

**SECTION 08 80 00**

**GLAZING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Exterior and interior glass and glazing, including glazing clips, channels, compound and glazing beads, unless furnished with frame to be glazed as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Section 07 92 00 – Joint Sealants.
  - 2. Section 08 11 13 – Hollow metal Door Frames.

**1.02 REFERENCE STANDARDS**

- A. ASTM C1036 – Standard Specification for Flat Glass (flat, for glazing, mirrors and other uses).
- B. ASTM C920 – Standard Specification for Elastomeric Joint Sealants (Sealing Compound, Synthetic Rubber base, Single Component, Chemical Curing for Caulking, Sealing and Glazing in Building Construction).
- C. AAMA 800 and AAMA 807.3 - Non-skinning Resilient Preformed Compounds - Tapes, Ribbons, Beads with Release Paper.
- D. ANSI Z97.1
- E. GANA – Glass Association of North America
- F. 16 CFR 1201
- G. Chapter 24, Part 2, Title 24, California Building Code, 2019.
- H. NFPA 80

**1.03 SUBMITTALS**

- A. Submit manufacturer's standard size samples of glass units to be used for review by Architect.
- B. Submit manufacturer's literature and pertinent technical data on the products to be installed. Submit two (2) samples of glass units.
- C. Prepare and submit a schedule of glass and glazing components.
  - 1. Schedule tapes, gaskets, separators and related items including the designation of areas and specific locations where materials and products are to be used, special instructions on their use and installation, and show scheduled items on shop drawings.
  - 2. Provide detailed instructions for the installation and reglazing of glass units.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

Include with instructions and explanatory details, the sequence of installation, method of installation for materials and products including the glass, glazing gaskets, setting blocks, jamb blocks, etc., location of specific items such as the setting blocks and jamb blocks and special instructions as may be required.

**D. Certifications:**

1. Certify that the following materials and products and processes conform to these Contract Documents and submit in accordance with other sections of these specifications:
  - a. Sealants
  - b. Neoprene, nylon, etc.
  - c. Glass
  - d. Compatibility of materials, finishes, methods of application.

**1.04 QUALITY ASSURANCE**

**A. Glass Performance:**

1. The maximum overall size, minimum thickness, and type of glass is to conform to the applicable glass manufacturer's published recommendations for the openings or sizes indicated on the drawings, and the performance requirements specified in these specifications.
  2. Ensure that glass and glazing components conform to governing codes and regulations.
  3. Design glass to perform to a specified safety factor of 2.5, and sustain at maximum wind loading a statistical glass breakage of no more than eight lites in one thousand.
- B.** Be responsible for correct selection of glass including required accommodations for fire access, conditions of thermal stress, venting, wind loading and other factors which can reasonably be inferred from the drawings and location of the project.
- C.** Safety Glazing: All glass to be tempered and installed in accordance with the requirements of the Consumer Products Safety Commission regulation CPSC 16 CFR 1201.
- D.** Identification-Safety Glazing Materials: Identification shall be etched or ceramic fired on the glass and readable from the inside of the building after installation, CBC 2019, Title 24, Part 2, Section 2406.3

**1.05 DELIVERY, STORAGE AND HANDLING**

- A.** Take reasonable precautions necessary to provide complete protection of glass and glazing materials before, during and after installation.
- B.** In event of damages or breakage, repair or replace damaged and defective materials and products to the satisfaction of the Owner within five (5) calendar days.

**1.06 GUARANTEE**

- A. Furnish written guarantee covering work of this Section for 5 years from date of substantial completion. Under the terms of this guarantee, failures shall be repaired or replaced to satisfaction of the Architect and Owner without additional cost to the Owner. Under the guarantee, failures except vandalism and malicious mischief shall be repaired at no additional cost to Owner.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Insulated dual pane Low E Glass Units (1"): Float/tempered/Fire Rated/Exterior (specify type) clear (or specify color), then 1/2" air gap and float/tempered/Fire with PPG Solarban 70XL (Solar Control Low-E Clear Insulating Glass) on #3 pane, or equal, as follows:
1. Coating on #3 surface
  2. U-Value: .28 Winter and .26 Summer
  4. SHGC: .27
  4. Visible light transmittance of 64 percent, light to solar gain.

