
- Z. Support cables running overhead that are not installed in raceways by bridle rings or J-Hooks spaced every 5 feet.
- AA. Install the telecommunication cabling system as detailed in the contract drawings in the exact location and layout shown in the details.
- AB. Openings around electrical raceway penetrations shall maintain the fire resistance rating required. See NEC 300-21.
- AC. Label all cables at both ends. The label shall be permanent. Labels shall be typed (not handwritten) and individual number strips are unacceptable. An acceptable labeling product is a self-laminating cable marker, such as Brady Design-BuilderT-9-292-series. All cable labeling shall include numeric designation, source, destination, cable type, and conform to the District-wide labeling standards and labeling scheme.
- AD. All outlet plates shall be installed neatly and square with floor and walls.

AE. Category 6 installations shall conform strictly with EIA/TIA 568B and TSB-40B to insure a quality system that meets the transmission rate criteria.

3.03 LABELING

A. Outside Plant

1. The Contractor is required to provide labels for all cables at any vaults, pull box, or access panel crossing. The Contractor shall provide cable labels twelve inches from the end of the cable as it enters the building, on service loop mounts, and twelve three inches from the end of the cable at the point of termination. Fiber optic and Copper cable orange laminate tag (3.5" x 2") HellermannTyton # CT2003X2. Telephone Copper cable yellow laminate tag (3.5" x 2") HellermannTyton # CT2012X2. Cable Orange Laminate Write-On Tag (4" x 1.5") HellermannTyton # WC1503X2. The Contractor shall provide adhesive labels on all termination hardware such as fiber distribution shelf, protector, and 110 blocks.
2. All cables will be labeled according to the guidelines shown below as adapted from the EIA/TIA 606-A standard.
3. Fiber and copper backbone cable labeling shall follow the convention to include:
 - a. Campus
 - b. The origination point (Building Room ID)
 - c. The destination point (Building Room ID)
 - d. The type of cable
 - e. The strand or pair count.

B. Horizontal Distribution

1. The Contractor is required to provide labels at all termination hardware such as patch panels, patch cords, faceplate outlets and devices.
2. Provide station location number and Rroom Number label at all patch panels. Coordinate with District IT Low Voltage Systems Representative prior to final labeling systems. The Contractor shall provide 1/8 inch thick engraved plastic labels for new cabinets or racks installed. The engraving shall be white on black background.

3.04 FIBER OPTIC CABLE SYSTEM

- A. The fiber optic raceway system must be continuous between pull boxes and junction boxes. The raceway system must enter and be secured to enclosures.
- B. All fiber supplied to the campus, must be tested with an OTDR, Microtest Certifiber, or equal prior to installation, while still on the shipping reel, using an optical time domain reflectometer (OTDR) or a 850/1300/1510 nm power meter and stabilized light source. The test results must be compared to the manufacturer's test results. A discrepancy of more than 1 dB on any fiber in either window indicates possible shipping damage and the fiber must be returned to the supplier.
- C. All fiber must be tested after installation according to the procedures and acceptability criteria described in EIA/TIA 455A (Aug 1991) and all applicable addenda after installation and termination using an OTDR in one direction and an 850/1300 nm power meter and stabilized light source in both directions and in both optical windows. The results of these tests (printed OTDR results and tabular loss results) must be provided by the installer as documentation of the quality of installation and as a baseline for future troubleshooting. The results must be compared to the pre-installation test results for significant changes.
- D. All optical test equipment must have current, traceable calibration certification.
- E. All spare optical ports and connectors should have a dust cap in place to protect the cable from the environment.
- F. Manufacturer's specification for pulling stress and minimum bend radius must not be exceeded on any fiber cable.
- G. Installation contractor must develop and review conduit installation plan with the owner before beginning installation.

- H. Installation contractor must verify all device locations with the owner before installation.
- I. Installation contractor must review cable numbering and labeling scheme with the owner prior to installation.
- J. Installation contractor must review drawing notes and drawing back-annotations (red line) on site plans with the owner prior to installation.
- K. Fiber Optics Cable Labeling: Fiber termination locations must be labeled to corresponding fiber strands pairs at the Main Cross-connect (MC), Intermediate Cross-connect Room (IR), and the Telecommunications Room (TR). Use embossed labels. The Contractor is expected to provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels must be of high quality that will endure over time. Hand written labels are not acceptable. All fiber cable numbering and labeling will conform to the District-wide labeling standards and labeling scheme.
- L. All outside fiber cable will be installed through 1.25" innerduct from point of origin and destination.
- M. Securely fasten the fiber optics raceway to the cable tray, or walls when routed inside buildings, using clamps and clips designed for this purpose.
- N. Provide a nylon or polyethylene pulling line in all fiber optics raceways. Clearly label as "pulling line", indicating source and destination.
- O. Openings around fiber optics raceway penetrations shall maintain the fire resistance rating required. See NEC 300-21.
- P. All fiber optics cables are to be run as efficiently as possible, minimizing the amount of cable required.
- Q. All fiber optics cables shall be continuously lubricated during the pulling-in process. The maximum pulling tensions specified by the cable manufacturers shall not be exceeded. Monitor cable pulling tension with a mechanical tension meter.
- R. The fiber optics cables passing through pullboxes and manholes shall be neatly arranged and secured to cable jacks on the interior walls. Cables will not be accepted when diving through the manhole or pullbox.
- S. As fiber optics cables emerge from intermediate-point pull boxes, coil the cable in a figure eight pattern with loops not less than two feet in diameter.
- T. Label all fiber optic cables at both ends. The label shall be permanent. Labels shall be typed (not handwritten) and individual number strips are unacceptable. All cable labeling shall include numeric designation, source, destination, and cable type. All fiber cable numbering and labeling will conform to the District-wide labeling standards and labeling scheme.
- U. Fiber optics raceways shall be clearly marked at each pull box indicating type and number of cables within.
- V. If connectors have been factory installed on fiber optic cables, protect the connector during the pulling-in by wrapping with a thin layer of foam and insert in a stiff plastic sleeve for protection.

3.05 OUTSIDE PLANT INSTALLATION

- A. The following specifications will be adhered to when splicing copper cable runs. These specifications and standards apply for all splicing situations, including:
 - 1. Manhole Splices and Splice Cases
 - 2. NEMA Enclosure Splices and Splice Cases
 - 3. MC/IC Splices and Splice Cases
 - 4. MC/IC Electrical Protection Splices
- B. The Contractor will splice all the cable pairs within each cable sheath using AT&T 710-SC1-25 Splice Modules, including cable pairs that will not be connected at this time. All splices shall be secured in a splice case using a preformed splice case. All splices and the installation of the splice case shall be in accordance with the manufacturer's specifications and GTE Practice, Section 632, ensuring a watertight seal. The Contractor will bond the cable's metallic

sheath/shield to the metallic splice case with the bonding bar assembly provided with the splice case. No filling compound is to be used in the splice enclosures; therefore the Contractor must take special care while assembling the case.

