SECTION 27 00 00

COMMUNICATIONS BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the common administration basic requirements and common methods for all low voltage systems installation work included under Division 27 and 28 (and other Divisions). Where those requirements differ from the requirements of this section, the more stringent shall govern.

1.02 STANDARDS, REGULATIONS, AND CODES REFERENCES

A. The following Standards, Regulations and Codes apply to work specified in the Contract Documents.

1. Applicable State and Local Codes.
2. California Building Code and California Electrical Code, Current Editions.
3. BICSI TDMM (Telecommunications Distribution Methods Manual), 11th Edition 2006.
4. ANSI/TIA/EIA-568-B.1. Commercial Building Telecommunications Cabling Standard,
5. ANSI/TIA/EIA-568-B.1-2. Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements, Addendum 2, Grounding and Bonding Specifications for Screened Balanced Twisted-Pair Horizontal Cabling.
6. ANSI/TIA/EIA-568-B.1-3. Commercial Building Telecommunications Cabling Standard.
7. ANSI/TIA/EIA-568-B.1-4. Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements, Addendum 4, Recognition of Category 6 and Category Cat 6A and 50 nm Laser-Optimized 50/125 um Multimode Optical Fiber Cabling.
8. ANSI/TIA/EIA-568-B.1-2. Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
9. ANSI/TIA/EIA-568-B.2-1. Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components, Addendum 1, Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cabling.
10. ANSI/TIA/EIA-568-B.2-10 (draft 2.0). Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components, Addendum 10, Transmission Performance Specifications for 4-Pair 100 Ohm Augmented Category 6 Cabling.
11. ANSI/TIA/EIA-568-B3.3 Optical Fiber Cabling Components Standard.
12. TIA-569-B. Commercial Building Standard for Telecommunications Pathways and Spaces.
13. ANSI/TIA/EIA-606-A. Administration Standard for Commercial Telecommunications Infrastructure.
14. ANSI/TIA/EIA-607-A. Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
15. TIA/EIA TSB-67 Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
16. TIA/EIA TSB-72 Centralized Optical Fiber Cabling Guidelines.

1.03 DEFINITIONS

A. The following is a list of abbreviations generally used in Divisions 27 & 28:

1. ADA - Americans with Disabilities Act
2. AHJ - Authority Having Jurisdiction
3. ANSI - American National Standards Institute
4. APWA - American Public Works Association
5. ASTM - American Society for Testing and Materials
6. CBC - California Building Code
7. CEC - California Electrical Code
8. CFC - California Fire Code
9. FCC - Federal Communications Commission
10. HVAC - Heating, Ventilating and Air Conditioning
11. IEC - International Electro-technical Commission
12. IEEE - Institute of Electrical and Electronics Engineers.
13. IETA - International Electrical Testing Association
14. FM - FM Global
15. NEMA - National Electrical Manufacturers Association
16. NFPA - National Fire Protection Association
17. OSHA - Occupational Safety and Health Administration
18. UL - Underwriters Laboratories Inc.

B. Provide: To furnish and install, complete and ready for the intended use.

C. Furnish: Supply and deliver to the project site, ready for unpacking, assembly, and installation.

D. Install: Includes unloading, unpacking, assembling, erecting, installing, applying, finishing, protecting, cleaning, and similar operations at the project site to complete items of work furnished by others.

E. Following is a list of commonly used terms:

1. Active Equipment: Electronic equipment used to develop various WAN and LAN services.
2. Backbone: A collective term sometimes used to describe the campus and vertical distribution subsystem facilities and media interconnecting service entrances, communications rooms, and communications cabinets.
3. Bonding: Permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to safely conduct currents likely to be imposed on it.
4. Cabinet: Wall-mounted modular enclosure designed to house and protect electronic equipment.
5. Cable Tray: Vertical or horizontal open supports, usually made of aluminum or steel, that are fastened to a building ceiling or wall. Cables are laid in and fastened to the trays. A cable tray is not a raceway.

6. Campus: Grounds and buildings of a multi-building premises environment.
7. Channel: The end-to-end transmission path between two points at which application specific equipment is connected; may include one or more links, cross-connect jumper and/or patch cords, and work area station cords. Does not include connections to active equipment.
8. Cross-Connect: Equipment used to terminate and tie together communications circuits.
9. Cross-Connect Jumper: A cluster of twisted-pair conductors without connectors used to establish a circuit by linking two cross-connect termination points.
10. District Representative: Persons employed directly by the District (Staff), personnel of a third-party Construction Management firm that is contracted by the District, and/or personnel of a third-party Consulting firm that is contracted by the District.
11. Fiber Optic Distribution Unit (FDU): Cabinet with terminating equipment used to develop fiber optic cross-connect facilities. Also known as LIU.
12. Grounding: a conducting connection to earth, or to some conducting body that serves in place of earth.
13. Hinged Cover Enclosure: Wall-mounted box with a hinged cover that is used to house and protect electrical devices.
14. Horizontal: Pathway facilities and media connecting the MDF or IDF to Telecommunications Outlets.
15. Intermediate Distribution Frame (IDF): Data networking equipment rack and/or location that serves an individual area, floor or building. Downstream from the MDF.
16. Jack: Receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight-position/eight-contact modular jacks.
17. Link: A transmission path between two points, not including terminal equipment, work area cables, and equipment cables; one continuous section of conductors or fiber, including the connecting hardware at each end.
18. Local Area Network (LAN): Data transmission facility connecting several communicating devices, typically Ethernet and the network is limited to a single campus.
19. Main Distribution Frame (MDF): Initial (main) data network equipment rack and/or location. Only one MDF occurs per site and may serve many downstream IDFs.
20. Media: The type of cable (e.g., twisted-pair, coaxial, or fiber optic) used to provide signal transmission paths.
21. Minimum Point of Entry (MPOE): The location where the service provider hands off connection and responsibility for service to on-premise customer owned equipment.
22. Modular plug: An eight-position, eight-conductor end-of-wire electrical connector used with Category rated cable.
23. Passive Equipment: Non-electronic hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, wiring blocks, FDUs, etc.
24. Patch Cord: A length of copper or fiber cable with connectors on both ends used to join communications circuits at MDF/IDF and end stations.
25. Patch Panel: System of terminal blocks or connectors used with patch cords that facilitate the administration of cross-connect fields.
26. Pathway: Facility for the placement of communications cable. A pathway facility can be composed of several components including conduit, wireway, cable tray, surface raceway, underfloor systems, raised floor, ceiling support wires, etc.
27. Protectors: Electrical protection devices used to limit foreign voltages on metallic communications circuits.

28. Raceway: An enclosed channel designed expressly for holding wires or cables; may either conductive metal or insulating plastic. The term includes conduit, tubing, wireway, underfloor raceway, and surface raceway; does not include cable tray.
29. Rack: An open or enclosed structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment rack. Maybe freestanding and floor mounted or a wall mounted cabinet. Industry standard 19" width spacing.
30. Wiring Block: Punch down terminating equipment used to develop twisted pair cross-connect facilities.

1.04 PRODUCT AVAILABILITY

A. Products with long delivery lead times are to be brought to the attention of the District's representative.

1.05 PRODUCT SUBMITTALS

A. See Division 01 Submittals for more requirements

1.06 SUBSTITUTION LIMITATIONS

A. Equivalent product(s) may be considered for substitution for those products specified, however, the equivalent product(s) must be approved, and show demonstrated and documented equivalence to the product(s) specified. Documentation includes, but is not limited to, product samples, data sheets, and actual test data. The request for product substitution, and supporting documentation, must be submitted to the District's representative in writing.

B. See Division 01 Substitutions for more requirements

1.07 QUALITY ASSURANCE

A. The Contractor is to conform to requirements of the latest adopted version of the CEC with amendments by local AHJs.

B. The Contractor is to conform to the latest adopted version of the CBC with amendments by local AHJs.

C. The Contractor is to obtain and pay for electrical permits, plan review, and inspections from local AHJs.

D. The Contractor is to furnish products listed by UL or other testing firm acceptable to AHJ.

E. The Contractor is to conform to requirements of the Service Providers (i.e., electric, telephone, broadband and cable television).

F. Contractor Qualifications:

1. The Contractor shall have a minimum of five years' direct experience with the product they are installing. Installation technicians shall be certified and with a minimum of three years' direct experience with the product they are installing.
2. The Contractor shall maintain a local (within 50 miles of District) service facility which stocks spare devices and/or components for servicing systems.
3. The Contractor shall have performed successful installation of at least three projects similar in scope and size. The Contractor must be able to provide project references for these three projects, including scope of work, project type, owner/user contact name and telephone number.
4. For sections requiring installation personnel to be certified by the manufacturer, the Contractor selected for this project shall provide current certificates for all technicians working on the project.
5. The Contractor shall hold and maintain a valid California C-7 or C-10 State Contractors License and can exhibit validity upon request.
6. The Contractor shall provide a list of test equipment proposed for use in verifying the installed integrity of systems installed.
7. The Contractor shall provide the resume for the Contractor's Project Manager and on-site Installation Supervisor who will be assigned to this project.
8. The Contractor shall provide a list of technical product training attended by the contractor's personnel that will install the specified manufacturer system.
9. The Contractor shall provide a list of Sub-Contractor(s) who will assist the Contractor in the performance of this work.

