

SECTION 26 00 10

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Table of Contents, Division 26 - Electrical:

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B. Work included: This Section includes general administrative and procedural requirements for Division 26. The following administrative and procedural requirements are included in this Section to supplement the requirements specified in Division 01.

1. Quality assurance.
2. Definition of terms.
3. Submittals.
4. Coordination.
5. Record documents.
6. Operation and maintenance manuals.
7. Project management and coordination services.

8. Contract modification pricing procedures.
 9. Excavation.
 10. Rough-in.
 11. Electrical installation.
 12. Cutting, patching, painting, and sealing.
 13. Field quality control.
 14. Cleaning.
 15. Project closeout.
 16. Interface/Responsibility Matrix.
- C. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete and operable installation.
1. General and supplementary conditions: Drawings and general provisions of Contract and Division 01 of the Specifications, apply to all Division 26 Sections.
 2. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, vaults, lighting pole foundations, etc. Refer to Division 31, Earthwork.
 3. Selective demolition: Nondestructive removal of materials and equipment for reuse or salvage as indicated. Also dismantling electrical materials and equipment made obsolete by these installations. Refer to Division 02, Selective Demolition.
 4. Concrete work: Include forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for underground conduit encasement, light pole foundations, pull box slabs, vaults, housekeeping pads, etc. Also includes setting of floor boxes in existing concrete slabs, saw-cutting of existing slabs and grouting of conduits in saw-cut. Refer to Division 03, Concrete.
 5. Miscellaneous metal work: Include fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, luminaires, panelboards, distribution boards, switchboards, motor control centers, etc. Refer to Division 05, Miscellaneous Metals.
 6. Miscellaneous lumber and framing work: Include wood grounds, nailers, blocking, fasteners and anchorage for support of electrical materials and equipment. Refer to Division 06, Rough Carpentry.
 7. Moisture protection and smoke barrier penetrations: Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vapor tight. Refer to Division 07, Thermal and Moisture Protection.

8. Access panels and doors: Required in walls, ceilings, and floors to provide access to electrical devices and equipment. Refer to Division 08, Access Doors also, Division 05, Metals.
 9. Painting: Include surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, etc. where indicated as field painted in this Division. Refer to Division 09, Painting.
 10. Luminaire supports: Provide slack support wire for luminaires installed in acoustical tile or lay-in suspended ceilings. Refer to Division 09, Acoustical Treatment.
- D. Work furnished and installed under another Division requiring connections under this Division includes but is not limited to:
1. Electric motors.
 2. Package mechanical equipment: fans, fan coil units, pumps, boilers, compressors, etc.
 3. Flow switches and valve monitors for sprinkler system.
 4. Elevator controllers.
 5. Pre-wired electrified partition furniture.
 6. Temperature control panel(s). (Line voltage only)
 7. Irrigation controller(s). (Line voltage only)
 8. FM-200 control panel. (Line voltage only)
 9. Kitchen equipment and appliances.
 10. Laboratory equipment.
 11. Electric signage.
 12. Electric door locks.
 13. Electric heat trace tape.
 14. Door hold-open/release devices.
 15. Variable frequency drive units.
 16. Chiller starters.
 17. Motorized roll down/sliding doors and grills.
 18. Motorized dock levelers.
 19. Projection screens.
- E. Items furnished under this Division, but installed and connected under another Division includes but is not limited to:
1. Diesel generator day tank. (Division 22)
 2. Diesel generator silencer. (Division 23)
 3. Generator daytank fuel strainer, manual fuel pump, check valve and any other specified accessories. (Division 22)

4. Remote radiator for generator. (Division 22)
- F. Items furnished under another Division, but installed and connected under this Division includes but is not limited to:
 1. Wall mounted control stations for motorized roll down and sliding doors.
 2. Electric fire sprinkler water flow bells.
 3. Speed control switches for ceiling exhaust fans.

1.02 QUALITY ASSURANCE

- A. Reference to Codes, Standards, Specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Such codes or standards shall be considered a part of this Specification as though fully repeated herein.
- B. When codes, standards, regulations, etc. allow Work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred authority for reducing the quality, requirements, or extent of the Contract Documents. The Contract Documents address the minimum requirements for construction.
- C. Work shall be performed in accordance with all applicable requirements of the latest edition of all governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
 1. California Electric Code (CEC).
 2. California Building Code (CBC).
 3. California Fire Code (CFC).
 4. California Mechanical Code (CMC).
- D. Standards: Equipment and materials specified under this Division shall conform to the following standards where applicable:

ACI	American Concrete Institute
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
CBM	Certified Ballast Manufacturers
ETL	Electrical Testing Laboratories
FS	Federal Specification
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IPCEA	Insulated Power Cable Engineer Association
NEMA	National Electrical Manufacturer's Association
UL	Underwriters' Laboratories
- E. Independent Testing Agency qualifications:
 1. Testing Agency shall be an independent testing organization that will function as an unbiased authority, professionally independent of Manufacturer, Supplier and Contractor, furnishing and installing equipment or system evaluated by Testing Agency.
 2. Testing Agency shall be regularly engaged in the testing of electrical equipment, devices, installations, and systems.

3. Testing Agency shall meet Federal Occupational Safety and Health Administration (OSHA) requirements for accreditation of independent testing laboratories, Title 9, Part 1907.
 4. On-site technical personnel shall be currently certified by the International Electrical Testing Association in electrical power distribution system testing.
 5. Testing Agency shall use technicians who are regularly employed by the firm for testing services.
 6. Contractor shall submit proof of above Testing Agency qualifications with bid documentation upon request.
- F. All base material shall be ASTM and/or ANSI standards.
- G. All electrical apparatus furnished under this Section shall conform to NEMA standards and the CEC and bear the UL label where such label is applicable.
- H. Certify that each welder performing Work has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

1.03 DEFINITION OF TERMS

- A. The following list of terms as used in the Division 26 documents shall be defined as follows:
1. "Provide": Shall mean furnish, install, and connect unless otherwise indicated.
 2. "Furnish": Shall mean purchase and deliver to Project site.
 3. "Install": Shall mean to physically install the items in-place.
 4. "Connect": Shall mean make final electrical connections for a complete operating piece of equipment.
 5. "As directed": Shall be as directed by the Owner or their authorized Representative.
 6. "Utility Companies": Shall mean the company providing electrical, telephone or cable television services to the Project.