- C. All copper cables passing through a manhole or pullbox will be dressed neatly to the inside walls with "L" brackets designed for securing cable in manholes and pullbox's. Cable that is not secured and routed properly will be removed and redone at no expense to the owner.
- D. Use pulling compound when necessary. Pulling compounds must be water-base lubricant that will not deteriorate cable or conduit.
- E. All cable/cabling shall be kept 30 inches away from any heat source; i.e. steam valves, etc.
- F. Cables shall be pulled free of sharp bends, kinks, twists, or impact damage to the sheath. Cables shall not be pulled across sharp edges. All conduits and sleeve with rough edges will be provided with bushings on both ends. Cables shall not be forced or jammed between metal parts, assemblies, etc.
- G. All outside plant cables will be terminated within 50 feet of the building entrance point. This is a maximum cable measurement and includes lengths for service loops, routing, backboard and patch panel mounting. If the cables cannot be terminated within the 50 foot length, the cables shall be extended in rigid conduit to within a 50 foot distance from the point of termination.
- H. Cable mountings and service loops on backboards will be installed efficiently to minimize the backboard space consumed. All cables will be routed at right angles, in accordance with the bend radius specifications for the type of cable being routed. Copper cables will be tie wrapped every 4 feet. Fiber cables shall use Velcro wraps.
- I. No splices of any type are permitted on any OSP or ISP Low Voltage System cabling.

3.06 GROUNDING

- A. Grounding shall be accomplished by common single-point termination of all ground conductors.
- B. All metallic components of the infrastructure system shall be solidly grounded by the shortest possible route.
- C. Manhole Splices and Splice Cases - the Contractor will connect the splice case to the manhole ground as per GTE practice 605-100-201 using a #6 AWG solid copper wire.
- D. NEMA Enclosure splices and Splice Cases - the splice case must be grounded to the provided ground lug in the existing NEMA box with a minimum #6 AWG wire.
- E. MC/IC Splices and Splice Cases - the splice case must be grounded to the provided ground bar in the Voice/Data Equipment Room with a minimum #6 AWG wire.
- F. MC/IC Electrical Protection Splices - the Contractor must bond the cable's metallic sheath/shield to the metallic splice case with the bonding bar assembly provided with the splice case.
- G. Labeling: The splice case and all cables must be labeled using a stamped metal plate or indelible plastic plate, that The owner has approved, which details exact pair counts and destinations. Each 25-pair binder group, of each cable entering the splice case, must be labeled with a Panduit PAN-TY PLF1M-0 Flag with appropriate cable pair counts. All copper and fiber cable numbering and labeling will conform to the District-wide labeling standards and labeling scheme.
- H. Conduit Sealing: The Contractor will supply and install all necessary components to effectively seal all conduits. The Contractor will use Semco part #PR-851 conduit sealing kit. The PR-851 compound is a two part polyurethane foam, which, when mixed for fifteen seconds, expands approximately fifteen times in volume. It forms a dense, tough foam with a density of three to four pounds per cubic foot. The expanding nature of the compound allows it to fill cracks and voids in conduit walls, and imperfections in the cable sheath. This effectively seals the conduit against the passages of gases and water. For additional information, refer to GTE Practice 628-020-203.

3.07 FIRE STOPPING

- A. Clean surfaces to be in contact with fire stopping materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting or the required fire resistance.
- B. Install fire stopping materials as indicated, in accordance with manufacturers instructions.
- C. Seal all holes or voids made by penetrations to ensure an effective smoke barrier.
- D. Unless protected from possible loading or traffic, install fire stopping materials in floors having void openings of 4 square inches or more to support the same floor load requirements.
- E. A small amount of hydrogen gas is released as foam cures. Use forced air ventilation when installing if areas of installation have less than 2 cubic feet of free air for each pound of liquid mixture being foamed.
- F. Examine fire stopped areas to ensure proper installation prior to concealing or enclosing fire stopped areas.
- G. Areas of work shall remain accessible until inspection (and approval) by the applicable code authorities.

3.08 CABLE AND RACEWAY MARKING

- A. Provide legible and indelible marking on all cables as indicated in the Drawings. Contractor shall insure labeling of the cables during installation.
- B. Raceways shall be clearly marked at each pull box indicating type and number of cables within.

3.09 SYSTEM TESTING

- A. The Contractor shall be responsible for separately testing and documenting the cables and termination throughout the entire cabling system. Ensure that the cable and equipment being installed in the system is without flaw and that no potential damage to the cable or equipment occurred in shipment, handling, or installation. The owner representative shall observe the testing of the installed cabling and terminations at any time during the testing process
- B. Testing of all installed unshielded twisted pair telecommunications cabling shall be performed by the Contractor. Interim testing of the cabling system during and after installation is encouraged to ensure that the testing and acceptance criteria are met.
- C. Acceptance of the Telecommunications Cabling System shall be based on the quality of Contractor performance by analysis/inspection of the testing program documentation and the conformance of the system operation with the criteria described herein. Contractor shall make available all drawings and documentation prior to acceptance testing.
- D. Contractor shall provide all necessary testing equipment for performing the required acceptance test. Contractor shall verify the authenticity and display appropriate calibration data to include the expiration date of the correct calibration.
- E. Testing methods are provided herein as reference for the Contractor. Test equipment, methods, and criteria shall comply with the guidelines set forth in EIA/TIA TSB - 67 - Transmission Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems where applicable.
- F. Copper Cable Testing:
 - 1. Contractor shall perform final testing on the copper cable system to demonstrate the acceptability of the project as installed. Contractor shall perform and furnish documentation of the following tests:
 - a. Continuity of all conductors.
 - b. Shorted conductors or pairs.
 - c. Crossed pairs.
 - d. Grounded conductors.
 - e. Open conductors.
 - f. Reversed pairs.
 - g. Split pairs.
 - h. NEXT performance.

- i. Length.
 - j. Attenuation.
 - k. AC voltage presence.
 - l. Pin-assignment confirmation
2. Results of the testing shall be furnished in printed format. All test documents shall be dated and signed by the personnel performing the testing. Hand-written test results are not acceptable. Test gear used for general testing shall be Tektronix TPS 100 Twisted Pair Cable Analyzer or approved similar device.
3. All Category 6 wiring shall be tested to indicate a minimum of 350 Mbps transmission capability. Test results shall document each installed cable pair for measured attenuation and Near End Cross Talk (NEXT). Category 6 testing shall utilize a Fluke 4000 Category 6 Scanner or approved similar device for performance validation. Category 6 End to End Link Performance shall be in accordance with the specification set forth in ANSI/TIA/EIA-568-A as well as meeting the documents' requirements for cabling length and topology, component performance and reliability, and installation practices.
4. Contractor shall be responsible for recording all test results. Copies of these test results shall be submitted to The owner for review prior to final acceptance of the copper cabling system.
5. The contractor shall perform all tests and adjustments, and shall furnish all test equipment necessary and perform all work required to determine or modify performance of the system in accordance with these specifications. The contractor will submit to the owner a complete test plan for Station Wiring/Information outlet (Voice, Data and Network), and Riser Cable to be used for this contract. At a minimum, the plan should show test configurations, calibration procedures, impedances, and measurement equipment. This plan must be approved by the owner prior to the start of testing. The test plan is a one-time requirement and will remain in effect for the duration of this contract unless specifications change requiring a re-submittal. The scope of this work includes, but is not limited to, the following:
 - a. Testing of Category 6 cable shall meet EIA/TIA 568A Requirements.
 - b. The vendor must utilize a check-off list for reference by the owner during tests.
 - c. The vendor must utilize a check-off list for reference by the owner during tests.
 - d. The result of the measurements outlined shall be recorded and submitted to the owner as final proof of system performance. Electronic results will be supplied in Fluke or equivalent format. If the owner requires specific software to view the results, the contractor will supply a copy of software to the owner.
 - e. All systems must pass Category 6 specifications and be accepted by the owner before the work will be considered complete.
 - f. Inter- and Intra-building tie cables: all tie cables will be tested for pass-fail connectivity ground continuity.