1.08 SEQUENCING AND SCHEDULING

A. For the proper execution of the work, the Contractor shall cooperate with other tradecrafts and contracts as needed.

B. To avoid installation and scheduling conflicts, the Contractor shall thoroughly examine the complete set of Contract Documents and resolve any conflicts the District's representative prior to installation.

1.09 SHOP DRAWINGS

A. Shop Drawings: When required by individual Specification Sections, the Contractor shall provide shop drawings which include physical characteristics, electrical characteristics, device layout plans, point-to-point wiring diagrams for all connections, and the like. Refer to individual Specification Sections for additional requirements for the shop drawings.

1.10 WARRANTY

A. The Contractor shall provide an extended manufacturer's warranty on the Backbone and Horizontal Communications systems as specified in other sections of Division 27.

1.11 CLOSE OUT DOCUMENTS

A. The Contractor shall provide final coordination drawings, with as-built information added, which are to be submitted as record drawings at completion of project.

B. Red-Line Drawings. The Contractor shall provide a clean set of Construction Drawings marked in red with the following:

1. All installation changes and deviations from the Construction Drawings (including all Addendums and change order documents).
2. All exact routes of installed pathways (sleeves, conduit, surface raceway, etc.).
3. Exact location of racks, cabinets, control panels, and the like.

C. Operation and Maintenance Documentation: The Contractor shall provide copies of certificates of code authority acceptance (i.e. Fire Alarm IOR), product data, guarantees, warranties, installation guides, maintenance guides and the like.

D. Inspection and/or testing: The Contractor shall submit testing reports for testing that was required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Contractor shall provide like items from one manufacturer, such as wire/cable, jacks, modular plugs, patch panels, equipment connection cords, wall plates, and the like. See individual sections for detailed information.

2.02 MATERIALS

A. The Contractor shall provide new materials of the type and quality detailed, listed by UL, bearing their label wherever standards have been established. Indicated brand names and catalog numbers are used to establish standards of performance and quality.

B. The Contractor shall provide material and equipment that is acceptable to AHJ as suitable for the use indicated. For example, provide plenum rated cables in ceilings that are utilized as air return plenums.

C. The Contractor is responsible for a complete and operable system and shall provide all incidental materials and accessories not specifically mentioned herein or noted on Drawings but needed for a complete and operable system, that is satisfactory to the District.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Construction Documents:

The Construction Drawings are diagrammatic with symbols representing Division 27/28 equipment, outlets, accessories, wiring etc.

2. The Contractor shall examine the entire set of Construction Drawings to avoid conflicts with other systems. The Contractor shall determine the exact route and installation of wiring and equipment and coordinate with other trades and/or construction conditions.

3.02 INSTALLATION

A. The Contractor shall install Division 27/28 equipment completely as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of the equipment and examine the instructions thoroughly. When requirements of the installation instructions conflict with the Contract Documents, request clarification from the District's representative prior to proceeding with the installation.

B. The Contractor shall not install equipment and/or wiring in obvious passages, doorways, scuttles, or crawl spaces, which would impede or block the passage's intended usage.

C. The Contractor shall not install equipment in locations where it would obviously be subject to damage during normal use.

3.03 FIELD QUALITY CONTROL

A. Tests: The Contractor shall conduct tests of equipment and systems to demonstrate compliance with requirements specified in Division 27/28. Refer to individual Specification Sections for required tests. Testing documentation is to be included in Closeout Documents.

3.04 CLEANING

A. The Contractor shall remove all dirt and debris caused by the execution of the work in all cabinets, surfaces and floors.

B. The Contractor shall leave the entire Division 27/28 systems installed under this Contract in a clean, dust-free, and proper working order.

C. The Contractor shall clean interiors of new and modified equipment enclosures.

END OF SECTION

SECTION 27 05 00

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This section specifies the basic materials and methods for all low voltage pathways installation work included under Division 27 and 28. Where those requirements differ from the requirements of this section, the more stringent shall govern.

B. This section adds refinements to Division 26 that apply to Division 27/28 communications and low-voltage systems.

1.02 SCOPE

A. Materials and/or methods for the following.

1. Communication services
2. Grounding
3. Fasteners
4. Hangers and supports
5. Conduits/Backboxes/Raceways
6. Underground
7. Sleeves and penetrations

1.03 SUBMITTALS

A. Submittals shall be made in accordance with District submittal procedures, see Division 01 Submittals for requirements.

1.04 RELATED REQUIREMENTS

A. Division 07 – Thermal and Moisture Protection

B. Section 09 91 00 - Painting

C. Division 26 – Electrical

D. 27 00 00 – Communications Basic Requirements

1.05 REFERENCES

A. ANSI American Nation Standards Institute

B. NFPA 70 – National Electrical Code

C. UL Underwriters Laboratory

D. California Building Code (CBC)

E. California Electrical Code (CEC)

1.06 WARRANTY

A. Refer to Division 01 -– Warranties

PART 2 – PRODUCTS

2.01 All products used on this project shall bear the label of- and be approved by Underwriters Laboratories unless otherwise approved in writing by the District's representative. See Appendix A for pre-approved materials.

2.02 GROUNDING BUS BAR

A. Copper bus bar 2"x10"x1/4" minimum size with stand-off brackets and insulators, pre-drilled and threaded mounting holes (hole qty. 12 or greater) for equipment grounding lug attachment. Approved Manufacturer is Chatsworth Products.

2.03 FASTENERS

A. Mounting hardware and anchors recommended by the manufacturer of any material that shall be mounted to the building or structure.

1. Sheet rock / drywall / wall board: Easy Anchor, toggle bolt, other spread type anchor with load distribution, or approved equivalent.
2. Concrete / cinder block / solid masonry: Expanding compression type lag, expanding compression type bolt, expanding compression type, all-thread with nuts, or approved equivalent.
3. Tile / Stucco / hollow masonry: Toggle bolts or approved equivalent.
4. Wood: Lag screws, wood screws, or approved equivalent.
5. Metal: Beam clamps, sheet metal screws, self-drilling screws or approved equivalent.

2.04 CABLE HANGERS AND SUPPORT

A. D-Rings

1. Commercial grade

B. J-Hooks (For bundles of 24 cables or less)

1. Commercial grade (See Appendix A)
2. Colored coded by system:
   a. No color = Data
   b. Orange = Fiber optic cables and service provider feeders
   c. Blue = CCTV, Electronic Access Control, and Intrusion
   d. Yellow = Audio-Visual (non-data)
   e. Green = EMS and lighting controls
   f. Red = Fire Alarm

2.04 SURFACE RACEWAY

A. The District has standardized the use of Wiremold 800, 2300, 5400 and 5500 series for non-metallic surface raceway.

2.05 CONDUITS AND ACCESSORIES

A. CONDUITS

1. See Division 26 for additional requirements.
2. For new construction, exposed Fire Alarm pathways to be in red painted conduit.
3. All new conduits shall be sized accordingly to achieve a 40% maximum fill ratio with initial cables installed.
4. Underground conduits shall be Schedule 40 PVC.

B. INNERDUCT

1. Orange corrugated HDPE (High Density Polyethylene) Innerduct shall be used for fiber optic cable protection in interior locations.
2. Fabric multi-cell innerduct is approved for underground conduits 2” and larger.

C. FITTINGS:

1. See Division 26 for additional requirements.
2. Commercial grade.
3. Compression type.
4. Conduit bodies and any other sharp bend fittings are strictly prohibited for communication Cat6A and fiber optic cables. Appropriate conduit sweeps are required.

B. PULL LINE

1. Minimum 1/8" diameter or larger braided line of polypropylene or continuous fiber polyolefin. The minimum breaking strength of 1/8 in. line is 200 lbs.

C. SLEEVES

1. All conduit sleeves shall be of sufficient quantity and size to achieve a 40% maximum fill ratio with initial cables installed.

2. Penetrations through rated assemblies to use EZ-Path or an approved equal.

2.06 CABLE TRAYS

A. Cable trays (For cable bundles of 25 or more)

B. For above ceilings wire basket cable trays are approved and an approved manufacturer is SnakeTray.

C. For exposed areas, solid cable trays are required and an approved manufacturer is MonoSystems.

2.07 BACKBOXES AND JUNCTION BOXES

A. Galvanized one-piece or welded pressed steel type. Boxes for fixtures shall not be less than 4” square and shall be equipped with fixture stud. Boxes shall be at least 2-1/8” deep, 4” square for 1 or 2 gang devices, with device rings. Boxes mounted in wall or ceiling finished with 5/8” gypsum board shall be furnished with 5/8” deep device rings. Provide blank cover for all boxes without fixture or device. 4 11/16 and/or 5” square back boxes may be required for larger cable requirements.