1.04 SUBMITTALS

- A. Format: Furnish submittal data in electronic format for each Specification Section with a table of contents listing materials by Section and paragraph number.
- B. Submittals shall consist of detailed Shop Drawings, Specifications, block wiring diagrams, "catalog cuts" and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication and material finish. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded. Furnish quantities of each submittal as noted in Division 01.
- C. Each submittal shall be labeled with the Specification Section Number and shall be accompanied by a cover letter or shall bear a stamp stating that the submittal has been thoroughly reviewed by the Contractor and is in full compliance with the requirements of the Contract Documents or provide a Specification Section line-by-line compliance response statement with detailed exception/ deviation response statements for all applicable provisions for the applicable Specification Section. Any Specification Section lines without a

- detailed exception/ deviation response statement shall be treated as the Contractor or Vendor is submitting in full compliance with the applicable Specification Section requirements. Cover letters shall list in full the items and data submitted. Failure to comply with this requirement shall constitute grounds for rejection of data.
- D. The Contractor shall submit detailed Drawings of all electrical equipment rooms and closets if the proposed installation layout differs from the construction documents. Physical size of electrical equipment indicated on the Drawings shall match those of the electrical equipment that is being submitted for review, i.e.: switchboards, panelboards, transformers, control panels, etc. Minimum scale: 1/4" = 1'- 0". Revised electrical equipment layouts must be approved prior to release of order for equipment and prior to installation.
- E. As part of the equipment and fixture submittals, the Contractor shall provide anchorage calculations for floor and wall mounted electrical equipment and fixtures, distribution conduits and raceways, in conformance with the 2019 California Building Code (CBC) and ASCE 7-16. Use the Occupancy Category, Ground Accelerations, Site Class, Seismic Design Category, and Seismic Importance Factor as noted in the structural drawings. For components required for Life Safety or containing hazardous materials use $I_p=1.5$. Structural Calculations shall be prepared, stamped, and signed by a California Registered Structural Engineer. Specify proof loads for drilled-in anchors, if used.
- F. The Manufacturer shall recommend the method of anchoring the equipment to the mounting surface and shall provide the Contractor with the assembly dimensions, weights, and approximate centers of gravity.
- G. Review of submittals is for general conformance to design concept and general compliance with the Specification Sections. Submittal Review Comments do not imply waiver of Specifications Section requirements unless specifically noted.
- H. All resubmittals shall include a cover letter that lists the action taken and revisions made to each Drawing and equipment data sheet in response to Submittal Review Comments. Resubmittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.
- I. Shop Drawings for the following systems must be prepared via a computer aided drafting (CAD)building information modeling (Revit) system for submission by the Contractor. The Engineer can provide CADRevit files of the electrical Contract Documents to the Contractor.
1. Manufactured wiring system, Section 260519.
 2. Fire alarm system, Section 266113.
 3. Security system, Section 266513.
 4. Telecommunication cabling system, Section 267113.
- J. Independent Testing Agency report:
1. Testing Agency shall provide 3 copies of the complete testing report.
 2. Test report shall include the following:
 - a. Summary of Project.
 - b. Description of equipment.

- c. Equipment used to conduct the test.
 - 1) Type.
 - 2) Manufacturer.
 - 3) Model number.
 - 4) Serial number.
 - 5) Date of last calibration.
 - 6) Documentation of calibration leading to NIST standards.
 - d. Description of test.
 - e. Test results, as compared to Manufacturers or industry accepted standards and tolerances.
 - f. Conclusion and recommendation.
 - g. Signature of responsible test organization authority.
3. Furnish completed test report to Engineer no later than 30-days after completion of testing, unless otherwise directed.
- K. Substitutions:
- 1. All requests for substitutions shall conform to the general requirements and procedure outlined in Division 01.
 - 2. Where items are noted as "or equal," a product of equal design, construction and performance will be considered. Contractor must submit to the Engineer all pertinent test data, catalog cuts and product information required substantiating that the product is in fact equal to that specified. Only one substitution will be considered for each product specified.
 - 3. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to establish standards of quality, utility, and appearance. Materials, processes, or equipment, which in the opinion of the Engineer is equal in quality, utility, and appearance, will be approved as substitutions to that specified.
 - 4. Whenever any material, process or equipment is specified in accordance with a Federal specification, an ASTM standard, an ANSI specification, UL rating or other association standard, the Contractor shall present an affidavit from the Manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, support test data to substantiate compliance shall be submitted by the Contractor at no additional cost.
 - 5. Substitutions shall be equal, in the opinion of the Architect/Engineer, to the specified product. The burden of proof of such shall rest with the Contractor. When the Architect/Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted article or material to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the Work or from any provisions of the Specifications.

6. The Contractor shall be responsible for all expenses in connection with the substitution materials, processes, and equipment, including the effect of the substitution on the Contractor, Subcontractor's, or other Contractor's Work. No substitution of material, processes or equipment shall be permitted without written authorization of the Architect/Engineer. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the Engineer are at the sole risk of the Contractor.

1.05 COORDINATION

A. Discrepancies:

1. In the event of discrepancies within the Contract Documents, the Engineer shall be so notified, within sufficient time, as delineated in Division 01, prior to the Bid Opening to allow the issuance of an Addendum.
2. If, in the event that time does not permit notification or clarification of discrepancies prior to the Bid Opening, the following shall apply: The Drawings govern in matters of quantity and the Specifications govern in matters of quality. In the event of conflict within the Drawings involving quantities or within the Specifications involving quantities or within the Specifications involving quality, the greater quantity and higher quality shall apply. Such discrepancies shall be noted and clarified in the Contractor's Bid. No additional allowances will be made because of errors, ambiguities or omissions that reasonably should have been discovered during the preparation of the Bid.

B. Project conditions:

1. Examination of Project site: The Contractor shall visit the Project site and thoroughly review the locale, working conditions, conflicting utilities, and the conditions in which the Electrical Work will take place. Verify all existing conditions in the field. No allowances will be made subsequently for any costs that may be incurred because of any error or omission due to failure to examine the Project site and to notify the Engineer of any discrepancies between Contract Documents and actual Project site conditions.
2. Protection: Keep conduits, junction boxes, outlet boxes and other openings closed to prevent entry of foreign matter. Cover fixtures, equipment, devices, and apparatus and protect them against dirt, paint, water, chemical or mechanical damage, before and during construction period. Prior to final acceptance, restore to original condition any fixture, apparatus or equipment damaged including restoration of damaged factory applied painted finishes. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.
3. Supervision: Contractor shall personally or through an authorized and competent representative constantly supervise the Work from beginning to completion and, within reason, keep the same foreman and workmen on the Project throughout the Project duration.

C. Preparation:

1. Drawings:
 - a. Layout: General layout indicated on the Drawings shall be followed except where other Work may conflict with the Drawings.

- b. Accuracy: Drawings for the Work under this Section are essentially diagrammatic within the constraints of the symbology applied.

