SECTION 27 00 00
COMMUNICATIONS BASIC REQUIREMENTS

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 where those requirements differ from the requirements of this section, the more stringent shall govern

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.

25. 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.
26. Protectors: Electrical protection devices used to limit foreign voltages on metallic communications circuits.
27. Raceway: An enclosed channel designed expressly for holding wires or cables; may

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. 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. Final coordination drawings, with as-built information added, are to be submitted as record drawings at completion of project.

B. Record Drawings:

1. Show changes and deviations from the Construction Drawings. Include written

2.01 MANUFACTURERS

A. 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. Provide new electrical 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. Provide material and equipment that is acceptable to AHJ as suitable for the use indicated. For example, provide plenum rated cable in ceilings that are utilized as air return plenums.

C. Include special features, finishes, accessories, and other requirements as described in the Contract Documents regardless of the item's listed catalog number.

D. Provide incidentals not specifically mentioned herein or noted on Drawings, but needed to complete the system, in a safe and satisfactory working condition.

3.01 EXAMINATION

A. Construction Documents:

1. Drawings are diagrammatic with symbols representing communications equipment, outlets, and wiring.
2. Electrical symbols indicating wiring and equipment shown in the Contract Documents are included in the Contract unless specifically noted otherwise.
3. Examine the entire set of Drawings to avoid conflicts with other systems. Determine exact route and installation of communications wiring and equipment with conditions of construction.

3.02 INSTALLATION

A. Install communications equipment completely as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of the

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 and 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 Communications and extra-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 done in accordance with District submittal procedures, see Division 01 Submittals for requirements.

1.04 RELATED REQUIREMENTS

A. Division 07 - Thermal and Moisture Protection

B. Division 26 - Electrical

C. 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

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

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

D. D] v] u µ u •] Ì] • í ó _ Æ ï ì _

2.08 PENETRATION SEALING

A. Firestopping: Provide UL Listed Firestopping materials for all penetrations through rated assemblies (walls/floors). See Division 07 for more information.

PART 3 EXECUTION

3.01 COMMUNICATION SERVICES

A.

E. 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 metal structure by means of bolts or lag screws, to metal by means of sheet-metal 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.

F. 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 t ^] Ì ï l ð _ šð [î u Æ] u µ u • ‰] v P ~ ï Z • µ ‰ ‰ } Œ š • ‰ Œ í o v P š Z • v í î _ (Œ } u Z v } (} v µ] š š-degree bend] v P U } v v

b. Rigid steel t ^] Ì ï l ð _ šð [î u Æ] u µ u • ‰] v P ~ ï Z • µ ‰ ‰ } Œ š • ‰ o v P š Z • v í î _ (Œ } u conduit Z at coupling, connector or 90 degree bend.

G. 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 boxes.

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

I. Clean, prep and paint with white primer all exposed conduit, junction boxes, channel strut, fittings, and accessories.

J. 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.

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

L. CAPPING

1. Cap conduits during construction with manufactured seals. Swab out conduits before installing wires.

2. Cap all empty conduits below grade and pull boxes with manufacturer's caps to prevent entrance of debris, attach pull string to cap.

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 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 lips 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 at electrical switch height.

C. } Æ • • Z o o ‰ o Á] š Z] v í ô _ } (o š Œ] o } µ š o š •

D. For sound control, separate outlets on opposite sides of f8 0 g 0 G [(Fo)-2(r so)-3(und co)-2(ntrol, s

C. FIRE STOPPING

1. Seal all conduit penetrations through fire rated walls and floors fire and smoke tight in conformance with current CBC and current CSFC. 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 by inspector and/or project manager. 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 silicon rubber caulk or other approved methods and materials. Submit method and material with inspector and/or project manager. 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 and match adjoining work before final acceptance.

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

3.09 FINAL DOCUMENT SUBMITTALS

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 District's standards shall familiarize themselves with the standards and requirements prior to beginning work.
3. The Contractor shall furnish and install all required fire-treated ¾_ ~ š Z Œ ‹ µ Œ š Œ] v Z plywood for the MDF and all IDF locations.
4. The Contractor shall furnish and install a ground bus bar at MDF and IDF rooms.
5. The Contractor shall furnish and install all required racks and cabinets.
6. The Contractor shall furnish, install, and configure uninterruptable power supply (UPS) for the MDF and/or IDF racks.
7. The Contractor shall furnish and install all newly required conduit/raceway.
8. The Contractor shall furnish and install all wire/cable (copper/fiber optic) as required.
9. The Contractor shall terminate all strands of fiber at each fiber enclosure.
10. The Contractor shall furnish and install termination all-end equipment (patch panels, jacks, wallplates, enclosures, etc.).
11. The Contractor shall furnish and install all patch cords (copper/fiber).
12. The Contractor shall test and certify installed cable plant.

1.

1.07 K E d Z d K Z ^ ^ , K W Z t / E ' ^ _ ^ / ' E Z Y h / Z D E d ^

A. See

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 [illegible] experience before the Bid Opening Date.

3.02

B.