B. Junction boxes, larger than 8”, located indoors shall be hinged, NEMA-1 rated.

C. Junction boxes, larger than 8”, located outdoors, or in wet or damp locations shall be hinged, NEMA-3R.

D. Provide and install tamper-proof screws for all exterior box lids.

E. Junction boxes used for Fire Alarm systems are to be red in color with red colored cover plates.

2.08 GROUND BOXES

A. See Division 26 and below for additional requirements.

B. Approved manufactures are Jensen, Christy or approved equivalent.

C. All ground boxes shall have metal traffic-rated lids with permanent factory markings

Division 27/28 Ground Boxes

Item	MFG1	MFG1 P/N	MFG2	MFG2 P/N	Access Control	DIV 27/28 Pathway	Comcast	AT&T	Lid Label
10” Round Ground Box Traffic Rated Bolt Down Lid	Jensen	HTV10-5	Christy	G05	A				None
10”x17” Rectangular Ground Box Traffic Rated Metal Lid	Jensen	HT1017	Christy	B1017		B			Comm
17”x30” Rectangular Ground Box Traffic Rated Metal Lid	Jensen	HT1730	Christy	B1730		C	1	1	Comm
24”x36” Rectangular Ground Box Traffic Rated Metal Lid	Jensen	HT2436	Christy	B2436		D	2		Comm
24”x36” Rectangular Ground Box Traffic Rated AT&T	Jensen	100010927						3	AT&T

Notes:

A – At Access Controlled Gates Requiring 2 or 3 Post Connections

B – For Special LV Pathway Max Conduits: 2 – 1” From 3 Sides (6 Total)

C – For LV Backbone Pathway Max Conduits: 4 – 2” From 2 Sides (8 Total)

D – For LV Backbone Pathway Max Conduits: 4 – 2” From 3 Sides (12 Total)

1 – 17”x30” Acceptable for Service Feed (Comcast/AT&T) Midspan Pull Box

2 – 24”x36” Acceptable for Comcast Service Entrance Splice Box

3 – 24”x36” Acceptable for AT&T Service Entrance Splice Box

2.09 PENETRATION SEALING

A. Firestopping: Provide UL Listed firestopping materials for all penetrations through rated assemblies (walls / floors). See Division 07 for more information. Approved manufacturers are Hilti and Specified Technologies Inc.

B. Draft stopping: Use foam sealant around conduit penetrations (in non-rated assemblies) to prevent passage of air, smoke, and/or toxic gas. See Division 07 for more information.

C. Weatherproofing: Use weatherproof sealant around conduit penetrations in exterior walls to prevent the intrusion of water. See Division 07 for more information.

PART 3 – EXECUTION

3.01 COMMUNICATION SERVICES

A. Install inground boxes, conduits, and terminal cabinets according to the service provider requirements.

3.02 GROUNDING

A. Ground fittings shall be UL approved for each application and installed and/or connected to system in accordance with current CEC Code requirements.

B. See Division 26 for additional requirements.

C. Install one grounding bus bar per manufacturer's instructions in each MDF and IDF.

3.03 CABLE HANGER AND SUPPORTS

A. Install J-hook cable hangers and supports per manufacturer's written instructions.

B. J-hook cable hanger spacing shall be 48" or less and within 12" of sleeves and/or junction/back boxes.

C. Install J-hooks pathways perpendicular/parallel to building structure – no diagonal runs.

3.04 LOW VOLTAGE PATHWAY/RACEWAYS

A. EMT conduits may be used at following locations (see Division 26 for additional requirements):

1. In dry locations in furred spaces.
2. In partitions other than concrete or solid masonry.
3. In protected exterior locations not exposed to direct weather.

B. Rigid steel conduit and fittings shall be used for vertical risers and on top of all roofs, overhangs, walkways, canopies, or any other location exposed to direct weather. See Division 26 for additional requirements.

C. Furnish and install pull lines in all unused (empty) conduits or raceways. All pull lines shall be permanently tagged with identification at both ends.

D. Install exposed conduits neatly, parallel to or at right angles to structural members. Maintain a minimum of 12 inches of clearance from steam or hot water pipes. All installed strut channel supports should allow for future conduit attachments. The width of strut channel to match the width of the closest attached junction box. See design document details for attachment requirements.

F. Supports: Support conduit with two-hole straps or strut channel where shown in design documents and/or specified. Coordinate supports with architectural details. Secure to wood structure by means of bolts or lag screws, to metal by means of shallow self-tapping screws, to concrete by means of insert or expansion bolts, to brickwork by means of expansion bolts, and to hollow masonry or stucco by means of toggle bolts.

G. Spacing for all EMT and rigid steel conduit supports shall be as follows, unless otherwise specified in design documents details:

1. Surface conduit spacing and supports and unless otherwise specified or shown on drawing details:
   a. EMT – Size 3/4" to 2" – 4' maximum spacing (3 each supports per 10' conduit length) and 12" from each end of conduit at coupling, connector, or 90-degree bend.
   b. Rigid steel – Size 3/4" to 2" – 4' maximum spacing (3 each supports per 10' conduit length) and 12" from each end of conduit at coupling, connector, or 90-degree bend.

H. If conduit is designated for low voltage use, no more than a total of 360 degrees of conduit bend radius will be allowed between pull/junction boxes.

I. All junction boxes shall be connected to conduits using appropriate connecting hardware (i.e. box connectors).

J. Clean, prep and paint with existing matching wall color all exposed conduit, junction boxes, channel strut, fittings, and accessories.

K. Non-metallic raceway to be installed with mechanical fasteners only, do not remove adhesive tape backing.

L. Capping

1. Cap conduits with manufactured seals during construction. Swab out conduits before installing wires.
2. Cap all empty conduits below grade and in pull boxes with manufacturer's caps to prevent entrance of debris; attach pull string to cap.

M. Underground Conduit

1. Service provider conduits shall be:
   a. AT&T – one ea. 4"

b. Comcast – two ea. 2” (one spare)

2. #10 tracer wire or tracer tape is required for all underground Division 27/28 PVC conduits.
3. Before pulling any conductors into an underground PVC conduit (new or existing), the conduit shall be first be proofed by pulling through a mandrel of a diameter ¼ in. smaller than the conduit inside dia., followed by a swab of the same diameter as the conduit inside diameter. IOR to witness the proofing of underground PVC conduits.

3.05 J-BOXES

A. Screws shall be used to attach boxes, and must be accurately placed for finish, independently and securely supported by adequate wood backing or by manufactured adjustable channel type heavy-duty box hangers.

1. Boxes shall be attached to metal studs with metal box hangers.
2. Boxes installed in masonry tile or concrete block construction shall be secured with auxiliary plates, bars, or clips, and be grouted in place.

B. Locate outlets at the following heights unless otherwise noted on Drawings, Specifications, current CBC, or as required to meet ADA handicap requirements.

1. Data Outlets: Same height as electrical outlets
2. Telephone Wall Outlets: Above counter/backsplash height or at electrical switch height.

C. Boxes shall be placed within 18” of electrical outlets.

D. For sound control, separate outlets on opposite sides of walls with a 16" minimum separation. Where outlets are less than 16" or in sound rated walls, seal airtight with fire rated sheet putty pads. Fill gap between junction box and wall with acoustic sealant all around perimeter of junction box. Fill conduits larger than 1 1/4" with fire rated putty.

E. Installation of conduit and outlet boxes in fire-resistive walls, floors, floor-ceiling or roof-ceiling assemblies shall comply with Title 24, Part 2, Section 713.

3.06 GROUND BOXES

A. To be installed per Division 26 requirements.

B. Provisions are to be made for supporting cables from the box sides (i.e., j-hooks, d-rings)

C. Install a 24” x 36” ground boxes for each service providers AT&T/Comcast/other at service tie-in location.

D. Maximum underground conduit bend degrees is 360°. Additional ground boxes are required to keep conduit bends under 360°.

E. 200’ is the maximum spacing between ground boxes.

F. 17”x30” ground boxes are acceptable for mid-span pull boxes for both AT&T and Comcast.

G. 17”x30” ground boxes are acceptable for 4 – 2” conduits from a maximum of 2 sides (8 conduits total).

H. 24”x36” ground boxes are appropriate for 4 – 2” conduits from 3 sides (12 conduits total)

3.07 CONDUIT PENETRATIONS AND SLEEVES

A. PENETRATIONS:

1. Where conduit passes through walls, ceilings, or floors, with connection points to junction boxes or raceways mounted to both sides of the same wall, provide a threaded conduit and secured in place with locking rings on both sides.
2. Where the conduit passes through walls, ceilings, floors with connection points to junction boxes or raceways not mounted to the same wall as the penetration, provide EMT conduit and secured in place with strut channel.
3. Penetrations through fire rated assemblies to use EZ-Path or an approved equal fire rated sleeves.