### 2.02 GLAZING

- A. Sealants:
1. Tremco, General Electric, and Dow Corning sealant products are approved where use is documented and in accordance with the use and conditions of this project.
  2. Compatibility and sequence of installation for sealants is to be carefully considered in design to ensure that required cure and optimum performance are met.
  3. Do not use sealants that degrade or fail under design conditions including, thermal movement (expansion and contraction), sanding water, ultra-violet exposure, aging, and other adverse time and environmental conditions.
  4. Structural Sealants: Provide Tremco, "Spectrum II", G.E. or Dow Corning "745", or equal, approved sealant and Dow Corning "1200 RTC4V" primer or equal. Ensure acceptance by manufacturer of product or system of construction into which glass and sealant is being installed.
  5. Color: To be selected by Architect.
  6. Test sealants in accordance with ASTM C794.
  7. Perform field adhesion tests in accordance with manufacturer's printed recommendations.
  8. Glazing Putty: NFPA-80, paintable.
- B. Spacers: Provide extruded silicone shims, 60-70 Type A Durometer.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

- C. Setting Blocks: Provide neoprene 80 to 90 Type A Durometer hardness type.
- D. Tape: Provide Tremco 440 tape, or other approved.
- E. Neoprene Glazing Gaskets and Air Seals:
  - 1. Provide glazing gaskets which are extruded type with continuous interlocking projection to engage into the metal glass holding member, are designed to be in contact at times with adjacent contiguous elements during dynamic loading, building and thermal movements, and provide a continuous water tight seal as required to meet the performance criteria.
  - 2. Roll-in and back-up gaskets are to be sized in lengths or units to provide for a minimum crowd-in of one percent to two percent, or as otherwise recommended by manufacturer, to ensure against pullback at corners.
  - 3. Roll-in glazing and back-up gaskets for one lite or glazed opening is to be continuous one-piece units with factory fabricated injection molded corners free of flashing and burrs.
  - 4. Materials, recommendations and details describing the proposed use, design, and application procedures for glass and glazing materials are to be documented and fully described on shop drawings.
  - 5. Air seal gaskets are to be continuous, closed cell (sponge) neoprene gaskets with pressure sensitive adhesive on one side in thickness and shore Durometer hardness as required for the specified performance criteria.
- F. Provide compound for fire-rated materials in strict accordance with manufacturer's instructions.

**2.03 SOURCE QUALITY CONTROL**

- A. Glass units are to be tongless edged, best quality, sizes and thickness required by drawings or conditions.
- B. Glass and related glass and glazing materials will be verified and coordinated with the performance requirements and be as recommended, in writing, by the applicable glass and gasket manufacturers. The type, size, thickness and design of glass units, including dimensions, tolerances, glazing pockets, jamb and seismic blocking, glass edge clearance and frame lap, will be verified and documented.

**Note:** The selection of the glass will take into special account the performance requirements herein specified.

- C. The edge treatment of butt glazed glass shall be as required to ensure the full adhesion and performance of the butt glazed sealant joint and shall be as recommended in writing by the applicable glass, sealant and gasket manufacturers.
- D. Where wire glass or fire assembly is scheduled, glaze in accordance with U.L. Building Materials, page 28A. Glazing putty compound shall be per NFPA 80.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. Remove lacquer and other coatings from glazing rabbets. Thoroughly clean areas to receive glass and glazing materials. The installation shall be in strict accordance with recommendations of window, glass and sealant manufacturers. Glass shall be installed so that no metal-to-glass contact occurs.
- B. Installation shall be in accordance with applicable requirements of the latest edition of the "Glazing Manual" of the Flat Glass Marketing Association. Where vinyl or neoprene glazing beads or channels are used, they shall be in one piece for each edge of glass, with corners neatly mitered and tightly fitted together.
- C. Glass shall be cut to size in the shop and shall have clean-cut edges. Other edges will not be accepted.
- D. Glass in aluminum frames unless otherwise specified shall be "dry-glazed" using neoprene glazing channels and snap-on beads furnished by manufacturer. Channels shall be installed so that no metal-to-glass contact occurs. Corners shall be neatly mitered to hairline joint. Channels shall be installed so that top of channel is flush with top of glazing stops and forms a neat, straight line.
- E. Before the shop or field pre-glazing of the curtainwall units, openings will be checked to see that they are square, plumb and in true plane. If found otherwise, glazing will not proceed until proper corrections are made.
- F. Perimeter clearance must be sufficient to avoid point loading and provide for jamb and seismic blocking.

### 3.02 TEMPERED GLASS UNITS

- A. Do not field cut or drill tempered glass units. Cut to proper size in factory.
- B. Vertical tempering will not be allowed.

### 3.03 MIRRORS

- A. Install mirrors in accordance with Drawings and include Dow Corning Mastic or other approved for adhesive application. Provide channel at bottom of mirror into which bottom is to rest, and at least four brackets for mechanical attachment around perimeter of mirror.

### 3.04 FIELD QUALITY CONTROL

- A. Testing: Upon completion of installation of glass and glazing, perform water tests in accordance with industry standards for such tests, and ASTM E331, AAMA FC-1, and NAAMM. Repair leaks and re-test. Continue with tests and repairs or replacements until such time as entire installation has been tested and certifiably exhibits no water intrusion, thereby instituting five-year guarantee against such water intrusion.