APPENDIX A - Pre-Approved Materials

DESCRIPTION	MFG	PART NUMBER
Vertical Cable Manager	DAMAC	F532004
Patch Panel 24-port 1-RU (Black)	Ortronics	OR-SPKSU24
Patch Panel 48-port 2-RU (Black)	Ortronics	OR-SPKSU48
Rear Cable Management Bar	Middle Atlantic	LBP-6R90
Surface Mount, 2-port (White)	Ortronics	KSSMB2

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. dZ]•šŒ] š[• ‰Œ (ŒŒ u vµ(šµŒ Œ (}Œ
   1. Routers - Cisco
   2. Firewalls - Cisco
   3. Networking Switches – Cisco (Aruba under evaluation)
   4. Wireless Access Points - Cisco (Aruba under evaluation)
   5. VoIP Phone Equipment – Cisco
   6. UPS – Tripp-Lite and N1C

B. Substitutions require proof of equivalence and approval by District and/or its representative.

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. d Z } v š Œ š } Œ ~ } Œ • µ } v š Œ š } Œ o] • š š š] u } ( ] • u µ • š Z experience installing data network equipment before the Bid Opening Date.

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 Project Manager of long lead time items.

B. The Contractor shall order all required parts and equipment only after receipt of approved product submittals from the Project Manager.

C. d Z } v š Œ š } Œ • Z o o } } Œ] v š Á] š Z š Z] • š Œ] š [• d Z v } o } P Ç needed IP addresses at least 2 weeks prior to configuration/installation.

3.04 SHOP DRAWINGS

A. d Z } v š Œ š } Œ • Z o o Œ š ^ ^ Z } ‰ Œ Á] v P • _ ‰ Œ • š] } v î ó ì

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. d Z] • š Œ] š [• W Œ } i š } Œ } v • š Œ µ š] } v D v P Œ Á] o o Z À š Z does not conform to the Drawings and Specifications.

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3.

APPENDIX A - Pre-Approved Materials

DESCRIPTION	MFG	PART NUMBER
Network Switch (Catalyst 48port PoE)	Cisco	C9300L-48PF-4X-EDU
Network Switch License (DNA Essentials, 48 port, 3-yr)	Cisco	C9300-DNA-E-48-3Y
SFP transceiver (Qty = 2) cable bundle	Cisco	SFP-H10GB-CU1M
Network Switch stacking kit	Cisco	C9300-STACK-KIT
Network Switch stacking cable (3 METER)	Cisco	STACK-T3-3M
UPS (IDF) with network monitoring	N1C	N1C.L1000
UPS (IDF) with network monitoring	N1C	N1C.L1500

* Product requires District Approval

END OF APPENDIX A

END OF SECTION

PART 2 - PRODUCTS

2.01 GENERAL

A. The approved manufacturers for this project are:
   1. Control unit and related accessories: Bogen 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

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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.

B. d Z } v š Œ š } Œ • Z o o } } Œ] v š Á] š Z š Z] • š Œ] š [• / d ‰ Œ š u network. The Contractor shall provide a spreadsheet of all device MAC addresses indexed by device location to the District IT department to facilitate 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.

C. During the formal Test & Inspection (Commissioning) of 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 when ready to perform a re-inspection of the installation.

F. District or its representative to provide final sign-off for acceptance.

3.11 AS-BUILT DRAWINGS

A. See section 27 00 00 for requirements.

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

3.12 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	TCC2011A
Zone Page Amplifier	Rauland Telecenter U	TCC3022
Zone Page Amplifier Aux Power Supply	Rauland Telecenter U	

SECTION 27 53 13
CLOCK SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This section specifies equipment, accessories, materials, wiring, installation, configuration, and testing requirements for a complete and operable Clock system.

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 Clock system to the District.

2. The contractor will coordinate with the District in writing for any needed information (i.e. IP addresses, etc.) 10 business days prior to date the information is needed.

3. Clock system equipment: Includes, but is not limited to:
   a. Clocks
   b. Master Clock or NTP server access
   c. Wire

5. New construction shall utilize IP based digital clocks that are powered by a PoE data switch in the nearest MDF/IDF. Clocks shall synchronize to 1 0 .

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. Anynew installations or existing system modifications shall seamlessly integrate into the

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.

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C. Clocks to be installed over wiring connection outlet.

D. Clocks to be installed flush against the mounting surface with no overhang.

3.06 LABELING/SCHEDULES

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

B. IP Clock label to MAC address on rear of the Clock.

C. Network Cable Termination label to MDF/IDF number - patch panel number - port number.

3.09 CONFIGURATION

A. Program all network clock equipment with network IP address information obtained from] • š Œ] Technology Services (including VLAN and NTP server information).

B. The Contractor shall submit a spreadsheet of all Clock MAC addresses indexed by device location to facilitate the programming of reserved IP addresses.

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

3.10 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 District of your readiness to perform the formal Test & Inspection of the complete system.

B. Submit the Record Drawings (as-builts) to District 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 when ready to perform a re-inspection of the installation.

F. District or its representative to provide final sign-off for acceptance.

3.11 AS-BUILT DRAWINGS

A. See section 27 00 00 for requirements.

APPENDIX A - Pre-Approved Materials

DESCRIPTION	MFG	PART NUMBER
Clock (IP-16_Round)	Sapling	SAP-4BS16R
16_Protective Cage	Rauland	WCANA16WG
Digital Messaging Board, Small	Rauland	TCC3011S