B. SLEEVES

1. Conduit sleeves are to extend 6” past wall surface and be securely attached to the building structure, with plastic bushings on both ends.
2. Sleeves through fire rated assemblies to use EZ-Path or an approved equal fire rated sleeves and to be installed per manufacturer’s instructions.

C. FIRE STOPPING

1. Seal all conduit penetrations through fire-rated walls and floors in a manner that is fire and smoke tight in conformance with current CBC and current CEC. See Division 07 for more information.

D. DRAFT STOPPING

1. All non-fire-rated walls must be draft-stopped and sealed. Submit method to be used for approval the District’s representative Mineral wool is one product that may be used. See Division 07 for more information.

E. WEATHER SEALING

1. All exterior penetrations shall be sealed watertight. The contractor shall use silicone rubber caulk or other approved methods and materials. Submit methods and materials to the District’s representative. See Division 07 for more information.

3.08 CLEANING

A. Clean all work prior to concealing, painting, and acceptance. Performed in stages if directed.

B. Clean and repair soiled or damaged painted exposed work before final acceptance in a manner to match adjoining work.

C. Remove debris from inside and outside of equipment and enclosures.

3.09 PAINTING

A. Paint exposed conduit and j-boxes occurring in finished areas with existing matching wall color. See 09 91 00 – Painting

3.10 FINAL DOCUMENT SUBMITTALS

A. See 27 00 00 for more information.

APPENDIX A – Pre-Approved Materials

DESCRIPTION	MANUFACTURER	PART NUMBER
Non-metallic Surface Raceway	Legrand/Wiremold	2300 Series
Non-metallic Surface Raceway	Legrand/Wiremold	5400/5500 Series
Fire Rated Sleeve	Specified Technologies Inc.	EZ Path
Fire Rated Sealant	Specified Technologies Inc. Hilti	SpecSeal products CFS products
Conduit, Fittings, J-Boxes	Commercial grade from local electrical supply companies.	Commercial grade from local electrical supply companies.
J-Hooks	Nvent Cooper	Caddy Series B-Line Series

END OF APPENDIX A

END OF SECTION

SECTION 27 10 00

STRUCTURED CABLING

PART 1 – GENERAL

1.01 SUMMARY

A. This section specifies equipment, accessories, materials, installation, configuration, and testing requirements for a complete and operable Structured Cabling communications system. The system shall provide highly reliable and high-performance data communication from main distribution frame (MDF) through each intermediate distribution frame (IDF) to end points requiring fiber optics and/or copper cabling and associated equipment.

B. This section condenses sections 27 11 00 – Communications Equipment Room Fittings, 27 13 00 – Communications Backbone Cabling, 27 15 00 – Communications Horizontal Cabling and 27 16 00 – Communications Connecting Cords into one comprehensive section.

1.02 SCOPE

A. The work will include but not be limited to the following objectives:

1. Contractor shall furnish and install all required components and accessories as outlined in the design documents for a complete and operable turn-key system.
2. Quality workmanship is a high priority for the District and the Contractor shall be held to a high-level of professional workmanship. Contractors unfamiliar with the District's standards shall familiarize themselves with the standards and requirements prior to beginning work
3. The Contractor shall furnish and install fire-treated ¾" (three quarter inch) plywood for the MDF room (all walls, from floor level to 8' high) and IDF locations (as required or indicated in the design documents).
4. The Contractor shall furnish and install a ground bus bar at the MDF and IDF rooms.
5. The Contractor shall furnish and install all required racks and cabinets.
6. The Contractor shall furnish and install all newly required conduit/raceway.
7. The Contractor shall furnish and install all wire/cable (copper/fiber optic) as required.
8. The Contractor shall terminate all strands of fiber at each fiber enclosure.
9. The Contractor shall furnish and install termination at all end-point equipment (patch panels, jacks, wallplates, enclosures, etc.).
10. The Contractor shall furnish and install all patch cords (copper/fiber).
11. The Contractor shall test and certify (for warranty) the installed cable plant.

1.03 RELATED REQUIREMENTS

A. Section 01 – General Requirements

B. Section 27 00 00 – Communications

C. Section 27 05 00 – Common Work Results for Communication Systems.

1.04 INDUSTRY GUIDELINES AND STANDARDS

A. California Electrical Code (CEC) – Current adopted version

B. California Building Code (CBC) – Current adopted version.

C. ANSI/TIA-568.0-D – Generic Communications Cabling for Customer Premises.

D. ANSI/TIA-568.1-D – Commercial Building Communications Cabling Standard Part 1: General Requirements.

E. ANSI/TIA 568-C.2 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards

F. ANSI/TIA 568.3-D – Optical Fiber Cabling Components Standard

G. ANSI/TIA-569-D – Commercial Building Standard for Telecommunications Pathways and Spaces.

H. ANSI/TIA-606-B – Administration Standard for the Commercial Telecommunications Infrastructure.

I. ANSI/JSTD-607-C – Commercial Building Bonding and Grounding (Earthing) Requirements for Telecommunications.

1.05 QUALIFICATIONS

A. The contractor shall possess a California C7 or C10 license.

B. The Contractor or Subcontractor shall have 5 years' documented experience.

C. The Contractor and installers shall be certified by the product manufacturer.

1.06 SYSTEM REQUIREMENTS

A. Any new installations or existing system modifications shall seamlessly integrate into the site's existing data cable plan system.

1.07 CONTRACTOR "SHOP DRAWINGS" DESIGN REQUIREMENTS

A. See section 27 00 00 for requirements.

1.08 SUBMITTALS

A. See section 27 00 00 for requirements.

1.09 WARRANTY

A. Refer to Division 01 Warranty section.

B. See section 27 00 00 for additional requirements.

C. 25-year manufacturer's warranty/certification required for all copper and fiber cable plant installations.

1.10 CLOSEOUT DOCUMENTS

A. See section 27 00 00 for requirements.

PART 2 – PRODUCTS

2.01 GENERAL

A. See Appendix A at the end of this document for pre-approved materials.

B. All products shall be new, unused and without blemishes and shall be of manufacturer's current and standard production.

C. The Contractor shall confirm all equipment part numbers with the District's representative prior to ordering equipment and updating submittals as required.

D. The Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. The Contractor shall provide all components needed for complete and satisfactory installation and operation.

E. The Contractor shall install mounting hardware and anchors as recommended by the Manufacturer of the equipment that requires mounting to the building or structure and adhere to all code requirements. See section 27 05 00 for requirements.

F. Product Availability

1. The Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.

2.02 MANUFACTURERS AND PRODUCTS

A. See Appendix A at the end of this document for pre-approved materials.

B. Product Substitutions require proof of equivalence and approval by District's representative. Substitution requests to be submitted in writing.

C. For maintenance and consistency with the existing installed base, data connectivity components (copper and fiber) shall be Superior Essex cable and Ortronics connectivity.

2.03 COPPER/FIBER OPTIC CABLES AND COMPONENTS

A. All copper cables and components shall be Cat6A rated.

1. Cable to be reduced diameter. White jacket for default cable, Blue jacket for CCTV and Access Control only.
2. Jacks to be keystone style.
3. All cables shall be terminated on keystones at IDF/MDF end. No modular plug terminations are permitted at IDF/MDF locations.
4. Outside plant (OSP) Category cable is acceptable for data drops that cannot be attached to a building (i.e. AP and cameras on light poles, irrigation controllers, monuments, etc.) and must be serviced by underground conduits. Standard data drops shall not utilize OSP Category cables (unless approved by the District's representative in writing).

B. Patch cords system/color:

1. Data = White color
2. AP = Green color (2 ea. req'd at each AP)
3. CCTV = Blue color
4. Clock/Intercom = Yellow color
5. Access Control = Black color
6. Fire Alarm/Intrusion Alarm = Red color

C. Patch cord length

1. At patch panel 6" typical or no more than 12" slack.
2. Station-side patch cords to be 10' in length.

D. Data jacks system/color:

1. Data/default = White color
2. AP = Green color
3. CCTV = Blue color
4. Clock/Intercom = Yellow color
5. Access Control = Black color
6. Fire Alarm/Intrusion Alarm = Red color

E. Fiber Optic Cable:

1. Minimum strand count is 24.
2. All fiber optic cables and components shall be single single-mode OS2 rated.

3. Fiber optic cable terminations shall be LC-Duplex style.

PART 3 – EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. The components making up the structure cabling system shall only be installed by Contractors who are qualified to install, service and maintain the system.

B. Cable terminations (copper or fiber) shall be installed by manufacturer-certified technicians.

C. The Contractor (or subcontractor listed at time of bid) must have at least five (5) years' experience before the Bid Opening Date.

3.02 EXAMINATION

A. The Contractor shall be required to visit the installation site(s) prior to job bidding. The Contractor acknowledges that the failure to visit the site(s) will not relieve the Contractor of the responsibility for accurate bidding and performance of the Work.