### 3.05 CLEANING

- A. Immediately prior to scheduled acceptance of work, remove protective materials and clean glass members, being careful not to use abrasive or harmful cleaning agents.

### 3.06 PROTECTION

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

- A. Maintain glass in a reasonable clean condition during construction so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other surfaces.

**END OF SECTION**

**09 00 00**

**FINISHES**

**SANTEE SCHOOL DISTRICT**

**SECTION 09 68 13**

**TILE CARPETING**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. This section includes the following:
  - 1. Tufted carpet tile.
- B. Related sections:
  - 1. 02 41 19 Selective Demolition

**1.03 SUBMITTALS**

- A. Manufacturer's Data - Submit two (2) copies of manufacturer's specifications and installation instructions for carpet tile and related items specified. Manufacturer shall also submit a plan for recycling the specified carpet tile and related items at the end of useful life of the carpet.
- B. Fiber and backing verification - Certification from the producer verifying use of the branded fiber and backing in the submitted carpet product. Certification should include the % recycled content by weight for fiber and backing, describing the source of this recycled content. If virgin nylon or backing is used, the manufacturer shall include as part of the fiber and backing certification, the precise method that will be used to recapture the nylon and backing at the end of the useful life of the carpet tile. State how it will be returned to carpet production, fiber into fiber and backing into backing. Fiber types shall not be mixed to facilitate future recycling.
- C. Shop Drawings - Submit shop drawings for areas to be carpeted showing installation of carpeting, seam diagram, pattern direction, necessary installation accessories, and provisions for work of other trades. Show location of different patterns or styles of carpet. Also, show locations of any threshold conditions.
  - 1. The construction manager will supply reproducible prints on request, to facilitate shop drawing preparation.
- D. Samples - Submit standard size carpet samples of each type of carpet, in each specified pattern, color and construction.
  - 1. Any alternates to specified products) must be submitted for approval by a representative of the end user at least ten (10) working days prior to bid or proposal.
  - 2. Final Sample Submittal - Submit two (2) sets of samples for each carpet type.



**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

3. No carpet shipments are permitted until acceptance of final samples by representative of the end user or architect/design firm, certifying that samples are the approved color, pattern, and texture. No carpet shipments are permitted until the fiber and backing certifications and recycling plans are approved by the end user or architect/design firm.
  4. Custom Color Only - Quality color samples shall be signed by a representative of the end user or architect/design firm, certifying that samples are the approved color, pattern, and texture.
  5. Samples submitted will be assumed to be the manufacturer's best obtainable match to the carpet described under Materials section.
- E. Maintenance Instructions - Submit to the District two (2) copies of the manufacturer's carpet maintenance instructions, including information needed for the removal of common stains from each type of carpet required.
- F. Recycling Instructions - Submit to the District two (2) copies of the manufacturer's instructions on post-consumer recycling of the specified carpet tile and related items.
1. A representative from the carpet manufacturer shall meet with the Construction Manager in the presence of a representative of the end user and architect/design firm to review the recommended procedures, prior to occupancy of the finished spaces.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer - Carpet manufacturer shall have no less than three years of production experience with recyclable carpet tile (fiber to fiber and backing to backing) similar to type specified in this document; and whose published product literature clearly indicates compliance of products with requirements of this section.
1. Single source responsibility - provide product material by a single manufacturer for each recyclable carpet type specified.
  2. Commitment to sustainability - carpet manufacturer must practice environmental responsibility through programs of source reduction, recycling, reuse, and conservation.
- B. Trade Contractor - firm with not less than five years of successful carpet tile experience similar to work of this Section and recommended and approved by the carpet manufacturer. Upon request, submit letter from carpet manufacturer stating certification qualifications and acceptance of all environmental requirements.
1. Participant in environmental program including responsible carpet removal, recycling and installation
- C. Substitutes - Where a selected manufacturer or product has been specified, an equal or superior product may be accepted only upon review and written acceptance by the architect. It is mandatory that such review and approval be obtained prior to bidding, or the substitution will not be considered. All such proposed substitutions shall be submitted to the architect with appropriate manufacturer's specifications, literature, environmental compliance assurance, and independent laboratory testing data. The architect's

decision as to whether a product is equal or superior to the one specified shall be final. This section applies to any "or equal" noted in the specification.