D. Utility company contacts:

1. Contact for electrical service:
2. Contact for telephone service:
3. Contact for television service:

1.06 RECORD DOCUMENTS

A. Provide Project Record Drawings as described herein:

1. Drawings shall fully represent installed conditions including actual locations of outlets, true panelboard connections following phase balancing routines, correct conduit, and wire sizing as well as routing, revised luminaire schedule listing Manufacturers and products installed and revised panel schedules. Contractor shall record all changes in the Work during the course of construction on blue or black line prints. These prints shall be made subject of monthly review by the Owner's Representative to ascertain that they are current. If not current, monthly payments may be withheld.
2. Record Drawings shall be the transfer of information on these prints to the construction documents via computer aided drafting (CAD)building information modeling (Revit) process. A set of Revit files of the electrical construction documents will be provided to the Contractor by the Engineer. For the BIM/clash detection process, a Revit file of the electrical construction documents will be provided to the Contractor by the Engineer, which will represent a LOD of 300 design level. The Contractor is responsible for updating the model with changes as well as taking the model to a LOD of 500 design level.
3. Record drawing submissions shall be provided to the Engineer to review upon the completion of the following phases of Work:
 - a. All underground installation.
 - b. Building electrical rough-in.
 - c. Final electrical installation.
4. Include in the record drawing submission the following shop drawing submission with all updated installation information:
 - a. Manufactured wiring system.
 - b. Fire alarm system.
 - c. Security system.
 - d. Telecommunication cabling system
 - e. Nurse call system.
 - f. Intercom system.
 - g. Television distribution system.
 - h. School communication system.

- i. Public address system.
 - j. Sound reinforcement system.
5. A single set of half size prints of the Record Drawings shall be submitted for review. Upon receipt of the Engineer's review comments, corrections shall be made, and the Contractor shall provide the following:
- a. Two sets of full-size prints.
 - b. Four sets of half-size prints.
 - c. One set of full size reproducibles.
 - d. Electronic files of Drawings in PDF and CADRevit.
- B. Panel schedules:
- 1. Typewritten panel schedules shall be provided for panelboards indicating the loads served and the correct branch circuit number. Schedules shall be prepared on forms provided by the Manufacturer and inserted in the pocket of the inner door of each panelboard. See Section 262416: Panelboards for requirements.
 - 2. A single set of the record panel schedules shall be submitted for review. Upon receipt of the Engineer's review comments, corrections shall be made, and the Contractor shall provide the following:
 - a. Fold and insert one copy of the appropriate schedule in the pocket of the inner door of each panelboard.
 - b. Three binders, each containing a full set of the panel schedules. Provide index listing all schedules and dividers for separation of schedules as follows:
 - 1) 277/480V normal.
 - 2) 277/480V emergency.
 - 3) 277/480V legally required standby.
 - 4) 277/480V optional standby.
 - 5) 277/480V critical.
 - 6) 277/480V life safety.
 - 7) 277/480V equipment.
 - 8) 277/480V generator equipment.
 - 9) 120/208V normal.
 - 10) 120/208V emergency.
 - 11) 120/208V legally required standby.
 - 12) 120/208V optional standby.
 - 13) 120/208V critical.
 - 14) 120/208V life safety.
 - 15) 120/208V equipment.

16) 120/208V generator equipment.

C. Field labels, markings, and warning signs: Provide in accordance and as required by:

1. General: CEC Article 110.21.
2. High-Leg System: CEC Article 110.15.
3. Arc-Flash Warning: CEC Article 110.16.
4. Identification of Disconnecting Means: CEC Article 110.22 (A).
5. Engineered Series Combination Systems: CEC Article 110.22 (B).
6. Tested Series Combination Systems: CEC Article 110.22 (C).
7. Available Fault Current: CEC Article 110.24.
8. Depth of Working Space in Existing Buildings: CEC Article 110.26 (A)(1)(c).
9. Guarding of Live Parts: CEC Article 110.27 (C).
10. Locked Rooms or Enclosures: CEC Article 110.34 (C).
11. Manholes: CEC Article 110.75 (E).

1.07 OPERATION AND MAINTENANCE MANUALS

A. Prior to Project closeout furnish to the Owner, six (6) hard back 3-ring binders containing all bulletins, operation and maintenance instructions, part lists, service telephone numbers and other pertinent information as noted in each Section all equipment furnished under Division 26. Binders shall be indexed into Division Sections and labeled for easy reference. Bulletins containing more information than the equipment concerned shall be properly stripped and assembled.

1.08 PROJECT MANAGEMENT AND COORDINATION SERVICES

- A. Overview: Contractor shall provide a Project Manager/Engineer for the duration of the Project to coordinate the Division 26 Work with all other trades. Coordination services, procedures and documentation responsibility shall include, but shall not be limited to the items listed in this Section.
- B. Review of Shop Drawings prepared by other Subcontractors:
1. Obtain copies of all Shop Drawings for equipment provided by others that require electrical service connections or interface with Division 26 Work.
 2. Perform a thorough review of the Shop Drawings to confirm compliance with the service requirements contained in the Division 26 Contract Documents. Document any discrepancy or deviation as follows:
 - a. Prepare memo summarizing the discrepancy.
 - b. Provide a copy of the specific shop drawing, indicating via cloud, the discrepancy.
 3. Prepare and maintain a shop drawing review log indicating the following information:
 - a. Shop drawing number and brief description of the system/material.
 - b. Date of your review.

- c. Indication if follow-up coordination is required.
 - C. Request for information (RFI):
 - 1. Thoroughly review the Contract Documents prior to the preparation and submission of an RFI. If an RFI is submitted, attach 8 1/2" x 11" copies of all relevant documents to clarify the issue.
 - 2. Prepare and maintain an RFI log indicating the following information:
 - a. RFI number and brief summary of the issue.
 - b. Date of issuance and receipt of response.
 - D. Clarification confirmation memo (CCM):
 - 1. Either the Contractor will prepare CCM memos or the Engineer to confirm a decision clarifying the Contract Documents that does not impact cost or affect other trades.
 - 2. Prepare and maintain a CCM log indicating the following information:
 - a. CCM number: Use CCM-C1, C2, etc. for memos issued by the Contractor and CCM-E1, E2, etc. for memos issued by the Engineer.
 - b. Brief summary of issue and date issued.
- 1.09 CONTRACT PRICING MODIFICATION PROCEDURES
- A. Submission guidelines: This Section covers the criteria for direct costs, mark-ups, and documentation requirements to be followed by the Contractor for any pricing modification to the Base Contract, where unit pricing has not already been established.
 - 1. Change orders: Pricing for additions or deletions to the Base Contract Scope of Work upon acceptance of bid value and receipt of authorization to proceed.
 - 2. Allowances: Cost allowances may be assigned for specific Scope of Work outlined within the Base Contract where design has not been fully delineated on the Contract Documents. When detailed information is available, the Contractor shall prepare and submit a price quotation for the Work. This price quotation will be compared to the allowance value and any adjustments necessary to the Base Contract value shall be made via change order.
 - B. Direct costs:
 - 1. Labor:
 - a. Hourly labor rates shall not exceed the prevailing wage for the County where the Work is being performed. The costs for all supervision, including general superintendents and foremen, shall be included in the mark-up defined herein. Working foremen will be considered a direct cost only if the individual is on the Project site physically installing Work under the change order.
 - b. Labor burden shall be based on rates currently in effect at the time the Work under the change order is being performed and shall include only fringe benefits by governing trade organizations, Federal Insurance Contribution Act, Federal and State Unemployment taxes, payroll taxes and net actual premium paid for public

liability, workers' compensation, property damage and other forms of insurance required by the Owner. No other cost will be included as labor burden.