3.10 FIBER CABLE TESTING

- A. Test all fiber with an OTDR, Microtest Certifiber or equal, prior to installation while fiber is still on the shipping reel, using an optical time domain reflectometer (OTDR) or a 850/1300/1510 nm power meter and stabilized light source. Compare test results to the manufacturer's tests. A discrepancy of more than 1 db on any fiber in either window indicates possible shipping damage and the fiber must be returned to the supplier. Contractor shall keep test results on file for future reference.
- B. Test all fiber after installation according to procedures and criteria described in EIA/TIA 455A and all applicable addenda after installation and termination using an OTDR in one direction and an 850/1300/1510nm power meter and stabilized light source in both directions and in both optical windows.
- C. All optical test equipment must have current, traceable calibration certification.

3.11 TEST DELIVERABLES

- A. Contractor shall submit a complete test plan for station and riser wiring. At a minimum, the plan should show test configurations, calibration procedures, and measurement equipment. The plan must be approved by the owner prior to the start of testing.
- B. Printed ODTR results and tabular loss results must be submitted by the Contractor as documentation of the quality of the installation and as a baseline for future troubleshooting. Compare results to pre-installation tests and document significant changes.
- C. Four (4) copies of the general Copper, Category 6, and Fiber ODTR results shall be submitted in a tabular, typewritten format at the completion of system testing. The test results must also be provided in a electronic file for future reference.

END OF SECTION 27 1000

SECTION 27 1116
CABINETS, ENCLOSURES AND RACKS

- GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Free-standing Equipment Cabinets, Enclosures or Racks.

1.03 REFERENCES

- A. ANSI/EIA RS-310-C - Rack mounting standards.
- B. NEMA 250 - Enclosures for Electrical Equipment 1000 V Max.
- C. Strictly adhere to all Building Industry Consulting Service International (BICSI), Electronic Industries Alliance (EIA) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.
- D. Material and work specified herein shall comply with the applicable requirements of:
 - 1. ANSI/TIA/EIA – 568-B Commercial Building Telecommunications Cabling Standard, 2000-2004
 - 2. TIA – 569-B Commercial Building Standard for Telecommunications Pathways and Spaces, 2004
 - 3. ANSI/TIA/EIA – 606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, 2002
 - 4. ANSI-J-STD – 607-A Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, 2002
- E. CEC - California Electrical Code - application, and installation of electrical cabinets and enclosures.
- F. UL 50 -Cabinets and Boxes.

1.04 SUBMITTALS

- A. Conform to the requirements of section 280500, General Requirements.
- B. Product Data: Submit manufacturer's technical data for all items to be used including specifications, installation instructions and general recommendations.

1.05 SITE CONDITIONS

- A. Cabinets shown on the Drawings are in approximate locations, actual location within the same room may depend on site conditions and Facility approval.

- PRODUCTS

2.01 EQUIPMENT RACKS

- A. Racks shall be rectangular in shape, manufactured from steel, welded construction with two pairs of removable (bolt-on) equipment mounting rails.
- B. The top of the rack shall be pre-punched with attachment holes for cable runway and a top-mount cable management jumper tray. The sides of the rack shall be pre-punched with attachment points for power strips, snap-on cable guides and vertical cable managers. The bottom of the rack shall be pre-punched with attachment points for a junction box and attachment to the floor.
- C. Equipment mounting rails shall be L-shaped, set 6" (150 mm) or 3" (80 mm) apart and punched on the front flange with the EIA-310-D Universal hole pattern to provide 44 rack-mount spaces for equipment. Each mounting space shall be marked and numbered on the mounting rails.

Mounting rails shall be removable and reversible so that RMU numbering can start at the bottom or top of the rack.

- D. Equipment-mounting rails shall be horizontally spaced to allow attachment of 19" EIA rack-mount equipment. Attachment points shall be threaded with 12-24 threads.
- E. The rack shall have two masked ground connection points located near the top and bottom of the frame and will include a ground terminal lug to attach ground conductors from the Telecommunications Grounding Busbar. Equipment mounting rails will bond to the rack through assembly hardware.
- F. The rack shall measure 7' (2.1 m) high, 24" (610 mm) wide and 15" (380 mm) deep at the base. The sides of the rack frame shall be 9.6" (294 mm) deep.
- G. The rack shall be rated for 1,000 lb (453.6 kg) of equipment in seismic areas and meet Telecordia Technologies GR-63-CORE Network Equipment Building Systems (NEBS) Zone 4 requirements.
- H. Finish shall be epoxy-polyester hybrid powder coat in the color as specified below. Mounting rails will be painted to match or zinc-plated.
- I. 4-post racks shall be designated for equipment only.

2.02 DESIGN MAKE:

- A. Chatsworth Products, Inc. (CPI),
- B. Standard Two-Post Rack
 - 1. Part Number 55053-703, Standard Rack, 7'H (2.1 m) x 20.3"W (515.9 mm) x 15"D (381.0 mm), 45U x 19" EIA, Black, UL Listed.
 - 2. Part Number 40605-001, Equipment Mounting Screws, #12-24, 50 pack, Zinc
 - 3. Part Number 40605-005, Equipment Mounting Screws, #12-24, 50 pack, Black
 - 4. Part Number 12637-001, Cage Nuts and Mounting Screws, M6, 25 pack, Gold
 - 5. Part Number 12638-001, Cage Nuts and Mounting Screws, #10-32, 25 pack, Zinc
 - 6. Part Number 12639-001, Cage Nuts and Mounting Screws, #12-24, 25 pack, Black
- C. QuadraRack™ 4-Post Frame
 - 1. Part Number 55053-703, QuadraRack™ 4-Post Frame, 19" x 7', Black.
- D.

2.03 CABLE MANAGEMENT

- A. Each rack shall have a minimum of one double-sided vertical cable manager attached to the side of the rack. The cable manager will have separate front-facing and rear-facing C-shaped troughs to hold cables. The troughs will attach to the rack with slotted brackets that allow the troughs to be adjusted in depth and positioned to align with the front and rear of the rack. When positioned to align with the front and rear of the rack, there will be a space between the troughs along the side of the rack. Each trough will have large, plastic edge-protected openings along the sides to allow cables to enter/exit the trough and connect to equipment on the front/rear of the rack. Plastic spin-open latches at the front of each trough will secure cables in the trough. Large, edge-protected, rectangular openings at the rear of the trough will allow cables to exit the rear of the trough. The rear of the troughs will also be punched with keyhole slots to support power strips in the space in between the front and rear trough. Each cable management trough shall measure 7' (2.1 m) high, 6" (150 mm) wide and 6.3" (162 mm) deep at the base. Two troughs are included with each vertical cable manager.
- B. Snap-on plastic cable guides with T-shaped dividers and openings that align with each RMU space on the rack shall be attached to the front side of each rack next to the vertical cable managers to provide by-RMU cable management for cables entering/exiting the rack.
- C. Materials: Provide cabinets and enclosures as follows:
 - 1. Provide electrical cabinets and enclosures which are UL listed and labeled, and constructed in conformance with UL 50 "Cabinets and Boxes."