1.05 PRODUCT DELIVERY AND STORAGE

- A. Deliver carpeting materials in sealed protective packaging for carpet tile and sealed containers for related materials. Carpet materials shall be bound with secure protective wrapping. Consideration should be given to bulk packaging of carpet tile when delivery is made to the jobsite for immediate installation to reduce packaging waste.
- B. Storage and staging area at the site must be coordinated with the Construction Manager.
- C. Provide 3% overage of calculated yardage for each type of carpet (calculated yardage shall include carpet needed for complete installation plus waste and usable scraps).
  - 1. Deliver specified overrun and usable scraps of packages to owner's designated storage space, properly packaged (boxed) and identified. (Redirect small pieces of waste carpet to be appropriately recycled.)
- D. Materials shall be stored in an enclosed and dry area protected from damage and soiling.

1.06 PRE-INSTALLATION MEETING

- A. The manufacturer shall meet at the project site with representatives of end user, Construction Manager and the Trade Contractor to review the carpet installation procedure and coordination with other trades. The Trade Contractor must have available at this meeting the carpet manufacturer's installation procedures, instructions for the carpet types specified in the various applications required, and recycling procedures outlined in the manufacturer's environmental program.
- B. Store carpet in working areas which have been enclosed and have maintained environmental conditions as those planned for occupancy. Carpet shall be allowed to reach room temperature or minimum temperature recommended by manufacturer before installation.

1.07 WARRANTY

- A. Provide warranties by Carpet Manufacturer and Trade Contractor agreeing to replace defective materials and workmanship of carpet work during one (1) year warranty period following Notice of Completion. Also, submit carpet manufacturer's warranties as follows:
  - 1. Wear - Surface wear shall not be more than 10% by weight throughout the life of the product.
  - 2. Static - Carpet will maintain static generation at less than 3.5 KV at 70 degrees F, and 20% R.H. throughout the life of the product.
  - 3. No delamination throughout the life of the product.
  - 4. No edge ravel throughout the life of the product.
  - 5. No dimensional instability, i.e. shrinkage, curling, and doming which adversely affect the ability of the tile to lay flat throughout the life of the product (per installation instructions). See Aachen test.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

6. Colorfastness Warranties: Lifetime Colorfastness to Light, Lifetime Colorfastness to Atmospheric Contaminants for 100% solution dyed nylon products.
  7. Stain Removal: Lifetime Stain Removal Limited Guarantee
  8. Manufacturer must take back carpet free of charge for quantities above 500 yds.
- B. Submit manufacturer's certified independent test results to show that carpet meets or exceeds product performance specification criteria for carpet testing requirements (i.e. see section 2.3 flame, smoke, Aachen test, etc.).
- C. Lifetime Commercial Limited Warranty (Owner's Option) - Owner will be completely satisfied with the performance of the carpet product when installed in accordance with the manufacturer's current installation specifications and is maintained in accordance with the current carpet care recommendations and such maintenance continues throughout the duration of the original installation when owned and maintained by the original end user. Further, owner will be satisfied with the recycling of the product at the end of its useful life as outlined in the manufacturer's environmental program.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURER**

- A. Preferred Manufacturer: Tarkett (Tandus)
1. Pattern- Main carpet: Haphazard II 03366 in Seahorse 13513  
Walk-off carpet: Abrasive Action in Charcoal 19100
- B. Acceptable Manufacturers: Equal products only.

**2.02 CARPET TILE**

- A. Package Marking - Mark each carpet package according to style, color, pattern, dye lot, run number and quantity. Within each continuous carpet area, install carpet from same dye lot and run.
- B. Carpet Construction Specification - All yarn and carpet shall be manufacturer's first quality and 100% recyclable.

**2.03 CARPET SHALL MEET THE FOLLOWING PERFORMANCE STANDARDS:**

- A. Flooring Radiant Panel (ASTM E648): Class I
- B. Smoke Generation (ASTM E662): < 450

**2.04 PRODUCT SPECIFICATIONS**

- A. Product recyclability 100%
- B. Format Type Modular 24" Tile
- C. Fiber System TDX Nylon; Antron Lumena Type 6
- D. Dye Method Solution Dyed
- E. Face Weight 14 oz/yd<sup>2</sup>

F.	Total Thickness (ASTM F386)	0.280" (7.06 mm)
G.	Recycled Content	29% Pre-Consumer 36% Post-Consumer
H.	Cradle to Cradle Certified	Must be MBDC Cradle to Cradle Certified
I.	Size	24 in. x 24 in.
J.	NSF140	Platinum Certified

#### 2.06 RELATED CARPET MATERIALS

- A. Leveling Compound - Latex type as recommended by carpet manufacturer and is compatible with carpet adhesive and curing/sealing compound on concrete.
- B. Releasable pressure sensitive type adhesive - Use the following as recommended by the carpet manufacturer which will allow removal of carpet at any time without damage or adherence to carpet: N5000 low VOC (no solvents) carpet tile adhesive.
- C. Multi-purpose Adhesive - Provide the following adhesive as recommended by carpet manufacturer for direct glue-down of carpet on steps.
- D. Carpet Edge Guard, Nonmetallic - Extruded or molded heavy duty vinyl or rubber carpet edge guard of size and profile indicated and with minimum 2 inch wide anchorage flange; colors selected by architect/designer from among standard colors available within the industry.
- E. Miscellaneous Materials - As recommended by manufacturer of carpet, cushion and other carpeting products and selected by Trade Contractor to meet project circumstance and requirements.