- c. NECA Manual of Labor Units will be utilized as the basis for determining labor productivity rates for Electrical Work as follows:
 - 1) 85% of NECA column 1 (normal) for change in scope issued well in advance of Work needing to be performed, so as not to cause slow-down or Work stoppage.
 - 2) 100% of NECA column 1 (normal) for Work being performed with other Base Contract Work, not out of sequence and with minimal slow-down or Work stoppage.
 - 3) 100% of NECA column 2 (difficult) for Work performed out of sequence, requiring Work stoppage and reconstruction in areas already complete. This Work may involve the removal of ceiling tiles or the cutting and patching of walls.
 - d. No labor costs shall be included for the following items since the labor is already covered by the NECA labor units for conduit and construction channel:
 - 1) Conduit straps and clips.
 - 2) Construction channel accessories (nuts, washers, etc.).
 - 3) Screws.
 - 4) Conduit elbows $\frac{3}{4}$ " and smaller.
2. Material:
- a. The cost of material shall be the direct cost, including sales tax and may include the cost of transportation from the Supplier to the Contractor, but charges for final delivery to the Project site will not be allowed.
 - b. Electrical commodities priced based on most current Trade Service Book with a 15% discount. Non-commodities priced per invoice from Supplier.
3. Equipment rental:
- a. Payment for equipment costs will be made at the rental rates listed for such equipment as specified in the current edition, at the time of the Work, of "Labor Surcharge and Equipment Rental Rates," a Caltrans Publication. Such rental rates shall be adjusted as appropriate and will be used to compute payments for equipment; regardless of the whether the equipment is under Contractor's control through direct ownership, leasing, renting or other method of acquisition. Daily, weekly, or monthly rates shall be used, whichever is lower. Hourly rates including operator shall not be used.
 - b. The actual time to be paid for equipment shall be the time the equipment is in productive operation on the Work. No payment will be made time while equipment is inoperative due to breakdown or for non-working days.
 - c. Individual pieces of equipment having a replacement value of \$1,000 or less shall be considered small tools or small equipment and no payment will be made since the

costs of these tools and equipment are included as part of the Contractor's mark-up for overhead and profit.

- d. Payment to Contractor for use of equipment as set forth herein shall constitute full compensation to Contractor for the cost of fuel, power, oil, lubricants, supplies, small equipment, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, labor (except for equipment operators) and any and all costs to Contractor for incidental use of the equipment.
4. Performance bond: Only the actual cost of insurance and bond premiums, with no mark-up for overhead and profit, will be allowed.
- C. Mark-up for overhead and profit on direct costs:
1. Costs to be included as part of mark-up:
 - a. Field and home office personnel including, but not limited to, Principals, Project Managers, Superintendents, Supervisory Foremen, Estimators, Project Engineers, Detailers, Draftspersons, Schedulers and Administrative Assistants.
 - b. All field and home office expenses including, but not limited to, field trailers, parking, storage sheds, office equipment and supplies, telephone service at the Project site, long-distance telephone calls, fax machines, computers and software, temporary utilities, sanitary facilities, etc.
 - c. Administrative functions including, but not limited to, reviewing, coordinating, distributing, processing, posting, recording, estimating, negotiating, scheduling, schedule updating and revising, expediting, detailing, revising Shop Drawings and preparing Record Drawings.
 - d. Vehicles required for the transportation of Contractor's staff and field personnel.
 2. Maximum mark-up values:
 - a. For Work performed by the Contractor, the overhead mark-up shall equal a maximum of 10 percent of the direct costs, as defined herein.
 - b. Mark-up for profit shall equal a maximum of 5 percent of combined direct and overhead costs.
 - c. For Work performed by a Subcontractor shall equal a maximum of 5 percent mark-up for profit. Subcontractor shall follow the same guidelines above for their mark-up allowance. No consideration shall be given for more mark-ups than this two-tier arrangement whereas the mark-up could exceed 20%.
 - d. For Work scope changes that result in a net decrease in cost to the Contractor or a Subcontractor, the Owner shall receive a credit based on the actual net decrease in direct cost figured in the same manner as an add cost. It is understood that the mark-up value applied at bid time will not be credited back. Although, if this is a change to a previous change order, then mark-up values shall be included in credit back to Owner.
 - e. There will be no mark-ups on the cost of performance bond.
- D. Documentation:

1. Project change order request submission:
 - a. Provide copies of all take-off sheets showing material and labor charges in line item format.
 - b. Provide recap sheet showing all direct costs and mark-ups.
 - c. Provide copies of invoices for Subcontracted Work.
2. Allowance account tracking:
 - a. Contractor shall prepare and maintain a spreadsheet for each allowance account to track and monitor the requested and approved charges.
 - b. Copies of these spreadsheets, along with the summary spreadsheets, shall be submitted to the Owner's Representative twice a month.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. All work shall be installed in a neat, workmanlike manner in accordance with ANSI/NECA 1-2015.
- B. Comply with the requirements of all listed codes and standards.
- C. All materials and equipment provided under this contract shall be new (except where otherwise noted) and shall be listed, labeled or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL.
- D. All equipment of the same type and capacity shall be by the same manufacturer.
- E. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.
- F. During construction the contractor shall at all times maintain electrical utilities of the building without interruption. Should it be necessary to interrupt any electrical service or utility, the contractor shall secure permission in writing from the owner's representative for such interruption at least ten (10) business days in advance. Any interruption shall be made with minimum amount of inconvenience and any shut-down time shall have to be on a premium time basis and such time to be included in the contractor's bid. Arrange to provide and pay for temporary power source as required by project conditions.
- G. Working clearance around equipment shall not be less than that specified in the CEC for all voltages specified.
- H. The locations of switches, receptacles, lights, motors, etc. outlets shown are approximate. The contractor shall use good judgment in placing the preceding items to eliminate all interference with ducts, piping, etc. The contractor shall check all door swings so that light switches are not located behind doors. Relocate switches as required, with approval from the Design Professional. The owner's representative may direct relocation of outlets before

- installation, up to five (5) feet from the position indicated on the Drawings, without additional cost.
- I. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity. Normal maintenance shall not require the removal of protective guards from adjacent equipment. Install equipment as close as practical to the locations shown on the Drawings.
 - 1. Where the owner's representative determines that the Contractor has installed equipment not conveniently accessible for operations and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the owner.
 - 2. "Conveniently Accessible" is defined as being capable of being reached without climbing or crawling over or under obstacles such as motors, pumps, belt guards, transformers, racks, piping, ductwork, raceways or similar.
 - J. Owner furnished equipment: Equipment furnished by the District shall be received, stored, uncrated, protected, and installed by the Contractor with all appurtenances required to place the equipment in operation, ready for use. The Contractor shall be responsible for the equipment as if he had purchased the equipment himself and shall hold the warranty

3.02 ROUGH-IN

- A. Contractor shall verify lines, levels and dimensions indicated on the Drawings and shall be responsible for the accuracy of the setting out of Work and for its strict conformance with existing conditions at the Project site.
- B. Verify final locations for rough ins with field measurements and with the requirements for the actual equipment to be connected.
- C. Refer to equipment specification in Divisions 22 through 33 for rough-in requirements.