B. The Contractor shall report any discrepancies between the Specifications, Drawings, and Site Examination prior to the Bid Opening Date.

3.03 PREPARATION

A. The Contractor shall order all required parts and equipment upon receipt of approved product submittals.

B. The Contractor shall verify the availability of power where required.

3.04 SHOP DRAWINGS

A. The Contractor shall create "Shop Drawings" per section 27 00 00 for this section.

B. Submit drawings for review and approval by the District's representative.

3.05 INSTALLATION

A. ENTRANCE FACILITIES

1. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and housing when so directed by service provider.
2. Install underground or aerial pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.

B. UNDERGROUND ENTRANCE PATHWAY

1. Install the underground entrance pathway complying with Division 26.

C. EQUIPMENT RACKS, CABINETS, ENCLOSURES AND ACCESSORIES

1. Backboards:
   a. Shall be installed behind the rack or cabinet if the cabinet is not able to be directly attached to two vertical wall studs.
   b. Backboards shall be made of fire retardant or treated materials, squarely cut, and with sanded edges
   c. Backboards shall be a minimum ¾" thick and large enough to secure it to two vertical wall studs.
   d. The "FIRE RATED" stamp shall be visible.
   e. Backboards shall be fastened with ¼" lag bolt and washer, non-recessed, with maximum spacing of 18" into 2 vertical studs, 1-1/2" embedment, or otherwise per DSA-approved anchorage details.
   f. Visible portions (outside of cabinet) of Backboards shall be painted black or wall color per Architect.

2. All data & voice communications racks and cabinets shall be anchored in accordance with manufacturer's specifications, project specifications and/or drawn details, to walls and floors and grounded to building ground grid (not to water pipes etc.).
3. Securely mount equipment cabinet and racks to the building structure. A proper quantity of support fasteners shall be utilized. Typically lag bolts for wood installations, wedge anchors for concrete flooring. Submit data sheets for mounting fasteners for approval before installation. Mount equipment per DSA approved drawings/details.
4. Equipment cabinet mounted on or against walls will have 3-foot clearance in front of deepest component and accessible to rear for service.
5. MDF and all IDFs shall have at least one dedicated 120VAC 20-amp quad-receptacle each.
6. Patch Panels: Mount patch panels into the cabinet/rack. Match manufacturer of existing install or if new construction, see Appendix A.
   a. Patch panel ports shall be grouped by Room and then by System (General Data, Intercom, AP, Other). Label the patch panel with the first port of each Room.
   b. Exterior devices shall be grouped with the closest adjacent interior space.
   c. Do not segregate patch panels by system unless specifically directed on the rack elevation.

7. Cable Management: Secure the cable bundle(s) to the rack strain relief and cable management behind the patch panels and cross connect block panels. Install horizontal cable management panels and brackets for routing and management of patch cables. Maintain TIA/EIA and BICSI standards on bundling, supporting and bend radius.
8. Surge Protected Outlet Strips: Required in MDF rack. Mount surge protected outlet strips per Manufacturer's directions. Refer to details on the Drawings for mounting location.

D. MDF/IDF GROUNDING

1. Refer to Section 27 05 00 Grounding for more requirements.
2. Locate the grounding bus bar to minimize the length of bonding conductors. Fasten to the wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 6 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
3. Bond metallic equipment (including ladder rack) to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.06 WORKMANSHIP

A. Quality workmanship is a high priority for the District and the Contractor shall be held to a high-level of professional workmanship.

B. The District's representative will have the authority to reject Work which does not conform to the Drawings and Specifications.

C. Comply with the highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.

D. Perform Work with persons experienced and qualified to produce workmanship specified.

E. Maintain quality control over suppliers and Subcontractors.

3.07 WIRE/CABLE (COPPER/FIBER OPTIC)

A. Design, layout, size, and plan new cable runs as required.

B. All wire and cable passing through metalwork shall be sleeved by an approved grommet or bushing.

C. Conduit/raceway fill shall not exceed 40 percent of interior cross-sectional area.

D. Neatly dress and tie (Velcro) all cabling.

E. UTP cabling shall conform to a 6-foot separation requirement from the main power panel, transformers, switchgear and/or starter motors adjacent to the MDF, IDF and termination locations.

F. Fiber optic cables shall be installed from the MDF to each IDF.

G. Orange corrugated HDPE (High Density Polythylene) Innerduct shall be used for fiber optic cable protection in all interior locations.

H. Spicing of fiber optic cable shall be done with fusion splices.

I. When required copper feeders (minimum 4-pair) are to be installed from the MDF to each IDF.

J. Maintain proper bend radius for all cable installations.

K. Do not exceed cable manufacturer's instructions for installation pull load. Any cable damaged by excessive pull force shall be replaced by the installation contractor.

L. Modular plug terminated link (MPTL) style wiring is acceptable for CCTV with modified single connector permanent link testing.

3.08 LABELING

A. Correct room numbering is critical, and labels shall match room signage. The Contractor shall verify all room numbers against the approved signage submittal prior to labeling.

B. MDF/IDF - Identification number in large font on front of cabinet.

1. The MDF shall be labeled MDF 1.00
2. IDF's shall be labeled sequentially beginning at IDF 1.01, then IDF 1.02, and so on.

C. MDF, Fiber Optic LIU Ports – IDF number and room number

D. MDF/IDF, Copper Patch Panel – Panels labeled P1, P2, P3, etc., ports labeled with room number.

E. LAN Outlet – IDF number, patch panel number, patch panel port number.

F. Cables to be labeled both ends with unique identifiers and from/to location identifiers. For Copper Cat cable IDF number, patch panel number, patch panel port number.

G. T-bar ceilings shall have device labels attached next to the device for ceiling mounted equipment and at the tile for above ceiling equipment with device type and device ID points/IP address.

3.09 CONDUIT AND RACEWAY INSTALLATION

A. See Division 26 and section 27 05 00 for additional requirements.

B. Conduit bodies and any other sharp bend fittings are strictly prohibited for communications cabling (copper/fiber).

C. Install proper radius conduit sweeps where required.

3.10 FIELD QUALITY CONTROL AND TESTING

A. All Fiber and Cat6a copper cable installations to be certified by testing with an certified test system that is approved by the manufacturer for warranty certification (typically a Fluke).

B. Submit the Record Drawings (as-builts) to the District's representative for review prior to inspection.

C. During the formal Test & Inspection (Commissioning) of the system, the Contractor shall have personnel available with tools and equipment to inspect wiring, devices, and system operation.

D. If corrections are needed, the Contractor will be provided with a Punch-List of all discrepancies. Perform the needed corrections in a timely fashion.

E. Notify the District's representative when ready to perform a re-inspection of the installation.

F. Provide 25-year manufacturer's warranty/certification documentation for all copper and fiber cable plant installations.

3.11 CLOSEOUT DOCUMENTS

A. See section 27 00 00 for requirements.

APPENDIX A – Pre-Approved Materials

DESCRIPTION	MFG	PART NUMBER
Wall Mount Cabinet 19U	Chatsworth Products	12419-736
Patch Panel 24-port 1-RU (Black)	Ortronics	OR-SPKSU24
Patch Panel Cable Management Support Bar	Ortronics	OR-CMBFR0RU
Faceplate, 2-port (White)	Ortronics	KSFP2-88
Faceplate, 4-port (White)	Ortronics	KSFP4-88
Surface Mount, 2-port (White)	Ortronics	KSSMB2
Faceplate, 1-port Phone Hanger (Stainless)	Legrand	WP3467WH
Cat6A Data Jacks (White)	Ortronics	KT2J6A-88
Cat6A Data Jacks (Green)	Ortronics	KT2J6A-45
Cat6A Data Jacks (Blue)	Ortronics	KT2J6A-36
Cat6A Data Jacks (Yellow)	Ortronics	KT2J6A-44
Cat6A Data Jacks (Black)	Ortronics	KT2J6A-00
Cat6A Data Cable, Plenum (White = default)	Superior Essex	6B-246-4B
Cat6A Data Cable, Plenum (Blue = CCTV/Access Control)	Superior Essex	6B-246-2B
Cat6A Data Cable, Indoor/Outdoor (Black)	Superior Essex	6B-272-ER
Cat6A Data Cable, OSP (Black)	Superior Essex	04-001-A8
Cat6A Patch Cord Slim (White) (12” typ.)	Quiktron	576A-RD25-0xx (xx = length)
Cat6A Patch Cord Slim (Blue) (12” typ.)	Quiktron	576A-RD10-0xx (xx = length)
Cat6A Patch Cord Slim (Green) (12” typ.)	Quiktron	576A-RD20-0xx (xx = length)
Cat6A Patch Cord Slim (Yellow) (12” typ.)	Quiktron	576A-RD15-0xx (xx = length)
Cat6A Patch Cord Slim	Quiktron	576A-RD35-0xx (xx = length)

(Black) (12" typ.)		
Fiber Optic LIU 1-RU	**Ortronics, Q-Series**	**EQ01U-CHC**
Splice Tray	**Ortronics, Q-Series**	**FST4-F012 w/ mounting bracket WQS-STB**
Fiber Optic Adapter	**Ortronics, Q-Series**	**OFP-LCQ24AC**
Fiber Optic LC Field Term Connector	**Ortronics**	**205KNF9SA-09**
Fiber Optic Cable 24-strand, Single-Mode OS2, Indoor/Outdoor	**Superior Essex**	**W4024K101**

END OF APPENDIX A

END OF SECTION

SECTION 27 21 00

DATA COMMUNICATIONS NETWORK EQUIPMENT

PART I - GENERAL

1.01 SUMMARY

A. This section specifies equipment, accessories, materials, installation, configuration, and testing requirements for a complete and operable data network system. The system shall provide reliable and high-performance data communication throughout the site.