### PART 3 - EXECUTION

#### 3.01 PRE-INSTALLATION REQUIREMENTS AND PREPARATORY WORK

- A. The Trade Contractor shall measure carefully and check all dimensions and other conditions in the field to insure proper fit in the areas designated. Trade Contractor shall be totally responsible for the accuracy of his measurements on total yardage requirements, individual floor yardage requirements and dye lot yardage requirements. No request for carpet or installation extras from the owner will be considered due to measurement or takeoff errors by the Trade Contractor. The Trade Contractor shall confirm total yardage required, including 3% attic stock along with bid.
- B. The Trade Contractor shall coordinate all installation activities with the Construction Manager.
- C. Removal of carpet to be replaced (if applicable) should be handled according to preapproved plan for reuse and/or recycling. See carpet reclamation specification.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

- D. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period. Carpet installation must not commence until painting and finishing work is complete and ceiling and other overhead work has been tested, approved and completed, unless specifically approved by owner's Project Manager, in writing.
- E. Trade Contractor and manufacturer's representative must examine substrates for conditions over which carpeting is to be installed.
  - 1. New concrete shall be allowed to cure for ninety (90) days before carpet installation.
  - 2. Trade Contractor shall perform moisture content testing as required in manufacturer's instructions to ensure pH readings of no more than 9. Moisture transmission of 5.5 pounds per sqm per 24 hours is acceptable. If values exceed this level manufacturer's recommendations must be followed for moisture transmission mitigation. Do not proceed until unsatisfactory conditions are corrected.
  - 3. Cracks 1/16 inch or more, holes, unevenness and roughness must be filled, leveled and made smooth with a compatible latex floor patching compound. Prior to filling, the floor must be swept clean of all loose granular debris. After filling, allow filler to dry. Then damp mop the floor with warm water and allow to dry. Vacuum after mopping, to ensure all loose granular debris is removed and provide a proper substrate to install carpet.
- F. All surfaces to receive carpet shall be clean and dry, and in a condition satisfactory to the Trade Contractor. Trade Contractor shall notify Construction Manager in writing of any conditions which will prevent him from producing satisfactory finish work after above specified preparatory work is completed.
- G. Trade Contractor shall vacuum floors again immediately before installation of carpeting.
- H. Confirm compatibility of adhesive with curing compounds on concrete floors. All adhesives and curing compounds shall comply with the CRI Green Label Certification program for low VOC.
- I. Environmental Conditions - Areas to be carpeted must be pre-heated at a minimum of 68° F. for 72 hours prior to installation with the relative humidity not more than 65%. A minimum temperature of 50° F. shall be maintained thereafter. Carpet and adhesive must be stored at a minimum temperature of 68° F. for 72 hours prior to installation.
- J. Once the Trade Contractor commences installation work under this contract, it shall be assumed that the condition of the floor has been accepted and any repairs or further corrections in the floor surface shall become the responsibility of the Trade Contractor.

**3.02 INSTALLATION**

- A. General
  - 1. Comply with manufacturer's instructions and recommendations for uniformity of direction of carpet installation.
  - 2. Install carpet under open-bottom obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.

3. Provide cut outs where required. Conceal cut edges with protective edge guards or overlapping flanges.
4. Run carpet under open-bottom items such as heating convectors and install tight against walls, columns and cabinets so that the entire floor area is covered with carpet. Cover over all floor type door closures.
5. Install edging guard at all openings and doors wherever carpet terminates, unless indicated otherwise. Prior to installation, report to the Construction Manager all other obstructions which may occur.
6. Cutting shall be done in accordance with the manufacturer's recommendation, using the tools designed for the carpet being installed. Scraps shall be retained or disposed of per the manufacturer's environmental program.
7. Edges shall be butted together with the proper pressure to produce the tightest joint possible without distortion.
8. All carpet shall be installed with pile-lay in the same direction except when directed to use a quarter turned method as specified in the drawings.
9. Use leveling compound where necessary. Any floor filling or leveling shall have a minimum of 4'0" of feather.
10. Expansion joints - Do not bridge building expansion joints with continuous carpeting. Provide for movements.