2. In normally dry interior locations, provide sheet steel with corrosion resistant fasteners.
 3. Outdoors and in damp interior locations, provide galvanized sheet steel with stainless steel fasteners.
 4. At constantly wet locations or corrosive atmospheres, provide stainless sheet steel with stainless steel fasteners
- D. Rail Mounts: Full enclosure length rack angles shall be installed and have ANSI/EIA RS-310-C mounting standards with 10-32 tapped mounting holes in each enclosure
- E. Shelf: Provide a shelf or other suitable mounting plate for all non rack mountable equipment
- F. Painting: In addition to galvanizing or priming coat, all inside and outside surfaces of trim and doors shall be given a factory finish coat of paint.
- G. Grounding:
1. Comply with Section 280526.
 2. Provide cabinets and enclosures with provision for cabinet grounding without penetrating exterior wall of the enclosure.

2.04 SLIDE OUT RACKS

- A. Provide slide out 19" racks to provide rear access to wiring and components. Custom build unistrut support to accommodate slide out rack. Provide the following or approved equal from other manufacturers.
1. Provide two single sided equipment shelves for each rack installed, Chatsworth P.N. 40074-700.
- B. Provide key-locking latches for doors.

- EXECUTION

3.01 INSTALLATION

- A. Mounting: Mount cabinets at a uniform height, nominally 6 feet to the top of the enclosure above finished floor, except as otherwise noted or physically not practical. Mount cabinets with fronts straight and plumb.
- B. Bracing: Brace or anchor all free-standing/wall-mounted cabinets using Uni-strut or other approved method to building structure.
- C. Flush Cabinets: Set flush cabinets in finished spaces flush with adjacent walls. Mount cabinets with fronts straight and plumb.
- D. Painting: Touch up all welds, scrapes and other mars in the enclosure finish with a rust inhibiting paint.
- E. Front Access: Locate with minimum of 36 inches clear space in front of each cabinet or rack.
- F. Other Access: Provide minimum 36 inches clear space to each side of enclosure which requires access for inspection or service.

END OF SECTION 27 1116

SECTION 27 1123
CABLE RUNWAY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, tests and services to install a complete cable ladder system as shown on the drawings. Cable ladder will be used for cable management inside the TC closets.
- B. Cable ladder systems are defined to include, but are not limited to straight sections of Ladder, type cable ladders, bends, tees, elbows, drop-outs, supports and accessories.
- C. Cable Runway will only be placed in Telecom and Server rooms below the ceiling. Cable Runway will not be placed above ceilings to convey cables throughout the building.

1.02 RELATED SECTIONS

- A. Section 27 05 28 – Cable Tray
- B. Section 27 10 00 – Structured Cabling
- C. Section 27 41 18 - Audio Visual Systems

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. ASTM B633 - Specification for Electro-deposited Coatings of Zinc on Iron and Steel
- C. NEMA VE 1 - Metallic Cable ladder Systems.

1.04 DRAWINGS

- A. The drawings which constitute a part of these specifications indicate the general route of the cable ladder systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.
- B. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.05 SUBMITTALS

- A. Submittal Drawings: Submit drawings of cable ladder and accessories including clamps, brackets, hanger rods, splice plate connectors, expansion joint assemblies, and fittings, showing accurately scaled components.
- B. Product Data: Submit manufacturer's data on cable ladder including, but not limited to, types, materials, finishes, rung spacing, inside depths and fitting radii. For side rails and rungs, submit cross sectional properties including Section Modulus (Sx) and Moment of Inertia (Ix).

1.06 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of cable ladders and fittings of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. NEMA Compliance: Comply with NEMA Standards Publication Number VE1, "Cable ladder Systems".
- C. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable ladder and cable channel systems (Article 318, NEC).
- D. UL Compliance: Provide products which are UL-classified and labeled.
- E. NFPA Compliance: Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable ladder systems.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver cable ladder systems and components carefully to avoid breakage, denting and scoring finishes. Do not install damaged equipment.
- B. Store cable ladders and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with these specifications, cable ladder and cable channel systems to be installed shall be as manufactured by Chatsworth, Inc. or engineer approved equal.

2.02 CABLE LADDER SECTIONS AND COMPONENTS

- A. General: Except as otherwise indicated, provide metal cable ladders, of types, classes and sizes indicated; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.
 - 1. Materials and Finish: Material and finish specifications for each cable ladder type are as follows:
 - 2. 1.5" Tubular Steel: Straight section and fitting side rails and rungs shall be extruded from ASTM A513 steel tube. All fabricated parts shall be finished with a black powder coat.
 - 3. Ladder rack to wall support, Chatsworth Wall Angle Support Kit, P.N. 11421-712
 - 4. Rack to runway support Chatsworth mounting plate P.N. 10595-712
 - 5. Ladder rack support system, Chatsworth Universal Cable Runway P.N. 10250-712
 - 6. Straight through ladder rack splice, Chatsworth Butt-Splice Kit P.N. 11301-701
 - 7. Ladder rack junction splice, Chatsworth Junction Splice Kit P.N. 11302-702
 - 8. Ladder rack protective end caps, Chatsworth Protective Rubber End Caps P.N. 10642-001
 - 9. Wall support for cable runway Chatsworth Triangular Support Bracket P.N. 11312-712

2.03 TYPE OF CABLE LADDER SYSTEM

- A. Ladder type cable ladders shall consist of two longitudinal members (stringers) with transverse members (rungs) welded to the stringers. Rungs shall be spaced 9" inches on center. Rung spacing in radius fittings shall be 9 inches and measured at the center of the cable ladder's width. Rungs shall have a minimum cable bearing surface of 1" with radius edges. No portion of the rungs shall protrude below the bottom plane of the side rails.
- B. Straight cable ladder sections shall have side rails fabricated as tubular steel channels. All straight sections shall be supplied in standard 10' foot lengths, except where shorter lengths are permitted to facilitate cable ladder assembly lengths as shown on drawings.
- C. Cable ladder widths shall be 12", 18" or 24" inches as indicated on drawings.
- D. Splice plates shall be the bolted type made as indicated below for each cable ladder type. The resistance of fixed splice connections between an adjacent section of cable ladder shall not exceed .00033 ohm. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing the cable ladder rated loading capacity.
- E. All splice materials shall be made of ASTM A570 structural steel using carriage bolts and serrated flange locknuts. Hardware shall be Yellow Zinc Dichromate. Chatsworth # 16299-001 or approved equal.
- F. Cable ladder Supports: Shall be placed so that the support spans do not exceed a maximum span of 5' feet. Supports shall be constructed from formed shape channel members 1 5/8" x 1 5/8" with necessary hardware such as trapeze support kits, ceiling support kits, triangular support brackets, or wall angle support kits as manufactured by Chatsworth Products or engineer approved equal.

- G. Trapeze hangers shall be supported by 3/8" (minimum) diameter all thread rods.
- H. Accessories - special accessories shall be furnished as required to protect, support, and install a cable ladder system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially-designed ladder drop-outs, barriers, etc.