1.02 SCOPE

A. The work will include but not be limited to the following objectives:

1. Provide, coordinate, and install all required equipment, licenses, and accessories as outlined in the design documents for a complete and operable system.
2. Labor and Materials: The Contractor shall provide and pay for all labor, supervision, materials, accessories, components, equipment, tools, utilities, construction equipment and machinery, transportation, and other facilities and services necessary for the proper execution, operation, and completion of a turn-key system to the District.
3. Data Communications Network Equipment: Includes, but is not limited to:
   a. Core Switch/Router
   b. Access Switches
   c. Wireless Access Points
   d. Licenses
   e. Uninterruptible Power Supplies (UPS)
4. Data Switches are to be programmed/configured by the contractor to the District's specifications. Contractors are responsible for retaining a Cisco-certified network engineer to complete this scope if they do not possess this capability in-house.

1.03 RELATED REQUIREMENTS

A. Division 01 - General Requirements

B. Section 27 00 00 - Communications

C. Section 27 05 00 - Common Work Results for Communication Systems.

D. Section 27 10 00 - Structured Cabling

1.04 QUALIFICATIONS

A. Contractor shall be located within 50 miles or less from the project site to support 2-hour response time.

B. Five years' experience installing data network equipment and systems.
C. Contractor shall have or retain a Cisco-certified network programmer.

1.05 SYSTEM REQUIREMENTS

A. Any new installations or existing system modifications shall seamlessly integrate into the site's existing data network infrastructure.

1.06 CONTRACTOR "SHOP DRAWINGS" DESIGN REQUIREMENTS

A. See section 27 00 00 for requirements.

1.07 SUBMITTALS

A. See section 27 00 00 for requirements.

1.08 WARRANTY

A. Refer to Division 01 Warranty section.

B. See section 27 00 00 for additional requirements.

1.09 CLOSEOUT DOCUMENTS

A. See section 27 00 00 for requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. See Appendix A at the end of this document for pre-approved materials.

B. All products shall be new, unused and without blemishes and shall be of manufacturer's current and standard production.
1. Cisco equipment shall be new, genuine, and obtained only from a Cisco-certified distributor. It shall carry the full Cisco standard warranty. Refurbished, remanufactured, recertified, and/or otherwise "grey" market equipment will be rejected.
2. Cisco "EDU" SKU's may not be substituted for their non-EDU equivalents. EDU products shall carry the enhanced EDU warranty, as applies.

C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory installation/operation.

D. Product Availability

1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
2. Subject to compliance with these specifications, products and systems included in this section are to be installed as specified by the manufacturer of the system or engineer approved equal.

2.02 EQUIPMENT

A. The District's preferred manufacturer for:

1. Core Switch / Router - Cisco
3. Networking Switches – Cisco
4. Wireless Access Points - Cisco
5. UPS – N1C

B. Substitutions require proof of equivalence and approval by District's representative.

C. All equipment shall be provided with Licenses as required for seamless integration with the District's network infrastructure.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. The equipment shall only be installed by Contractors who are qualified to install and maintain the system.

B. The Contractor (or subcontractor listed at time of bid) must have at least five (5) years' experience installing data network equipment before the Bid Opening Date.

C. The Contractor shall have or retain a Cisco-certified network programmer to carry out programming the Cisco network equipment to the District's specifications.

3.02 EXAMINATION

A. The Contractor shall be required to visit the installation site(s) prior to bidding for the job. The Contractor acknowledges that the failure to visit the site(s) will not relieve the Contractor of the responsibility for observing and considering those conditions which a Contractor would have observed and considered during a site visit, estimating properly the difficulty and cost of successfully performing the Work or proceeding to perform the Work without additional cost to District.

B. The Contractor shall report any discrepancies between the Specifications, Drawings, and Site Examination prior to the Bid Opening Date.

3.03 PREPARATION

A. The Contractor shall verify materials are readily available prior to submitting product submittals and notify the District's representative of long lead time items.

B. The Contractor shall order all required parts and equipment only after receipt of approved product submittals from the District's representative.

C. The Contractor shall coordinate with the District's representative for needed configuration information (templates, topology, hostnames, IP addresses, etc.) at least 4 weeks prior to configuration/installation.

3.04 SHOP DRAWINGS

A. The Contractor shall create "Shop Drawings" per section 27 00 00.

3.05 WORKMANSHIP

A. Quality workmanship is a high priority for the District and the Contractor shall be held to a high-level of professional workmanship.

B. The District's representative will have the authority to reject Work which does not conform to the Drawings and Specifications.

C. Comply with the highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.

D. Perform Work with persons experienced and qualified to produce workmanship specified.

E. Maintain quality control over suppliers and Subcontractors.

3.06 PATHWAY AND EQUIPMENT INSTALLATION

A. Equipment to be installed per manufacturer's instructions.

B. MDF/IDF locations with multiple switches shall utilize backplane stacking. Provide the necessary quantity of stack kits.

C. IDF locations with multiple switches shall utilize a PortChannel configuration with redundant fiber pairs back to the MDF. Provide (2) EA. SFP modules at the IDF side and (2) EA. SFP modules at the MDF side. Utilize the first fiber pair and the last fiber pair (strands 1, 2, and 23, 24) unless existing conditions require a different configuration.

3.07 EQUIPMENT COMISSIONING/CONFIGURATION

A. The Contractor shall install the equipment and patch in all connections.

B. The Contractor shall fully program and commission the network switches utilizing a District-provided configuration template. Standard commissioning includes:
   1. Updating the switch firmware to the current “golden image” as provided by Cisco.
   2. Loading the District-provided template configuration on each switch. Make appropriate updates for each switch’s unique hostname, IP address, VTP domain, and similar parameters.
   3. Identifying ports for systems requiring dedicated VLANs and configuring the ports for those VLANs.
   4. Performing basic connectivity and functionality tests.

D. Programming must be completed off-site at the Contractor’s facility or while directly connected to the equipment at the job site. VPN access will not be provided.

E. At least 4 weeks prior to system activation, provide a list of interior and exterior wireless AP MAC addresses correlated to room/location. Provide this list to the District’s representative in an electronic spreadsheet format.

F. All equipment is to be fully configured and tested for functionality by the Contractor prior to District acceptance testing.

3.08 LABELING

A. The contractor shall be responsible for labeling all newly-provided active equipment per District standard.

B. Correct room numbering is critical and labeling shall match room signage. The Contractor shall verify all room numbers against the approved door signage submittal prior to configuration/programming.

C. Network Switches

   1. ½” Label tape on front of switch, above SFP ports, with Host Name, IP address, and stack position (if applicable)
   2. Host Names shall follow the format

   <Site Code>-<IDF#>-<Location>-<Model>-<Ports>-<Stack>

   For example, Oak Ridge, IDF 1, Room A120, Cisco 9300, 48 port, two switch stack: ORIDGE-IDF1-A120-9300-48P-1-2

D. Wireless AP’s

   1. ½” label tape on center of AP, with Host Name
   2. Interior AP Host Names shall follow the format

   <Site Code>_AP_RM<location>_<last 4 of MAC address>

   Example: ORIDGE_AP_RMA101_XXXX
   3. Exterior AP Host Names shall follow the format

<Site Code>_AP_EXTRM<location>_<last 4 of MAC address>
Example: ORIDGE_AP_EXTRMA101_XXXX

3.09 FIELD QUALITY CONTROL AND TESTING

A. Upon reaching substantial completion, perform a complete test and inspection of the system. If found to be installed and operating properly, notify the District's representative of readiness to perform the formal Test & Inspection of the complete system by the District's representative. Make all adjustments/changes required from District's representative review.

B. Submit the Record Drawings (as-builts) to the District's representative for review prior to inspection.

C. During the formal Test & Inspection (Commissioning) of the system and have personnel available with tools and equipment to inspect wiring, devices, and system operation. Also have the programmer available to make programming configuration changes.

D. If corrections are needed, the Contractor will be provided with a Punch-List of all discrepancies. Perform the needed corrections in a timely fashion.