B. Installation

1. Install carpet according to carpet manufacturer's printed instructions.
2. Measuring - Divide the room into four quadrants and snap a chalk line. Make sure quadrants meet at right angles (offset the center line, if necessary, to ensure that perimeter tiles will be cut no less than half size (9 inches).
3. Apply environmentally approved adhesive as per instructions in the area to be carpeted first.
4. Note carefully if the product is designed to be installed "quarter turned" only. Arrows should point in the same direction every other tile and diagonally. Arrows on alternating tiles should be turned 90° in either direction, consistently.
5. Begin installing by laying an anchor row of tiles on one side of the center chalk line. Ensure straight lines and square corners. Repeat anchor rows in each quadrant, extending out from center. Fill in each quadrant with tiles using a stair step technique.
6. Tip individual tiles into place to avoid catching pile in the joint. Frequently check tile joints for proper alignment and firm abutment.
7. Although tiles are nominally 24 inches by 24 inches square, there will be slight gain due to joints. To check, measure 10 installed tiles from edge to edge, spanning 10 joints. This measurement should be no greater than 240 and 1/8

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

inches for tufted product. If more gain is measured, tiles are not butted tightly enough. Reposition and check again. Use this method to continually check for excessive gain. See manufacturer's instructions for 24" x 24" modular tiles.

8. Fixtures, architectural elements, and perimeters will require tile cutting. Cut tiles from the back. Secure cut or partial tiles with adhesive.
9. Electrical floor outlets are usually wired after tile installation. Install tile over electrical boxes and mark locations with a piece of tape. Tiles can be lifted for cut-outs later.
10. Center trench headers directly under a full tile row.
11. In open perimeter designs, use a fixed reducer strip to secure the tile area.
12. Use an environmentally acceptable permanent adhesive for tiles installed on stairs. Compatible edge trim and nosing products may also be required.

**3.03 CLEANING AND PROTECTION**

- A. On completion of the installation in each area, all dirt, carpet scraps, etc., must be removed from the surface of the carpet. Any soiling spots or excessive adhesive on the carpet shall be removed with the proper spot remover. (See Section 1.3.7)
- B. Construction traffic other than as may be required to fit up specific carpeted area will not be allowed to traverse the completed work.
- C. Remove debris, and sort pieces to be saved from scraps to be redirected and recycled.
- D. Protect carpeting against damage during construction. Cover with 6-mil thick polyethylene covering with taped joints during the construction period, wherever protection is required, so that carpet will be without any indication of deterioration, wear, or damage at the time of acceptance. Damaged carpeting will be rejected and recycled. As the carpet is laid, remove all trimmings, excess pieces of carpet and laying materials.
- E. At the completion of the work and when directed by the Construction Manager, vacuum carpet using commercial dual motor vacuum of type recommended by carpet manufacturer. Remove spots and replace carpet where spots cannot be removed. Remove rejected carpeting and replace with new carpeting. Remove any protruding yarns with shears or sharp scissors.
- F. Protection of carpeting shall be maintained on each floor or area until accepted.

**3.04 INSPECTION**

- A. Preliminary Acceptance - Upon completion of the carpet installation of each floor, it shall be inspected by Owner, the Construction Manager and Trade Contractor.
- B. Upon completion of the installation, verify that work is complete, properly installed and acceptable. Remove and replace all work not found acceptable to the owner at the installer's expense.
- C. Upon completion of the installation the manufacturer shall deliver a certificate of recycling describing the method by which the uplifted carpet was recycled, and shall provide a

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

promise of recycling specifying the method of recycling of the newly installed carpet tile at the end of its useful life.

**END OF SECTION**



**SECTION 09 77 23**

**FABRIC- WRAPPED PANELS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Vinyl-wrapped panels on tackboard including coordination with electrical trades as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Section 09 29 00 – Gypsum Board: for walls
  - 3. Electrical work, Division 26.

**1.02 SUBMITTALS**

- A. Submit samples of fabric-wrapped materials and core for review.
- B. Provide Architect with Shop Drawings showing vertical joints, as well as details of panel attachment to substrates, and details at inside and outside corners.
  - 1. Describe materials, fabrics, adhesives, and mechanical fasteners or clips.
  - 2. Provide Certifications for Low-emitting materials.
- C. Submit certified test reports showing the acoustical properties as required in this Specification.

**1.03 QUALITY ASSURANCE**

- A. Ensure installation of these systems by persons thoroughly experienced with this type of installation and approved by the manufacturer of the systems being installed.
- B. Comply with requirements of Title 19 and Title 24, Part 2, California Building Code, 2019, Chapter 8.
- C. Acoustical measurements shall be performed in accordance with ASTM C423 performed in type A mounting per ASTM E795. The test shall be performed within the last 5 years by a laboratory accredited under the National Voluntary Laboratory Accredited Program for ASTM C423.
- D. Low-Emitting Materials: Provide tackable wallcovering that is third-party certified to have been tested and passed the following indoor air quality standard:
  - 1. Comply with the volatile organic compound emissions requirements of California Department of Public Health Standard Method, Section 01350.