3.03 ELECTRICAL INSTALLATION

- A. Preparation, sequencing, handling, and installation shall be in accordance with Manufacturer's written instructions and technical data particular to the product specified and/or accepted equal except as otherwise specified. Comply with the following requirements:
 - 1. Shop Drawings prepared by Manufacturer.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 5. Sequence, coordinate and integrate installations of electrical materials and equipment for efficient flow of the Work. Give attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting height is not detailed or dimensioned, contact the Architect for direction prior to proceeding with rough-in.
7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination Drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are indicated only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel, and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install electrical equipment to facilitate servicing, maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Coordinate electrical systems, equipment, and materials installations with other building components.
12. Provide access panel or doors where devices or equipment are concealed behind finished surfaces. Furnish and install access doors per the requirements of Division 08.
13. Install systems, materials and equipment giving right-of-way priority to other systems that are required to maintain a specified slope.
14. Conform to the National Electrical Contractors Association "Standard of Installation" for general installation practice.

3.04 CUTTING, PATCHING, PAINTING AND SEALING

- A. Structural members shall in no case be drilled, bored, or notched in such a manner that will impair their structural value. Cutting of holes, if required, shall be done with core drill and only with the approval of the Architect and Structural Engineer.
- B. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- C. Cut, remove, and legally dispose of selected electrical equipment, components and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new work.
- D. Protect the structure, furnishings, finishes and adjacent materials not indicated or scheduled to be removed.
- E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- F. Patch existing surfaces and building components using experienced installers and new materials matching existing materials and the original installation. For installers'

qualifications refer to the materials and methods required for the surface and building components being patched.

G. Application of joint sealers:

1. General: Comply with joint sealer Manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
2. Installation of fire-stopping sealant: Install sealant, including forming, packing and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops and fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.05 FIELD QUALITY CONTROL

A. General testing requirements:

1. The purpose of testing is to ensure that all tested electrical equipment, both Contractor and Owner supplied, is operational and within industry and Manufacturer's tolerances and is installed in accordance with design Specifications.
2. Tests and inspections shall determine suitability for energization.
3. Perform tests in presence of the Owner's Representative and furnish test equipment, facilities and technical personnel required to perform tests.
4. Tests shall be conducted during the construction period and at completion to determine conformity with applicable codes and with these Specifications.

B. Tests: In addition to specific system test described elsewhere, tests shall include:

1. Equipment operations: Test motors for correct operation and rotation.
2. Lighting control circuits: Test lighting circuits for correct operation through their control devices.
3. Alarm and interlock systems: Produce malfunction symptoms in operating systems to test alarm and interlock systems. In addition, all specific tests described in the fire alarm system shall be performed.
4. Circuit numbering verification: Select on a random basis, various circuit breakers within the panelboards and cycle them on and off to verify compliance of the typed panel directories with actual field wiring.
5. Voltage check:
 - a. At completion of job, check voltage at several points of utilization on the system that has been installed under this Contract. During test, energize all installed loads.
 - b. Adjust taps on transformers to give proper voltage, which is 118 to 122volts for 120volt nominal systems and proportionately equivalent for higher voltage systems. If proper voltage cannot be obtained, inform the Owner and the serving Utility Company.

- C. Contractor shall provide test power required when testing equipment before service energization and coordinate availability of test power with General Contractor after service energization. The Contractor shall provide any specialized test power as needed or specified herein.
- D. Testing safety and precautions:
 - 1. Safety practices shall include the following requirements:
 - a. Applicable State and Local safety operating procedures.
 - b. OSHA.
 - c. NSC.
 - d. NFPA 70E.
 - 2. All tests shall be performed with apparatus de-energized and grounded except where otherwise specifically required ungrounded by test procedure.
- E. Calibration of test equipment:
 - 1. Testing Agency shall have calibration program that assures test instruments are maintained within rated accuracy.
 - 2. Instruments shall be calibrated in accordance with the following frequency schedule:
 - a. Field instruments: Analog, 6-months maximum; Digital, 12-months maximum.
 - b. Laboratory instruments: 12-months.
 - c. Leased specialty equipment: 12-months where accuracy is guaranteed by lessor.
 - 3. Dated calibration labels shall be visible on test equipment.
 - 4. Records, which show date and results of instruments calibrated or tested, must be kept up to date.
 - 5. Up-to-date instrument calibration instructions and procedures shall be maintained for test instrument.
 - 6. Calibration standards shall be of higher accuracy than instrument tested.
 - 7. Equipment used for field testing shall be more accurate than instrument being tested.
- F. Coordinate with General Contractor regarding testing schedule and availability of equipment ready for testing.
- G. Notify Owner and Engineer one week in advance of any testing.
- H. Any products which fail during the tests or are ruled unsatisfactory by the Owner's Representative shall be replaced, repaired, or corrected as prescribed by the Owner's Representative at the expense of the Contractor. Tests shall be performed after repairs, replacements or corrections until satisfactory performance is demonstrated.
- I. Testing Agency shall maintain written record of tests and shall assemble and certify final test report.
- J. Include all test results in the maintenance manuals.

3.06 CLEANING

- A. Prior to energizing of electrical equipment, the Contractor shall thoroughly clean the interior of enclosures from construction debris, scrap wire, etc. using Manufacturer's approved methods and materials.
- B. Upon completion of Project, prior to final acceptance, the Contractor shall thoroughly clean both the interior and exterior of all electrical equipment per Manufacturers approved methods and materials. Remove paint splatters and other spots, dirt, and debris.
- C. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

3.07 PROJECT CLOSEOUT

- A. Training:
 - 1. At the time of completion, a period of not less than 4-hours shall be allotted by the Contractor for instruction of building operating and maintenance personnel in the use of all systems. This 4-hour training is in addition to any instruction time called out in the Specifications for specific systems. All personnel shall be instructed at one time, the Contractor making all necessary arrangements with Manufacturer's Representative. The equipment Manufacturer shall be requested to provide product literature and application guides for the users' reference. Costs, if any, for the above services shall be paid by the Contractor.
 - 2. All training sessions shall be video recorded. Confirm file type, i.e. MOV, AVI, MP4, etc. with the district. Each specification section that requires training shall include one file, and all Division 26 specifications shall be stored on a flash drive (USB3.0, 1TB min.) 3 flash drives shall be provided to the district representative with closeout documentation.
- B. Special tools: Provide one of each tool type required for proper operation and maintenance of the equipment provided under this Section. All tools shall be delivered to the Owner at the Project completion.
- C. Keying: Provide two keys for each lock furnished under this Section and turn over to Owner.