E. Notify the District's representative when ready to perform a re-inspection of the installation.

3.10 AS-BUILT DRAWINGS

A. See section 27 00 00 for requirements.

APPENDIX A – Pre-Approved Materials

DESCRIPTION	MFG	PART NUMBER
UPS (MDF 4-post) with network monitoring and external battery (2000VA, 50AH) 120VAC input	N1C	N1C.LR2000, N1C.L4850EBM2U (For 2 post rack mount only - add N1C.24RAILKIT)
UPS (IDF) with network monitoring (1000 VA) 120VAC input	N1C	N1C.L1000
UPS (IDF) with network monitoring (1500 VA) 120VAC input	N1C	N1C.L1500
1U Rack Mount Monitor	Tripp Lite	B021-000-19-HD2

END OF APPENDIX A

END OF SECTION

SECTION 27 51 23.50

EDUCATIONAL INTERCOM SYSTEMS

PART I – GENERAL

1.01 SUMMARY

A. This section specifies equipment, accessories, materials, wire, installation, configuration, and testing requirements for a complete and operable Intercom/Public Address/Bell system. This system shall provide the ability to bi-directionally communicate with an individual room, broadcast to defined speaker zone(s) and ring bell tones on a predefined schedule. For sites that utilize the small message board, this section will supplant the use of section 27 53 13 Clock Systems.

1.02 SCOPE

A. The work will include but not be limited to the following objectives:

1. Labor and Materials: The Contractor shall provide and pay for all labor, supervision, materials, accessories, components, equipment, tools, transportation, and other facilities and services necessary for the proper installation of a turn-key Assistive Listening system to the District.
2. The contractor will coordinate with the District's representative in writing for any needed information (i.e. IP addresses, etc.) 10 business days prior to the date the information is needed.

B. The District has standardized on Rauland Telecenter U equipment and the installing Contractor shall be Rauland Telecenter authorized.

C. For existing construction – provide and install all components and accessories to modify the existing system while maintaining code compliance and to seamlessly integrate the new components into the existing campus' system. Prior to beginning any work, the Contractor is responsible for identifying any existing system errors or faults and bring these issues to the attention of the District's representative.

D. The Contractor shall be responsible for programming the Rauland Telecenter Intercom System.

E. The Contractor shall coordinate with site staff for Bell schedule programming requirements.

F. The Contractor shall review the proposed final system programming, functionality and expectations with the District's representative prior to final programming.

G. After completion of the installation and pretest of the system a satisfactory final test of the entire system shall be made in the presence of the inspector of record (IOR) and/or the District's representative.

H. The Contractor shall adjust any speaker levels to the appropriate level as determined in system testing.

I. Existing systems shall remain operable until the new system is accepted and approved by the District's representative.

J. The Contractor is responsible for user/operator training (maximum 2 hours).

K. The Contractor shall complete all required project closeout documentation in a timely fashion.

J. The Contractor shall provide and install hardware required for the interoperability with other systems (i.e. Fire Alarm, Intrusion Alarm, Electronic Access Control, Mecho Shades, etc.).

1.03 RELATED REQUIREMENTS

A. Division 01 – General Requirements

B. Section 27 00 00 – Communications

C. Section 27 05 00 – Common Work Results for Communication Systems.

D. Section 27 10 00 – Structured Cabling

1.04 REFERENCES

A. See section 27 00 00 for requirements.

1.05 DEFINITIONS

A. See section 27 00 00 for requirements.

1.06 SYSTEM REQUIREMENTS

A. Any new installations or existing system modifications shall seamlessly integrate into the site's existing intercom system when applicable.

1.07 SUBMITTALS

A. See section 27 00 00 for requirements.

1.08 CONTRACTOR "SHOP DRAWINGS" DESIGN REQUIREMENTS

A. See section 27 00 00 for requirements.

B. Shop drawings are required for this section.

1.09 QUALIFICATIONS

A. The Contractor shall be located within 50 miles or less from the project site to support 2-hour response time.

B. Five (5) years' experience installing Rauland Telecenter equipment.

C. The contractor shall possess a California a C7 or C10 license.

D. The Contractor or Subcontractor shall be Rauland Telecenter authorized to provide and install equipment with 5 years documented experience.

1.10 CERTIFICATIONS

A. Installers for this project shall be manufacturer certified.

1.11 WORKMANSHIP

A. Quality workmanship is a high priority for the District and the Contractor shall be held to a high-level of professional workmanship.

B. The District's representative will have the authority to reject Work which does not conform to the Drawings and Specifications.

C. The Contractor shall comply with highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.

D. The Contractor shall perform the "Work" with persons experienced and qualified to produce the high-level workmanship specified.

E. The Contractor shall maintain quality control over suppliers and Subcontractors.

F. The Contractor shall be responsible for scheduling Subcontractors in a timely fashion.

1.12 WARRANTY

A. Refer to Division 01 Warranty section.

B. See section 27 00 00 for additional requirements.

1.13 CLOSEOUT DOCUMENTS

A. See section 27 00 00 for requirements.

PART 2 – PRODUCTS

2.01 GENERAL

A. The approved manufacturers for the project are:

1. Control unit and related accessories: Rauland Telecenter U
2. Speakers: See Appendix A for different installation types
3. Wire, cable, and accessories: See Appendix A.

B. All products shall be new, unused and without blemishes and shall be of manufacturer's current and standard production.

C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. The Contractor shall provide all components needed for complete and satisfactory installation and operation.

D. Product Availability

1. The Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
2. Subject to compliance with these specifications, products and systems included in this section are to be installed as specified by the manufacturer of the system or engineer approved equal.

2.02 EQUIPMENT

A. See Appendix A at the end of this document for pre-approved materials.

B. Substitutions require proof of equivalence and prior approval by District 's representative before ordering.

C. Main system components:

1. Rauland Telecenter U IP Campus Controller and software
2. Rauland Telecenter U Auxilliary Input/Output Module
4. Rauland Telecenter U IP Classroom Module
5. Rauland Telecenter U Administrative Console
6. Rauland Telecenter U Program Line Input Module

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. The equipment shall only be installed by Contractors who are qualified and certified by the manufacturer to install and maintain the system.

B. The Contractor (or subcontractor listed at time of bid) must have at least five (5) years' experience installing educational intercom equipment before the Bid Opening Date.

3.02 EXAMINATION

A. The Contractor shall be required to visit the installation site(s) prior to bidding the job. The Contractor acknowledges that the failure to visit the site(s) will not relieve the Contractor of the responsibility for observing and considering those conditions which a Contractor would have observed and considered during a site visit, estimating properly the difficulty and cost of successfully performing the Work or proceeding to perform the Work without additional cost to District.

B. The Contractor shall report any discrepancies between the Specifications, Drawings, and Site Examination prior to the Bid Opening Date.

3.03 PREPARATION

A. The Contractor shall verify materials are readily available prior to submitting product submittals and notify the District's representative of long lead time items.

B. The Contractor shall order all required parts and equipment only after receipt of approved product submittals from the District's representative.

C. The Contractor shall submit and receive approval for shop drawings prior to work commencement.

D. The Contractor will coordinate with the District's representative in writing for any needed information (i.e. IP addresses, etc.) at least 3 weeks prior to date the information is needed.

3.04 PATHWAY INSTALLATION

A. See Division 26 and Section 27 05 00 for requirements and more information.

B. Existing Construction:

1. Refer to design documents.
2. Surface raceway and components shall be Wiremold 2300.

3.05 EQUIPMENT INSTALLATION

A. Equipment to be wired and installed per manufacturer's instructions.

B. The Contractor shall coordinate with the District's representative and provide a spreadsheet of all device MAC addresses indexed by device location for the programming of reserved IP addresses for each device.

C. Installation shall be in accordance with applicable codes (i.e. NEC, NFPA 72) local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

D. Perform all Work as indicated in the Drawings and Specifications.

E. All low voltage cables shall be kept away from power circuits.

F. Contractor shall provide programming and configuration of the Educational Intercom system for full functionality.

G. Contractor shall maintain a complete, up-to-date backup of the system configuration. Backup shall be maintained throughout the programming period until final Acceptance by the District's representative. Submit back-ups to the District's representative upon Final Acceptance.

3.06 LABELING/SCHEDULES

A. The Contractor shall verify all room numbers against the approved signage submittal prior to labeling.

B. All labels are to be machine generated black letters on white adhesive label stock that is appropriate for the installation environment (interior/exterior).

C. Label all standard speaker cables with port ID.

D. Label all speakers with speaker ID.

E. Label all IP speakers with MDF/IDF, patch panel and jack numbers.

3.07 CONFIGURATION

A. All equipment to be fully configured and tested for functionality prior to testing.

B. Correct room numbering is critical for configuration/programming and labeling shall match room signage. The Contractor shall verify all room numbers against the approved signage submittal prior to configuration/programming.

3.08 FIELD QUALITY CONTROL AND TESTING

A. Upon reaching substantial completion, perform a complete test and inspection of the system. If found to be installed and operating properly, notify the District's representative of your readiness to perform the formal Test & Inspection of the complete system.