**1.04 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products and materials to the project and store in a safe, dry place with shop supplied protection and labeling intact and legible until set applied or installed.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTÉE SCHOOL DISTRICT  
PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Vinyl Wrapped Panels: Provide wrapped-edge design panels with shop applied fabric finishes as scheduled below. Fabric shall not lap the back face more than 1-1/2" from edge.
  - 1. Core: Lamvin, Chatfield-Clarke, or equal - 1/2" fiberboard, noncombustible with flame spread less than 75, smoke density less than 450, ASTM E84. Fiber board ironed core 18lbs per cubic foot, Class C complying with ASTM C208, flame spread of 45 or less, and smoke density of 45.
  - 2. Vinyl: Koroseal, Esquire in Gentleman's Gray, or equal, with flame spread of 25 or less.
- B. Minimum NRC of 0.70 for vinyl wrapped panels and 0.85 for fabric wrapped panels.

**2.02 ACCESSORIES**

- A. Fastening: Provide adhesive spread over entire contact surface with a 1/8-inch notched trowel or apply 1-inch dabs no more than 12 inches o.k. and 2 inches from edge of panel.
- B. Metal Trim: Where metal J-Trim is used, metal trim shall be clear anodized aluminum.
- C. Provide vinyl plastic 1/2-inch J-Bead Trim, as manufactured by Trim-Tex® Co. 3700 W. Pratt Ave. Lincolnwood, IL, 60712, or equal. Finish shall be glued on vinyl fabric to match wall panel finish. Install J-Bead Trim full height and where wall panels abut:
  - 1. Hard ceilings (gypsum board or plaster);
  - 2. At all dissimilar wall surfaces.
- E. Adhesives: Use adhesive to fasten fabric onto backing, per manufacturer's recommendations. Provide mildew-resistant, moisture-proof type which will not discolor or stain exposed surfaces of the fabrics.
  - 1. Apply adhesive to wall panel, full skim coat over the entire panel, level for an even, straight line appearance.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Examine building before beginning work to determine that it is properly enclosed, and the structure is in proper condition to receive installation.

**3.02 INSTALLATION**

- A. Prime subsurface with GL3210 Gripper Primer-Sealer, by Glidden, or equal as approved by adhesive manufacturer. Provide panel manufacturer approved adhesive over entire panel.
- B. Layout work in accordance with reviewed and approved shop drawings. Install panels over entire area of scheduled walls including areas to be covered by casework.
- C. Install system as scheduled on the Drawings. Ensure that no fasteners are exposed.

- D. Contiguous panels are to be in identical planes with no more than 1/8-inch variation in plane in 12-foot area.
- E. Coordinate installation of vinyl wrapped panels with gypsum wall board installer, at walls where channel screed molding occurs.

3.03 CLEANING

- A. Clean surfaces, including floors and walls which have become soiled from this work.
- B. Replace materials which have become broken, chipped or abraded.

3.04 WARRANTY

- A. Submit manufacturer's limited written warranty against manufacturing defects.
  - 1. Warranty Period: Five Years.

**END OF SECTION**

SECTION 09 90 00

PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Provide materials, labor and equipment necessary for the completion of a completely painted project, including preparation of painted surfaces. Provide finishes based on materials and products scheduled in these specifications and on the drawings. If not otherwise specified, provide prime coat and two finish coats on all exposed to view or weather surfaces. This shall include painting all pigmented exterior plaster (integral color stucco) in not less than three colors. The following miscellaneous items shall also be painted:
  - 1. Areas shown to be painted on the Room Finish Schedule or Exterior and Interior Elevations. Items called out to be painted in Divisions 23 and Division 26. All hollow metal.
  - 2. Exposed site plumbing items, such as PIV's, backflow preventors, exposed pipes and standpipes, fire hydrants, irrigation air relief valve covers, exposed valves, exposed roof drainpipes, etc.
  - 3. Exposed interior mechanical ductwork, piping, and electrical conduits (except in electrical rooms and closets), wall and ceiling access covers, hatches, panel covers, and plates, and exposed cable tray and supports.
  - 4. Priming and sealing of gypsum wallboard that is to receive vinyl wall covering.
  - 5. Roof hatches (interior and exterior), exterior galvanized ladders, sheet metal parapet copings on both sides and top. Exposed metal components that arrive on job with only prime finish. Signposts. Decorative metal fence and gates. Metal railings and bollards. Exposed steel connectors, bolts, and plates.
  - 6. Stain and seal exposed wood components.
- B. Specific items NOT to be painted or finished: Factory finished items (as opposed to factory primed), chain link fence, volleyball and basketball posts, football goals, chin-up bars, concrete benches, wood casework finished by casework fabricator.
- C. Related Work:
  - 1. Section 32 12 16 – Asphalt Paving.
  - 2. Section 07 92 00 – Joint Sealants.
  - 3. Electrical, Division 26.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT  
1.02 REFERENCE STANDARDS**