2.04 LOADING CAPACITIES

- A. Cable ladders shall meet NEMA class designations: 8A.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All cable ladder will be installed in the IC and/or TC spaces only. Cable ladder is not acceptable in the space above the ceiling for distribution of horizontal cable runs. Refer to Cable Tray section 270528.
- B. Install cable ladders as indicated; in accordance with equipment manufacturer's instructions, and with recognized industry practices, to ensure that cable ladder equipment comply with requirements of NEC, and applicable portions of NFPA 70b and NECA's "Standards of Installation" pertaining to general electrical installation practices.
- C. Coordinate cable ladder with other electrical work as necessary to properly interface installation of cable ladder work with other work.
- D. Provide sufficient space encompassing cable ladders to permit access for installing and maintaining cables.
- E. Ground all cable ladder to the communications room bus bar. Use ground straps between each section of runway installed or where splice plates are used to join sections. Scrape paint away from cable runway at points of connection to each section of runway by the ground strap.

3.02 TESTING

- A. Test cable ladders to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. Refer to NFPA70B, Chapter 18, for testing and test methods.

END OF SECTION 27 1123

SECTION 27 5116
PUBLIC ADDRESS & MASS NOTIFICATION SYSTEM

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Division 00 General Conditions and Division 01 General Requirements apply to the work of this Section.

1.02 WORK INCLUDED

- A. This Section specifies the requirements necessary to furnish and install:
 - 1. Indoor speakers
 - 2. Exterior speakers
 - 3. Connection to new or existing Telecor equipment
 - 4. Wireless clocks

1.03 RELATED WORK

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for basic communications materials and methods:
 - 1. Sections of Division 26 00 00, Electrical General Requirements
 - 2. Sections of Division 27 00 00 Communications
- B. In the event of conflict regarding requirements for communications materials and methods between this Section and any other section, the provisions of this Section shall govern.

1.04 SUBMITTALS

- A. Manufacturer's literature describing the product
- B. Wiring diagrams clearly showing the interconnections of all major components
- C. Maintenance manuals and parts lists. Manuals shall include schematic drawings and service instructions.
- D. Floor plan drawings showing device locations, conduit routings, and number of conductors

1.05 EXISTING SYSTEM FUNCTIONAL DESCRIPTION

- A. The existing campus public address system shall be extended to the new / modernized building.

1.06 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least seven calendar days prior to installing any equipment, devices or systems in the IDF Room. For projects with underground and/or roof mounted conduits, convene a separate pre-installation meeting
- B. Attendance: Architect, Construction Manager, Contractor, Electrical Subcontractor, Low Voltage Subcontractor/s, District Low Voltage Systems Representative and Project Inspector.
- C. Agenda: Review all low voltage systems related to the project. Subcontractors shall come prepared to discuss how the low voltage systems are being installed and run throughout the building/s.

PART 2 – PRODUCTS

2.01 INTERIOR SPEAKERS

- A. Interior speakers shall be eighth inch diameter paper cone type with T25 25V line matching transformer. Frequency range to be 30 to 15,000 Hz. Telecor STB-11 or equal. Drop ceiling support shall be Telecor CC1, or equal. Interior wall mounted speakers shall be mounted in Atlas Sound VP-161A-APF backbox/baffle assembly. Atlas Sound SE161-R6 where surface mounted.

2.02 EXTERIOR SPEAKERS

- A. Exterior speaker assembly shall be Atlas APF-15TUC series loudspeaker with T-11 transformer in an Atlas SE161-R6 backbox and VP161-APF cover, or equal. Housing shall include a baffle and be painted to match surrounding surfaces.

2.03 CABLING

- A. Cable serving interior speakers shall be home run 23 AWG Category 6 CMP, Berk-Tek LANmark 1000 Cat6 white in color 11074738
- B. Cables are to be terminated at the IDF onto purple Leviton Cat 6 jacks
- C. 61110-RP6 and secured to a 48 port Leviton Multimedia panel 49255-H48 with a 49257-QHD. Ports utilized will depend on speaker counts.
- D. A 50 pair ISP cable is to terminate from a 48 port Leviton 69586-U48 patch panel to the 110 frame in the same IDF. Ports utilized will depend on speaker counts.

2.04 TELECOR EQUIPMENT

- A. Provide and install a Telecor XL system and Tel-250 amplifier with supporting heavy duty CPI rack shelves. The headend is to include enough points on the system to support a 1:1 speaker to points ratio for the campus. An additional 25 inputs and 100 outputs will also be required for growth.
- B. Provide and install from the Telecor XL unit 25 pair tails to C5PPLs located in the designated equipment rack TBD in the MDF. The 25 pair tail counts are to support the build out in 2.4A.
- C. Provide and install a custom length CAT 6 purple in color patch cord for each speaker from the terminated purple jacks to the C5PPLs.
- D. Each patch cord must be labeled at each end with a wraparound Brady type label approximately 2" from the male plug. Each label is to match the speaker location label. Each label must be clearly visible when plugged into equipment / patch panels.
- E. Neatly route all patch cords through existing vertical and horizontal management. All patch cords installed must have sufficient slack as to not exceed its bend radius minimum and not too long as to take up unnecessary space in the cable management spaces.
- F. Provide all programming, bell schedules, Primex syncing module and syncing of clock system for the entire campus Telecor system.
- G. Provide and install 2 MCC300 consoles including associated cabling to 2 workstations TBD.
- H. The contractor will be responsible for connecting and programming the XL system to the ESUHSD network for remote accessibility at the Ed Center.
- I. When adding to an existing system the Contractor shall program all new speakers to Telecor Equipment as directed by the district representative.
- J. When adding to an existing system install TELECOR IOP-4 CARD. 25 pair CAT 3 Tail terminated into 110 frame. Contractor shall program one port of the new card(s) for each speaker installed. Provide separate card for each building. The bell schedule will be provided by the district IT Representative.

2.05 CLOCKS

- A. Install new wired Primex Traditional Series Clocks 14306 12.5" (31.75cm) Black in color. Clocks shall be synchronized to existing campus clock system. Electrical outlet must be installed to support the 120VAC clock.
- B. Transmitters:
 - 1. Primex XR Series 1-watt Transmitter
 - a. For single building deployments
- C. Accessories
 - 1. Primex Dual Clock Kit
 - 2. Wire Clock Guard

3. Surge Protector
4. 1-Watt Transmitter Rack

2.06 LABELS

- A. The Contractor shall provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels must be of high quality that will endure heat, water, and time.
- B. Shall meet the legibility, defacement, exposure, and adhesion requirements of UL 969.
- C. Shall be pre-printed using a mechanical means of printing.
- D. Where used for cable marking, provide vinyl substrate with a white printing area and a clear "tail" that self laminates the printed area when wrapped around the cable. The cable marking should be immediately visible and be within two inches from the termination point.
- E. Where insert type labels are used, provide clear plastic cover over label.
- F. Copper patch panel labeling shall be completed with adhesive labeling kit specifically designed for the panel, Leviton 49257-QHD.
- G. Labeling P-touch font size 4MM bold, black on White, 3/8" labeling tape on all work stations, panels and devices. Contractor must provide labeling samples for approval by the District's Low Voltage Systems Representative before labeling of the systems is performed.
- H. Labels shall be numbered consecutively and separate for each type of use. Refer to Work Station Details and Floor Plan Device Numbering Example for additional information