END OF SECTION

SECTION 26 00 90
ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work included: Labor and equipment necessary to complete the demolition required for the item specified under this Division, including but not limited to:
 - 1. Electrical demolition

1.02 SYSTEM DESCRIPTION

- A. Disconnection, removal and relocation of all wiring, luminaires, outlets, conduit, and all other types of electrical equipment as described on Drawings.
- B. Purpose is to remove, relocate and extend existing installations to accommodate new construction.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment necessary for patching and extending Work, as specified in other Sections.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Contractor shall thoroughly review conditions in the area of demolition prior to commencing Work to ensure complete understanding of existing installation in relationship to demolition Work.

3.02 GENERAL REQUIREMENTS

- A. Remove all wiring, luminaires, outlets, conduit, and all other types of electrical equipment indicated to be removed. Devices that are to be removed may require reworking conduit and wiring in order to maintain service to other devices. If removed devices are on walls or ceilings that are to remain, blank coverplates are to be installed on outlet boxes.
- B. Where remodeling interferes with circuits in areas that are otherwise undisturbed, circuits shall be reworked as required.
- C. Existing devices and circuiting that are indicated are indicated only for informational purposes. Contractor shall visit the Project site and shall verify conditions as they exist and shall remove, relocate, and/or rework any electrical equipment or circuits affected (whether indicated or not) due to removal of existing walls, ceilings, etc. Coordinate all Work with that of other trades.

- D. All equipment, luminaires, devices, etc., which are removed shall be delivered to the Owner for disposition. All items which are removed and not wanted by the Owner and which are not reused shall become the property of the Contractor and shall be legally removed from the Project site.
 - E. Cutting and patching necessary for the removal of Electrical Work shall be included.
 - F. Remove and replace luminaires, rework, relocate or replace conduit and wiring and do other Work required by the installation of new ductwork, piping, etc., above the ceiling. Coordinate with other trades and verify the extent of the Work.
- 3.03 LUMINAIRES
- A. Disconnect and remove abandoned luminaires. Remove conduits, wiring, boxes, brackets, stems, hangers, and other accessories.
- 3.04 OUTLETS
- A. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- 3.05 CONDUIT
- A. Remove abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors and patch surfaces.
- 3.06 WIRING
- A. Remove abandoned wiring to source of supply.
- 3.07 EXISTING SYSTEMS
- A. Electrical distribution system: Disable system only to make switchovers and connections. Obtain permission from Owner's designated representative at least 24-hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to Work area.
- 3.08 CLEANING AND REPAIR
- A. Clean and repair existing materials and equipment that shall remain.
 - B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
 - C. Luminaries: Remove lenses and lamps and clean all exposed surfaces. Also clean the lenses or replace if discolored. Provide all new lamping when re-assembling.

END OF SECTION

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 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 in Division 27:

1. Active Equipment: Electronic equipment used to develop various WAN and LAN services.
2. Backbone: 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 connection 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. Fiber Optic Distribution Unit (FDU): Cabinet with terminating equipment used to develop fiber optic cross-connect facilities. Also known as LIU.
11. Grounding: a conducting connection to earth, or to some conducting body that serves in place of earth.
12. Hinged Cover Enclosure: Wall-mounted box with a hinged cover that is used to house and protect electrical devices.
13. Horizontal: Pathway facilities and media connecting the MDF or IDF to Telecommunications Outlets.
14. Intermediate Distribution Frame (IDF): Data networking equipment rack and/or location that serves an individual area, floor or building. Downstream from the MDF.
15. Jack: Receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight-position/eight-contact modular jacks.
16. 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.
17. Local Area Network (LAN): Data transmission facility connecting several communicating devices, typically Ethernet and the network is limited to a single campus.
18. 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.
19. Media: The type of cable (e.g., twisted-pair, coaxial, or fiber optic) used to provide signal transmission paths.
20. Minimum Point of Entry (MPOE): The location where the service provider hands off connection and responsibility for service to on premise customer owned equipment.
21. Modular plug: An eight-position, eight-conductor end-of-wire electrical connector used with Category rated cable.
22. Passive Equipment: Non-electronic hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, wiring blocks, FDUs, etc.
23. 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.
24. Patch Panel: System of terminal blocks or connectors used with patch cords that facilitate the administration of cross-connect fields.

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

1.04 PRODUCT AVAILABILITY

- A. Products with long lead times are to be brought to the attention of the project manager.

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, in writing to the Project Manager/Designer.
- B. See Division 01 Substitutions for more requirements

1.07 QUALITY ASSURANCE

- A. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs.
- B. Conform to the latest adopted version of the CBC with amendments by local AHJs.
- C. Obtain and pay for electrical permits, plan review, and inspections from local AHJs.
- D. Furnish products listed by UL or other testing firm acceptable to AHJ.

- E. Conform to requirements of the serving electric, telephone, broadband and cable television utilities.
- F. Contractor Qualifications:
 - 1. Minimum of five years' experience in the design, installation, testing, and maintenance of low-voltage systems.
 - 2. Maintain a local service facility which stocks spare devices and/or components for servicing systems.
 - 3. Have performed successful installation and maintenance of at least three projects similar in scope and size. Be able to provide project references for these three projects, including scope of Work, project type, owner/user contact name and telephone number.
 - 4. The contractor selected for this project must be certified by the manufacturer of the products and utilize these components for completion of work.
 - 5. Holds and maintains a valid California C-7 or C-10 State Contractors License and can exhibit validity upon request.
 - 6. A list of test equipment proposed for use in verifying the installed integrity of copper and fiber optic cable systems used.
 - 7. A technical resume of experience for the contractor's Project Manager and on-site installation supervisor who will be assigned to this project.
 - 8. A list of technical product training attended by the contractor's personnel that will install the specified manufacturer system.
 - 9. 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, cooperate with other tradecrafts and contracts as needed.
- B. To avoid installation conflicts, thoroughly examine the complete set of Contract Documents. Resolve conflicts with Project Manager/Designer prior to installation.
- C. Prior to installation of communications cable to equipment requiring connections, examine the manufacturer's shop drawings, wiring diagrams, product data, and installation instructions. Verify that the electrical characteristics detailed in the Contract Documents are consistent with the electrical characteristics of the actual equipment being installed. When inconsistencies occur request clarification from Project Manager/Designer.