B. Submit the Record Drawings (as-builts) to the District's representative for review prior to inspection.

C. During the formal Test & Inspection (Commissioning) of the system the Contractor shall have personnel available with tools and equipment to inspect wiring, devices, and system operation.

D. If corrections are needed, the Contractor will be provided with a Punch-List of all discrepancies. Perform the needed corrections in a timely fashion.

E. Notify the District's representative when ready to perform a re-inspection of the installation.

F. The District's representative to provide final sign-off for acceptance.

3.09 AS-BUILT DRAWINGS

A. See section 27 00 00 for requirements.

B. As-built riser diagram showing all access control components for site.

3.10 TRAINING

A. For new systems provide 8-hrs end-user training.

B. For existing system upgrades provide 2-hrs end-user training.

APPENDIX A – Pre-Approved Materials

DESCRIPTION	MFG	PART NUMBER
IP Campus Controller and software/licenses	**Rauland Telecenter U**	**TCC2000**
Administrative Console	**Rauland Telecenter U**	**TCC2045**
Auxiliary Input/Output Module	**Rauland Telecenter U**	**TCC2033**
Universal Rack Mounting Kit	**Rauland Telecenter U**	**TCC2099**
Program Line Input Module	**Rauland Telecenter U**	**TCC2055**
IP Classroom Module	**Rauland Telecenter U**	**TCC2011B**
8-Ohm 8" Speaker assembly surface (retrofit)	**Rauland**	- **Speaker USO880** - **Backbox ACC1112** - **Baffle ACC1003** - **Add: IP Classroom module**
Clock/Speaker surface combo (standard classroom/office retrofit)	**Rauland**	- **Baffle w/ Speaker ACC3011S** - **Backbox ACC3011SBB** - **Message Board TCC3011S** **Add: IP Classroom module**
Exterior Speaker (retrofit)	**Rauland** **Lowell** **Rauland** **FSR**	**Backbox: ACC1113** **Baffle: ACC1012** **Speaker: 8C10MRB** **Interior Backbox SMWB-4G-WHT** - **Add: IP Classroom Module (single speaker up to 2W)** **Add: Wire breakout 603101 (when IP module used)**
Large Message Board (Clock)	**Rauland**	**TCC3012L**
Wire Guard for Large Message Board	**American Time**	**G2055OF-28**

END OF APPENDIX

END OF SECTION

SECTION 28 20 00

VIDEO SURVEILLANCE

PART I - GENERAL

1.01 SUMMARY

A. This section specifies software, equipment, accessories, wire, materials, installation, configuration, and testing requirements for a complete and operable Video Surveillance system. The system shall provide electronic recording/playback and monitoring of digital cameras installed at the site.

1.02 SCOPE

A. The work will include but not be limited to the following objectives:

1. Labor and Materials: The Contractor shall provide and pay for all labor, supervision, materials, accessories, wire, components, equipment, tools, transportation, and other facilities and services necessary for the proper installation of a turn-key Video Surveillance system to District.

A. The CCTV system shall have the following minimum requirements.

1. Cameras
   a. Weather resistant IP67 or greater (exterior only)
   b. Network/IP based
   c. PoE powered
   d. 5MP or 4K resolution
   e. H.265 video compression
   f. Day/night with IR illumination
   g. Motion detection
   h. ONVIF

2. Network Video Recorder
   a. Network/IP based
   b. H.265 video compression
   c. RAID 5 or greater
   d. Record on motion detection
   e. 30+ day recording

3. Software
   a. PC and Mobile viewing
   b. View live and recorded video
   c. Search
   d. Save video to MP4 format
   e. Notifications

1.03 RELATED REQUIREMENTS

A. Division 01 - General Requirements

B. Section 27 00 00 - Communications

C. Section 27 05 00 - Common Work Results for Communication Systems.

C. Section 27 10 00 - Structured Cabling

1.04 QUALIFICATIONS

A. Contractor shall be located within 50 miles or less from the project site to support 2-hour response time.

B. Five years' experience installing Video Surveillance equipment systems.

1.05 SYSTEM REQUIREMENTS

A. Any new installations or existing system modifications shall seamlessly integrate into the site's existing Video Surveillance system.

1.06 CONTRACTOR "SHOP DRAWINGS" DESIGN REQUIREMENTS

A. See section 27 00 00 for requirements.

B. Shop drawings are required for this section

1.07 SUBMITTALS

A. See section 27 00 00 for requirements.

1.08 WARRANTY

A. Refer to Division 01 Warranty section.

B. See section 27 00 00 for additional requirements.

1.09 CLOSEOUT DOCUMENTS

A. See section 27 00 00 for requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. See Appendix A at the end of this document for pre-approved materials.

B. All products shall be new, unused and without blemishes and shall be of manufacturer's current and standard production.

C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory installation/operation.

D. Product Availability

1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
2. Subject to compliance with these specifications, products and systems included in this section are to be installed as specified by the manufacturer of the system or engineer approved equal.

2.02 EQUIPMENT

A. The District’s preferred manufacturer for CCTV equipment is i-Pro (formally Panasonic) for cameras and network video recorders (NVR).

B. The District’s preferred manufacturer for video intercom is Avigilon.

C. Substitutions require proof of equivalence and approval by District’s representative.

D. All exterior cameras to be IP67 rated or better.

E. The Contractor shall provide and install a rack-mounted monitor/keyboard in the rack where the NVR is located.

2.03 LICENSES

A. The Contractor shall provide i-PRO single camera licenses for each installed video intercom device. Verify with the District’s representative for license version.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. The equipment shall only be installed by Contractors who are qualified to install and maintain the system.

B. The Contractor (or subcontractor listed at time of bid) must have at least five (5) years' experience installing Video Surveillance equipment before the Bid Opening Date.

3.02 EXAMINATION

A. The Contractor shall be required to visit the installation site(s) prior to job bidding. The Contractor acknowledges that the failure to visit the site(s) will not relieve the Contractor of the responsibility for observing and considering those conditions which a Contractor would have observed and considered during a site visit, estimating properly the difficulty and cost of successfully performing the Work or proceeding to perform the Work without additional cost to District.

B. The Contractor shall report any discrepancies between the Specifications, Drawings, and Site Examination prior to the Bid Opening Date.

3.03 PREPARATION

A. The Contractor shall verify materials are readily available prior to submitting product submittals and notify the District's representative of long lead time items.

B. The Contractor shall order all required parts and equipment only after receipt of approved product submittals from the District's representative.

C. The Contractor shall coordinate with the District's representative for needed IP addresses at least 4 weeks prior to configuration/installation.

3.04 SHOP DRAWINGS

A. The Contractor shall create "Shop Drawings" per section 27 00 00.

3.05 WORKMANSHIP

A. Quality workmanship is a high priority for the District and the Contractor shall be held to a high-level of professional workmanship.

B. The District's representative will have the authority to reject Work which does not conform to the Drawings and Specifications.

C. Comply with highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.

D. Perform Work with persons experienced and qualified to produce workmanship specified.

E. Maintain quality control over suppliers and Subcontractors.

3.06 PATHWAY AND EQUIPMENT INSTALLATION

A. Install all conduit and pathway per design documents. Refer to 27 05 00 for additional information/requirements.

B. Install all Cat6A cables per design documents. Refer to Section 27 10 00 for additional information/requirements.

C. Equipment to be installed per manufacturer's instructions.

D. Devices requiring PoE power shall be connected to a PoE switch in the MDF/IDF data rack – verify for adequate PoE power capacity.

E. The Contractor shall provide and install a rack-mounted monitor/keyboard in the rack where the NVR is located. Install at a minimum 36" to a maximum of 45" AFF.

3.07 CONFIGURATION

A. Configure cameras for DHCP addressing.

B. Provide a list of MAC addresses correlated to camera locations to District's representative at least 4 weeks prior to system activation so that Technology Services can configure the DHCP scope.

C. The District will configure the NVR.

C. All other equipment is to be fully configured and tested for functionality prior to the District's representative acceptance testing.

3.08 CAMERA VIEW

A. Adjust view aim, zoom and focus camera to show intended view from design documents.

3.09 FIELD QUALITY CONTROL AND TESTING

A. Upon completion of network programming and initial view setting, notify the District's representative of your readiness to perform the formal camera view review with District's representative. Make all adjustments required from the District's representative review.

B. Submit the Record Drawings (as-builts) to the District's representative for review prior to inspection.

C. During the formal Test & Inspection (Commissioning) of the system, Contractor to have personnel available with tools and equipment to inspect wiring, devices, and system operation.

D. If corrections are needed, the Contractor will be provided with a Punch-List of all discrepancies. Perform the needed corrections in a timely fashion.

E. Notify the District's representative when ready to perform a re-inspection of the installation.

3.10 AS-BUILT DRAWINGS

A. See section 27 00 00 for requirements.

END OF SECTION