PART 3 – EXECUTION

3.01 GENERAL COMMUNICATION CABLING METHODS

- A. Install cable after interior of building has been physically protected from the weather and work likely to damage conductors has been completed. .
- B. Before installing cabling, ensure cable pathways are thoroughly cleaned. Inspect conduit and wireway installed by others.
- C. Cabling systems shall be separated by color and segregated along the paths.
- D. Pull tape with preprinted foot markers is usually provided when conduit and innerduct are installed; if not, provide pull tape in each empty communications conduit containing a bend or over 10 feet in length.
- E. All wiring shall be installed in conduit in concealed areas and in surface nonmetallic raceway in exposed locations.
- F. Provide pigtails of adequate length for neat, trained, and bundled connections.
- G. Provide protection for exposed cables where subject to damage.
- H. Provide abrasion protection for cable or wire bundles that pass through holes or across edges of sheet metal.
- I. All equipment except portable equipment shall be secured firmly in place. This shall include loudspeakers, amplifiers, cables, etc. Fastening and supports shall be adequate to support their loads with a safety factor of at least three (3). All switches, connectors, outlets, etc., shall be clearly, logically and permanently marked during installation.

3.02 TESTING

- A. The Contractor shall perform an operational check to assure that the system complies with all requirements of these specifications. Operation tests shall be made in the presence of the Engineer and Owner's representative who shall be notified of the test date a minimum of ten (10) days prior to that date.
- B. The Contractor, if requested to do so by the Owner, shall be prepared to show by "proof of performance" test that the equipment furnished is equal or superior to the equipment specifications. This proof shall be shown by actual tests and not be printed sales literature. To this end, the Contractor shall provide qualified audio technicians and such test equipment as required to perform this function. The following test equipment shall be considered minimum

for the above stated purpose. Sound level meter, 1/3 and 1/10 octave-band wave analyzer, sine and square-wave generator, impedance (CRL) bridge, audio oscilloscope, distortion analyzer, graphic level recorder, calibrated microphone, real-time spectrum analyzer, beat-frequency oscillator, random-noise generator, etc. Instruments, as manufactured by General Radio, Tektronix, Hewlett-Packard and Bruel & Kjaer, are considered acceptable for measurements. Non-professional test equipment or "home-built kit" type gear shall not be acceptable under these specifications.

3.03 AS BUILT DOCUMENTATION

- A. The Contractor will be provided drawings in electronic format (DWG, AutoCAD release 14 or later) on which as-built construction information can be added.
- B. Upon completion of the project, the Contractor is to prepare as-built documentation showing actual site conditions and installation as constructed.
- C. The Contractor shall annotate the base drawings and return a hard copy and electronic form (AutoCAD release 14 or later).
- D. The Contractor shall provide and install a C-size framed floor plan with outlet and device locations for all low voltage systems. The floor plan shall be framed and installed in the new MDF/IDF Room. The drawing should be a plan of the building with a symbols legend showing where all the devices are and the labeling for each device only. Remove all general notes and details not applicable to the low voltage systems.

END OF SECTION 27 5116

**SECTION 28 1600
INTRUSION DETECTION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Intrusion detection system requirements.
- B. Alarm control unit.
- C. Keypads.
- D. Initiating devices.
- E. Alarm notification appliances.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 08 7100 - Door Hardware: Electrically operated locks and door holder devices to be monitored and controlled by intrusion detection system.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems - .
- D. Section 26 0534 - Conduit.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 28 2300 - Video Surveillance: For interface with intrusion detection system.
- G. Section 28 3100 - Fire Detection and Alarm.

1.03 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 365 - Police Station Connected Burglar Alarm Units and Systems; Current Edition, Including All Revisions.
- E. UL 609 - Local Burglar Alarm Units and Systems; Current Edition, Including All Revisions.
- F. UL 634 - Connectors and Switches for Use with Burglar-Alarm Systems; Current Edition, Including All Revisions.
- G. UL 636 - Holdup Alarm Units and Systems; Current Edition, Including All Revisions.
- H. UL 639 - Intrusion-Detection Units; Current Edition, Including All Revisions.
- I. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.
- J. UL 1037 - Antitheft Alarms and Devices; Current Edition, Including All Revisions.
- K. UL 1076 - Proprietary Burglar Alarm Units and Systems; Current Edition, Including All Revisions.
- L. UL 1610 - Central-Station Burglar-Alarm Units; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate compatibility of devices for the installed locations with work provided under other sections or by others.

2. Coordinate the placement of sensors and keypads with millwork, furniture, equipment, etc. installed under other sections or by others.
 3. Coordinate the work with other installers to provide communication lines required for alarm control unit connection to central station.
 4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Preinstallation Meeting: Conduct meeting with facility representative and other related equipment manufacturers to discuss intrusion detection system interface requirements.
- C. Sequencing:
1. Do not install sensors and keypads until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.
1. Motion Detectors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include system interconnection schematic diagrams. Include requirements for interface with other systems.
- D. Design Data: Include standby battery calculations.
- E. Certify that proposed system design and components meet or exceed specified requirements.
- F. Evidence of qualifications for installer.
- G. Evidence of qualifications for maintenance contractor (if different entity from installer).
- H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- I. Manufacturer's detailed field testing procedures.
- J. Field quality control test reports.
- K. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
- L. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- M. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.
- N. Software: One copy of software not resident in read-only memory.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with intrusion detection systems of similar size,

type, and complexity and providing contract maintenance service as a regular part of their business; authorized representative of control unit manufacturer.

1. Contract maintenance office located within 50 miles (80 km) of project site.

- E. Maintenance Contractor Qualifications: Same entity as installer.
- F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide minimum two year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 INTRUSION DETECTION SYSTEM REQUIREMENTS

- A. Provide new intrusion detection devices consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Alarm Control Unit: New addressable alarm control panel located as shown on drawings.
- C. Combination fire/intrusion systems are not permitted.
- D. Keypads: Located as shown on drawings.
- E. Initiating Device Requirements:
 - 1. Protected Premises: Entire building shown on drawings.
 - 2. Provide motion detectors to detect intruder in designated areas.
 - a. Model number #ISC-BPR2 Blue Line Gen2 PIR.
 - 3. Provide glass break detectors to monitor:
 - a. Designated perimeter windows.
 - b. Model number #DS1103i.
- F. Alarm Notification and Reporting Requirements:
 - 1. Activate alarm notification at alarm control unit and associated keypads/annunciators with appropriate zone information displayed.
 - 2. Activate local notification appliances.
 - a. Interior: Provide siren located as indicated on drawings.
 - b. Exterior: Provide siren and strobe located as indicated on drawings.
 - 3. Transmit alarm report to listed remote central station under contract with facility.
 - a. Primary Communication Means: Telephone line (digital alarm communicator).
 - b. Secondary Communication Means: Internet/intranet (IP addressing).
- G. Interface with Other Systems:
 - 1. Provide products compatible with other systems requiring interface with intrusion detection system.
 - 2. Interface with access control system as specified in Section 28 1300.
 - a. Capable of affecting access for designated doors for selected intrusion detection system events.