1.09 SHOP DRAWINGS

- A. Shop Drawings: When required by individual Specification Sections, 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. 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 Addendum and change order items.
 - 2. Show exact routes of pathway facilities and service entrance conduits.
 - 3. Show the exact location of racks, cabinets, mounting frames and the like.
- C. Operation and Maintenance Documentation: Provide copies of certificates of code authority acceptance, product data, guarantees, warranties, installation guides, maintenance guides and the like.
- D. Inspection and/or testing: Submit testing reports for testing that was performed.

PART 2 PRODUCTS

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.

PART 3 - EXECUTION

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 communications equipment, examine the instructions thoroughly. When requirements of the installation instructions conflict with the Contract Documents, request clarification from Project Manager/Designer prior to proceeding with the installation.
- B. Do not install communications equipment in obvious passages, doorways, scuttles, or crawl spaces which would impede or block the passage's intended usage.
- C. Do not install communications equipment in locations where it would obviously be subject to damage during normal usage.

3.03 FIELD QUALITY CONTROL

- A. Tests: Conduct tests of equipment and systems to demonstrate compliance with requirements specified in Division 27 & 28. Refer to individual Specification Sections for required tests. Document tests and include in Closeout Documents.

3.04 CLEANING

- A. Remove dirt and debris caused by the execution of the communications work.
- B. Leave the entire communications system installed under this Contract in a clean, dust-free, and proper working order.

- C. Vacuum clean interiors of new and modified electrical signal and communication 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 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

PART 2 – PRODUCTS

2.01 All products used on this project shall bear the label and be approved by Underwriters Laboratories unless otherwise approved in writing by District.

2.02 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 equal.
2. Concrete / cinder block / solid masonry: Expanding compression type lag, expanding compression type bolt, expanding compression type, all-thread with nuts, or approved equal.
3. Tile / Stucco / hollow masonry: Toggle bolts or approved equal.
4. Wood: Lag screws, wood screws, or approved equal.
5. Metal: Beam clamps, sheet metal screws, self-drilling screws or approved equal.

2.03 HANGERS AND SUPPORT

A. D-RINGS

1. Commercial grade

B. J-HOOKS

1. Commercial grade

2.04 SURFACE RACEWAY

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

2.05 CONDUITS AND ACCESSORIES

A. CONDUITS

1. See Division 26 for requirements.
2. Conduit for Fire Alarm applications shall be red in color (non-accessible areas are excluded).

3. All new conduits shall be sized accordingly to achieve a 40% maximum fill ratio with initial cables installed.

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 requirements.
2. Conduit bodies and any sharp bend fittings are strictly prohibited for communication Cat6A and fiber optic cables. Appropriate conduit sweeps are required.

D. 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.

2.06 BACKBOXES, JUNCTION BOXES AND FLOOR 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.
- 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 boxes.
- E. Junction boxes used for Fire Alarm systems are to be red in color with red colored cover plates.

2.07 GROUND BOXES

- A. See Division 26 for requirements.

- 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. Minimum size is 17" x 30"

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.
- B. Draft stopping: Foam sealant for use 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: Weatherproof sealant for use around conduit penetrations in exterior walls to prevent the intrusion of water. See Division 07 for more information.

2.09 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.

PART 3 - EXECUTION

3.01 COMMUNICATION SERVICES

- A. Install underground boxes, conduits, and terminal cabinets per 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 grounding bus bar per manufacturer's instructions and to be in each MDF and IDF.

3.03 HANGERS AND SUPPORTS

- A. Install hangers and supports per manufacturer's written instructions.
- B. Hanger spacing shall be 48" or less and within 12" of sleeves and/or junction/back boxes.

3.04 LOW VOLTAGE PATHWAY/RACEWAYS

- A. EMT conduit may be used at following locations (see Division 26 for exact 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 exact 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 conduit 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.

- 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 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.
- 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 – 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.
- 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 in 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 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 16" minimum. 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 acoustical 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 UNDERGROUND BOXES

- A. To be installed per Division 26 requirements.
- B. Provisions to be made for supporting cables from the box sides (i.e., j-hooks, d-rings)

3.07 SLEEVES AND CONDUIT PENETRATIONS

- A. Where conduit passes through walls, ceilings, or floors with connection points to junction boxes or raceways mounted to the same wall as the penetration provide a threaded conduit and secured in place with locking rings on both sides. Bend radius requirements shall be maintained where penetrations are made through the back of raceways; junction boxes with adequate depth shall be installed to comply with this requirement.
- B. Where conduit passes through walls, ceilings, or 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. Box connectors shall always be used to connect EMT to junction boxes and raceways.

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 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 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

- A. See 27 00 00 for more information.

END OF SECTION

SECTION 27 41 00
AUDIO-VISUAL 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 audio-visual system. This system shall provide multi-media presentation capabilities for multiple purposes including board meetings, professional development meetings, community events and other functions.

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 Audio Visual system to the District.
 - 2. The contractor will coordinate with the District in writing for any needed information (i.e. IP addresses, etc.) At least 2 weeks prior to date the information is needed.
- E. The Contractor is responsible for user/operator training.
- F. The Contractor shall complete all required project closeout documentation in a timely fashion.

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 A-V system

1.07 SUBMITTALS

- A. Submittals are required for this section.

1.08 CONTRACTOR "SHOP DRAWINGS" DESIGN REQUIREMENTS

- B. Shop drawings are required for this section.

1.09 QUALIFICATIONS

- A. 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 Assistive Listening/AV equipment systems.
- C. The contractor shall possess a California a C7 or C10 license.
- D. The Contractor or Subcontractor shall be AV equipment manufacturer authorized to provide and install equipment with 5 years documented experience.
- E. The Contractor or Subcontractor shall designate a CTS-I (Certified Technology Specialist - Installation) certified employee to actively manage this project. Provide their current CTS-I certificate.

1.10 CERTIFICATIONS

- A. Installers shall be manufacturer certified.
- B. The Contractor shall designate a Biamp Tesira-Server certified employee to be actively involved in the implementation and commissioning of systems in this project.

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 Project or Construction Manager 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.
- F. 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. A-V Control unit and related accessories: Crestron
 - 2. See Appendix A for additional pre-approved equipment/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 and 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. See Appendix A at the end of this document for pre-approved materials.

- B. Substitutions require proof of equivalence and prior approval by District and/or its representative before ordering.

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 A-V 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 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 District's Project Manager.
- C. Submit and receive approval shop drawings prior to work commencement.

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.

3.05 EQUIPMENT INSTALLATION

- A. Equipment to be wired and installed per manufacturer's instructions.
- B. The Contractor shall coordinate with the District's IT Department if connecting to their network.

- 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 on the approved Shop Drawings, Design Documents and Specifications.
- E. All low voltage cables shall be kept away from power circuits.
- F. Contractor shall provide programming and configuration for each A-V control/input system.
- G. Cables/wire shall be installed in a neat and orderly manner. Loose cables/wires shall be bundled and wrapped with Velcro.