- b. Capable of affecting intrusion detection system status for selected access control system events.
 - 3. Interface with video surveillance system as specified in Section 28 2300.
 - a. Capable of activating video surveillance system and controlling camera inputs/video outputs for selected intrusion detection system events.
 - 4. Interface with electrically operated door hardware as specified in Section 08 7100.
 - a. Capable of locking/unlocking/releasing designated doors for selected intrusion detection system events.
- H. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 1. Local Alarm Units and Systems: Listed and labeled as complying with UL 609.
 - 2. Central Station Alarm Units: Listed and labeled as complying with UL 1610.
 - 3. Proprietary Alarm Units and Systems: Listed and labeled as complying with UL 1076.
 - 4. Police Station Connected Alarm Units and Systems: Listed and labeled as complying with UL 365.
- I. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.02 ALARM CONTROL UNIT

- A. Manufacturers:
 - 1. Addressable Alarm Control Panel - Basis of Design: Bosch security.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
 - 3. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer.
- B. Alarm Control Panel: Modular construction.
 - 1. Enclosure: Lockable; provide tamper protection.
 - a. Bosch D8103 grey steel enclosure 16in. x16in. x 3.5in
 - b. Bosch D101 lock and key set
 - 2. Control Panels: Model number #B9512G
 - 3. Power Supply:
 - a. Primary Power: 120 VAC; provide suitable transformer/power supply; supervised for loss of AC power.
 - b. Secondary Power: Standby battery; provide suitable capacity for minimum standby time required by listing requirements, applicable codes, and authority having jurisdiction, but not less than four hours; provide suitable battery charger; supervised for low battery condition; protected from accidental reversal of battery leads.
 - c. AlarmSAF PS5-M003-UL
 - 1) 12 VDC, 5 amp uninterruptible power supply in vented locking 11"H x 15"W x 4"D cabinet
- C. Alarm Initiating Circuits: Supervised.
 - 1. Hardwired Zones: Supports both normally closed and normally open conventional (non-addressable) initiating devices.
 - 2. Addressable Zones: Supports addressable initiating devices and modules using multiplexed polling loops.
- D. Alarm Notification Circuits: Supervised.
- E. Communications Interfaces: Supervised.
 - 1. Supports system reporting to central station receivers via integral interface or accessory interface modules using:
 - a. Telephone lines.
 - b. Internet/intranet (IP addressing).
- F. Keypads: Supervised.
- G. Peripheral Devices: Supervised; provide tamper protection.

- H. Output Relays:
 - 1. Relay Modules: Form C relays (normally open and normally closed); provide tamper protection.
 - 2. Programmable to respond to system events, according to defined scheduling, or by manual activation from keypad.
- I. User Codes:
 - 1. Each user code to be individually assignable to any defined authority level for configurable access to system features and functions.
- J. Partitions:
 - 1. Each partition to operate independently with individually programmable annunciation, control, and reporting functions.
 - 2. Each zone to be individually assignable to any partition.
 - 3. Each keypad to be individually assignable to any partition.
 - 4. Each output relay to be individually assignable to any partition.
 - 5. Each user code to be individually assignable to any partition.
- K. Scheduling:
 - 1. Provide time/calendar-based scheduling capability for automated system control.
 - 2. Supports open/close schedules for control of arming/disarming and reporting.
 - 3. Supports timed events including, but not limited to:
 - a. Point bypass/unbypass.
 - b. Relay activate/deactivate.
- L. Event Log:
 - 1. Stores system events including time, date, partition, zone, and user code where applicable.
 - 2. Supports viewing of event log on keypads.
 - 3. Supports viewing of event log on remote PC.
 - 4. Supports printing of event logs on local printer.
- M. Features:
 - 1. Capable of being programmed locally or remotely.
 - 2. Capable of being armed via key switch.
 - 3. Supports panic/duress codes.
 - 4. Supports force arming.
 - 5. Supports cross zoning.
 - 6. Supports swinger bypass.
 - 7. Supports walk test mode.

2.03 KEYPADS

- A. Manufacturer: Same as manufacturer of alarm control unit.
- B. Provides interface to alarm control unit for system control and remote annunciation.
- C. Provides visual notification of system status and zone information.
- D. Provides audible notification to indicate system status, entry/exit delay, and alarm situations; provide separate distinguishable sounds for alarm and trouble conditions.
- E. Keypad Type: Only LCD or graphic touch screen keypads are acceptable. Do not use LED keypads.
- F. Graphic Touch Screen Keypads: Displays system status and zone information using plain English on graphic display; touch screen interface.
- G. LCD Keypads: Displays system status and zone information using plain English on alphanumeric display; illuminated keys.
- H. Basis of Design Products:
 - 1. Bosch. D1255 with an off-white case, wall mounted with illuminated 16 character vacuum fluorescent display and sounder

2.04 INITIATING DEVICES

- A. Manufacturers: Same as manufacturer of alarm control units where possible.
 - 1. Substitutions: See Section 01 6000 - Product Requirements.
- B. General Requirements:
 - 1. Provide devices suitable for intended application and location to be installed.
 - 2. Outdoor Units: Weather resistant, suitable for outdoor use.
 - 3. Addressable Systems:
 - a. Addressable Devices: Individually identifiable by control unit.
 - b. Provide suitable addressable modules for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
- C. Motion Detectors:
 - 1. Listed and labeled as complying with UL 639.
 - 2. Passive Infrared (PIR) Motion Detectors: Designed to detect intruder by sensing movement of thermal energy between zones.
 - 3. Dual Technology PIR/Microwave Motion Detectors: Designed to detect intruder using combination of passive infrared technology (by sensing movement of thermal energy between zones) and microwave technology (by sensing frequency shifts in emitted and reflected high frequency microwave signals).
 - 4. Basis of Design Products:
 - a. Bosch ISC-BPR2 Blue Line Gen2 PIR Motion Detector
 - 1) Wall to wall coverage
 - 2) Dynamic Temperature Control
 - 3) Flexible mounting height
 - b. Bosch B335-3 Swiveling low profile gimble mount EOL
- D. Glass Break Detectors:
 - 1. Listed and labeled as complying with UL 639.
 - 2. Suitable for the glass type to be monitored.
 - 3. Accurately discriminates false alarms from true glass break events.
 - 4. Furnished with selectable sensitivity.
 - 5. Acoustic Glass Break Detectors: Designed to analyze ambient sound and activate upon detection of specific audio patterns representative of the sound of breaking glass.
 - 6. Shock Glass Break Detectors: Piezoelectric sensing element; designed to detect vibrations representative of breaking glass.
 - 7. Acoustic/Shock Dual Technology Glass Break Detectors: Designed to detect breaking glass using a combination of ambient sound and vibration analysis.
 - 8. Basis of Design Products:
 - a. Bosch DS1103i Flush mount Glassbreak detector
 - 1) Microprocessor based sound analysis technology
 - 2) Automatic environmental test circuitry
 - 3) Sound check
 - 4) Flush mounting
- E. Exterior Bell
 - 1. Amesco ABB-1014 outdoor slimline steel bell box
 - a. Microprocessor based sound analysis technology
 - b. Automatic environmental test circuitry
 - c. Sound check
 - d. 18 gauge cold rolled steel
 - e. UL listed motor driven low current bell
 - f. dual wired, UL listed reed tamper switches
 - g. Salt spray and rust resistance
 - h. 12V DC operating voltage
 - i. Durable, weather resistant powder coat paint