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. Cables shall be identified with a machine-printed tag identifying the system type, source or head end location, and destination location in all access points (i.e. junction boxes, ground boxes, MDF, IDF, etc.) and as they enter or exit and conduit pathway.

3.07 CONFIGURATION

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

3.08 FIELD QUALITY CONTROL AND TESTING

- A. The installation contractor will fine tune and test the systems for optimal audio and visual performance.
- B. Audio System:
 - 1. Frequency Response: ± 3 dB per octave band, 125 Hz to 10,000 Hz. 3dB per octave roll off below 125 Hz and above 10 kHz.
 - 2. Total Acoustical Harmonic Distortion: Less than 2% at 85 dBC (1kHz reference) at four feet (1,220mm) above finished floor in the middle of the room.
 - 3. Adjust the gain structure for all audio system components (mixer input to amplifier output) to achieve the highest signal-to-noise ratio, 75 dB from 50 Hz to 15 kHz minimum.

4. Ensure that the audio frequency response of the electronics system with equalizers bypassed varies less than ± 1 dB from 50 Hz to 12 kHz.
 5. The electronic system audio distortion shall be less than 0.5% at 1 kHz at the equipment's rated input signal level.
 6. Sound Output Capability: Provide program levels of not less than 95 dB and speech reinforcement levels of not less than 85dB in the seating area without objectionable distortion, rattles, or buzzes, employing as test signals several different samples of recorded music and microphones applied at each system input.
 7. Hum and Noise: Hum and noise shall be inaudible (below the background noise level of the space) under normal operation and as observed in normal seat locations.
- G. 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.
 - H. Submit the Record Drawings (as-builts) to District for review prior to inspection.
 - I. During the formal Test & Inspection (Commissioning) of the system, have personnel available with tools and equipment to inspect wiring, devices, and system operation.
 - J. If corrections are needed, the Contractor will be provided with a Punch-List of all discrepancies. Perform the needed corrections in a timely fashion.
 - K. Notify the District when ready to perform a re-inspection of the installation.
 - L. District or its representative to provide final sign-off for acceptance.

3.09 AS-BUILT DRAWINGS

- A. As-built drawings shall be provided for this section.

3.10 TRAINING

- A. The contractor shall make a video recording of all training sessions and export to digital medium (USB Drive) for district archive.
- B. The Contractor shall provide 4 hours of training for the audio-visual system.

APPENDIX A – Pre-Approved Materials

Item	Description
Projector	Panasonic PT-MZ14KLWU
Lens	Panasonic ET-EMW500
Projector mount	Chief VCTUW
Fixed projection screen	Dalite 23734 w/ custom size 85"x151".
Decora HDMI transmitter	Crestron DM-TX-200-C-2G-B-T
DM Output Module	Crestron DMC-4KZ-CO-HD
Ceiling speakers	Biamp DX-IC8-W
Amplifier	Crestron DM-NAX-AMP-X300
Cable	Belden 82740
Gooseneck Microphone	Earthworks FM500
Shock Mount Input Plate w/ switch	Audio Technica AT8647QM/S
Shock Mount Input Plate	Audio Technica AT8646QM
Microphone Battery	Shure SB901A
Microphone Battery	Shure SB902A
Timer Control Unit	Dsan Limitimer Rackmount
Timer Display - soffit	Dsan ASL4-ND3
Timer Display – dais	Dsan ASL2-ND3

END OF SECTION

SECTION 27 51 26
ASSISTIVE LISTENING 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 Assistive Listening system. The system shall be provided in each assembly area, including conference and meeting rooms, in accordance with ADA Accessibility Guidelines for Buildings and Facilities (ADAAG) 2010 section(s) 216.10, 219, 706, and CBC section(s) 11B-216.10, 11B-219, 11B-706.

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 in writing for any needed information (i.e. IP addresses, etc.) at least 2 weeks prior to date the information is needed.
- B. The Assistive Listening System shall be FM (72 MHz) for permanent systems, and IR for portable systems.
- C. Assistive Listening equipment: Includes, but is not limited to:
- a. Transmitters
 - b. Receivers
 - c. Earpiece/Neck loops
 - d. Chargers
 - e. Signs
- D. Typical installation includes a transmitter with audio source input or microphone and portable rechargeable receivers with either neck loops or earpieces.
- E. Permanently installed assistive-listening systems are required in areas if (1) they accommodate at least 50 persons or if they have audio-amplification systems, and (2) they have fixed seating. If portable assistive-listening systems are used for conference or meeting rooms, the system may serve more than one room. An adequate number of electrical

outlets or other supplementary wiring necessary to support a portable assistive-listening system shall be provided.

- F. The minimum number of receivers to be provided shall be equal to 4 percent of the total number of seats, but in no case less than two. Twenty-five percent minimum of receivers provided, but no fewer than two, shall be hearing aid compatible.
- G. Receivers required to be hearing-aid compatible shall interface with telecoils in hearing aids through the provision of neck loops.

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 A-V system

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. 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 Assistive Listening/AV equipment systems.

1.10 CERTIFICATIONS

- A. See section 27 00 00 for requirements.

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 Project or Construction Manager 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.
- F. 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. Manufacturers – The District has standardized on Listen Technologies.
- 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. 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 and/or its representative before ordering.

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 electronic assistive listening 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 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 District's Project Manager.
- C. Submit and receive approval for shop drawings prior to work commencement.

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. BASE TRANSMITTER (provide 1 for each permanent sound system).
 - 1. Provide base transmitter with rack mount kit. Install where specified in the sound equipment rack and connect to content source.
 - 2. Install antenna where specified and cabling from the Base Transmitter to the antenna location.
 - 3. Program the transmitter to an interference-free transmit frequency in coordination with any adjacent systems

- C. RECEIVERS (provide a quantity equal to or greater than 4% of the total number of seats, but in no case less than 2)
 - 1. Install rechargeable batteries, if applicable
 - 2. Program receivers to the broadcast frequency of the Base Transmitter

- D. SIGN
 - 1. Provide Assistive Listening System sign per ADA requirements to indicate equipment available for the hearing impaired. Verify location with the architect prior to installation. Submit sample for approval. The sign shall include wording that states "Assistive-Listening System Available" and shall be posted in a prominent place at or near the assembly area entrance, or ticket booth window as applicable. Verify location with architect prior to installation. Assistive listening signs shall include the International Symbol of Access for Hearing Loss.

- E. PORTABLE SYSTEMS
 - 1. Contractor shall provide programming and configuration for each Assistive Listening System portable system to ensure interference-free operation between adjacent systems.

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. Cables shall be identified with a machine-printed tag identifying the system type, source or head end location, and destination location in all access points (i.e. junction boxes, ground boxes, MDF, IDF, etc.) and as they enter or exit and conduit pathway.

3.09 CONFIGURATION

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

3.11 AS-BUILT DRAWINGS

- A. See section 27 00 00 for requirements.

END OF SECTION