- j. Overall size 14' x 14" x 4"
- k. Exterior color, Almond

2.05 CABLE, BARRIER STRIPS AND CONNECTORS

- A. West Penn 25241
 - 1. #22/4 stranded bare copper conductors, unshielded with an overall jacket
- B. West Penn 25244
 - 1. #18/4 stranded bare copper conductors, unshielded with an overall jacket
- C. Ideal 89-610
 - 1. Barrier strip for consolidation of power wires at the panel
 - 2. UL recognized for 30A, 600V
 - 3. CSA certified for 20A, 400V
 - 4. Torque Rating of 4.4 in-lbs
 - 5. Recessed screws and tubular contacts
 - 6. UL Listed and CSA certified
 - 7. Connect stripped un-terminated solid or stranded wire
 - 8. Modular 12 circuits can be cut into smaller sections
 - 9. Plastic housing is UL flame rated to 94V-2
 - 10. Rated temperature to 105 degrees C
- D. Berk-Tek 11074739
 - 1. LANmark-1000
 - 2. CAT 6
 - 3. Plenum rated
 - 4. Unshielded twisted pair data cable
 - 5. 23 AWG
 - 6. 4 pair
 - 7. Solid bare copper conductors
 - 8. FEP insulation
 - 9. Flame tetardant PVC jacket
 - 10. Gray
- E. Leviton 61110-RG6 eXtreme CAT 6 Quickport connector, grey.
- F. No splicing allowed. All cabling shall be homerun to each device.

2.06 LABELS

- A. Provide tags, straps, and adhesive labels must be of high quality that will endure heat, water, and time
 - 1. Meet the legibility, defacement, exposure, and adhesion requirements of UL 969
 - 2. Pre-printed using a mechanical means of printing. Ideal 89-610
- B. Where used for cable marking, provide vinyl substrate with a white printing area and a clear "tail" that self laminates the printed area when wrapped around the cable. The cable marking should be immediately visible and be within two inches from the termination point.
- C. Where insert type labels are used, provide clear plastic cover over label.
- D. Labeling P-touch font size 4MM bold, black on White, 3/8" labeling tape on all patch cords, cable ends, and panels and devices.
- E. Labels shall be numbered consecutively and separate for each type of use.

2.07 ALARM NOTIFICATION APPLIANCES

- A. Manufacturers: Same as manufacturer of alarm control units where possible.
- B. Provide alarm notification appliances suitable for connection to control unit outputs.
- C. Outdoor Units: Weather resistant, suitable for outdoor use.
- D. Sirens: Speaker with self-contained siren driver.

1. Provide tamper switches for outdoor units.
- E. Strobes:
1. Color: Clear.
 2. Provide tamper switches for outdoor units.

2.08 ACCESSORIES

- A. Provide components as indicated or as required for connection of alarm control unit to devices and other systems indicated.
- B. Provide cables as indicated or as required for connections between system components.
- C. Provide end-of-line resistors (EOLR) as required for supervision of hardwired zones.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1.
- B. Install products in accordance with manufacturer's instructions.
- C. Wiring Method: Unless otherwise indicated, use cables (not in conduit).
 1. Use listed plenum rated cables in spaces used for environmental air.
 2. Install wiring in conduit where required for rough-in, where required by authority having jurisdiction, and where exposed to damage.
 3. Conduit: Comply with Section 26 0534.
 4. Conceal all cables unless specifically indicated to be exposed.
 5. Cables in the following areas may be exposed, unless otherwise indicated:
 - a. Equipment closets.
 6. Route exposed cables parallel or perpendicular to building structural members and surfaces.
- D. Provide grounding and bonding in accordance with Section 26 0526.
- E. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- F. Identify system wiring and components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.
- C. Prepare and start system in accordance with manufacturer's instructions.
- D. Inspection and testing to include, at a minimum:
 1. Test each initiating device for proper response by alarm control unit.
 - a. Test glass break detectors using only manufacturer's recommended glass break simulation test units.
 2. Test for proper operation of alarm notification appliances.

3. Test for proper operation of output relays.
 4. Test for proper operation of communication interfaces and central station reporting.
 5. Test for proper interface with other systems.
- E. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 ADJUSTING

- A. Program system parameters according to requirements of Owner.

3.05 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. See Section 01 7900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
- D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 2. Provide minimum of four hours of training.
 3. Instructor: Manufacturer's authorized representative.
 4. Location: At project site.

3.07 PROTECTION

- A. Protect installed system components from subsequent construction operations.

3.08 MAINTENANCE

- A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.
- C. Provide trouble call-back service upon notification by Owner:
1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
 2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 28 1600

SECTION 28 2300
VIDEO SURVEILLANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Video surveillance system requirements.
- B. Cameras.
- C. Accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
 - 3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Preinstallation Meetings:
 - 1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.
 - 2. Conduct meeting with facility representative and other related equipment manufacturers to discuss video surveillance system interface requirements.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

1.04 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. NFPA 70
 - 2. Applicable TIA/EIA standards.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with video surveillance systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.06 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Video Recording and Viewing Equipment - Basis of Design: OnSSI.
 - 1. Security Camera License: OnSSI OVcularis CS 1C
 - 2. Security Camera License SUP: OnSSI Ocularis CS 1C Sup 3yr.
- B. Cameras - Basis of Design: OnSSI.
 - 1. 90 degree Panasonic indoor/outdoor cameras WV-SFV631
 - 2. Adjustment of final camera focusing and coverage must be done in the presence of the school district low voltage system representative.
- C. Substitutions: See Section 01 6000 - Product Requirements.
- D. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- E. Source Limitations: Where possible, furnish system components and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 VIDEO SURVEILLANCE SYSTEM

- A. Provide modifications and extensions to existing video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. System Description: IP system with connection to network (IP) cameras.
 - 1. OnSSI Ocularis OC-ENT-1C Camera License - 1 License per camera
 - 2. OnSSI Ocularis SC-OC-ENT-1C-3Y Camera License (SC) - Stay current Software Upgrade Package for each camera.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B, consumer application.

2.03 ACCESSORIES

- A. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.
- B. Provide network switches as required for network connections to system components.
- C. Provide cables as indicated or as required for connections between system components.
- D. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.
- B. The servers must view and store data for each camera for a minimum of 30 days of storage based upon 35% motion
- C. Program Cameras as follows:
 - 1. True Day Night with Automatic light detection
 - 2. 15 FPS, H.264
 - 3. For 360 degree cameras, Panasonic WV-SFV481, 6 Megapixels Day, 4 Megapixels Night
- D. Program the video system for home positions, scheduled tours, detection windows, recording times, rates, and resolution by others.
- E. Program the software with Map views and full integration to each camera and location.
- F. Label cameras according to specification in OnSSI software
- G. Multi-Level access as designated.
 - 1. Administrator - Full use and ability to move cameras and focus
 - 2. Viewing users - View ability only, no access to settings.
- H. Provide required support and attachment in accordance with Section 26 0529.
- I. Provide grounding and bonding in accordance with Section 26 0526.
- J. Identify system wiring and components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Prepare and start system in accordance with manufacturer's instructions.
- C. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.
- D. Program system parameters according to requirements of Owner.
- E. Test for proper interface with other systems.
- F. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 28 2300