- A. Conform to California Air Resources Board (CARB) Rules, especially 1113, Architectural Coatings.
- B. Title 19, California Code of Regulations (CCR), Public Safety, State Fire Marshal Regulations

**1.03 SUBMITTALS**

- A. Prepare eight, 8-1/2-inch by 11-inch samples of finishes, to be provided to District's Maintenance and Operations Department. When possible, apply finishes on identical type materials to which they will be applied on job.
- B. Identify each sample as to finish formula, color name, reflectance number and sheen name and gloss units.
- C. Colors will be selected by Owner and Architect prior to commencement of work, from manufacturer's full range of standard and custom colors.
- D. State Fire Marshal, Fire and Life Safety Approval: Flame retardant coatings shall be listed by the California State Fire Marshal's office. A copy of this listing and a material specification sheet shall accompany the submittal.
- E. Submittal to be reviewed and signed by District's Maintenance and Operations Department prior to Architects approval.

**1.04 QUALITY ASSURANCE**

- A. Mock-up: Before proceeding with paint application, finish one complete surface of each color scheme required, clearly indicating selected colors, finish texture, materials and workmanship. If approved, sample area will serve as a minimum standard for work throughout.

**1.05 MAINTENANCE MATERIALS**

- A. Leave on premises where directed, not less than one full gallon of each color, of each type of paint, in new unopened containers. Label each container for identification.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver paint materials in sealed original labeled containers bearing manufacturer's name, type of paint, brand name, solids content, color designation and instructions for mixing and/or reducing.
- B. Provide adequate storage facilities. Store paint materials at a minimum ambient temperature of 65 degrees F., in well ventilated area.
- C. Take precautionary measures to prevent fire hazards and spontaneous combustion.

**1.07 PROJECT CONDITIONS**

- A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following minimums: gypsum board - 12 percent; cementitious materials - 12 percent.
- B. Ensure surface temperatures and surrounding temperatures are above 50 degrees F.,

before applying finishes.

- C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 50 degrees F., for 24 hours before, during, and 48 hours after application of finishes.
- D. During painting, provide minimum of 25-foot candles of lighting on surfaces to be painted.

#### 1.08 EQUAL PRODUCTS

- A. All products specified herein, may be substituted with a product that is equal to better than the product specified. Products must be equal in all ways, including chemical and physical make up, as well as performance.
- B. Substitutions will be reviewed by the District and a determination will be made on the acceptability of the product submitted. If a determination is made that the substituted product is not equal, the original project specified herein will be provided at no cost to the owner.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Provide paints and coatings manufactured by one of the following companies noted in Section 2.02, D and refer to cross-reference guide for acceptable alternates.

#### 2.02 PAINT MATERIALS

- A. Accessories: Provide linseed oil, turpentine and other materials not specifically specified but required to achieve finishes.
- B. Paints and Coatings: Provide ready-mixed type except field catalyzed coatings; pigments fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixtures.
- C. Provide paints and coatings with good flowing and brushing properties and capable of drying or curing free of streaks and sags.
- D. Painting  
Provide equivalent paint types according to the following schedule.

##### Interior

##### New Drywall (Semi-Gloss Finish)

1 <sup>st</sup> coat	SW ProMar 200 Zero VOC Primer
2 <sup>nd</sup> coat	SW ProMar 200 Zero VOC Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProMar 200 Zero VOC Semi-Gloss

##### New Drywall (Low Sheen Finish)

1 <sup>st</sup> coat	SW ProMar 200 Zero VOC Primer
2 <sup>nd</sup> coat	SW ProMar 200 Zero VOC Low-Sheen
3 <sup>rd</sup> coat (to cover*)	SW ProMar 200 Zero VOC Low-Sheen

##### New Drywall (Eggshell Finish)

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

1 <sup>st</sup> coat	SW ProMar 200 Zero VOC Primer
2 <sup>nd</sup> coat	SW ProMar 200 Zero VOC Eg-shel
3 <sup>rd</sup> coat (to cover*)	SW ProMar 200 Zero VOC Eg-shel

New Drywall (Microbicidal Eggshell Finish – Locker Rooms, Nurses Office)

1 <sup>st</sup> coat	SW ProMar 200 Zero VOC Primer
2 <sup>nd</sup> coat	SW Paint Shield Microbicidal Eg-shel
3 <sup>rd</sup> coat (to cover*)	SW Paint Shield Microbicidal Eg-shel

New Wood Painted Surfaces (Semi-Gloss Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

New Steel Door / Door and Window Frames

1 <sup>st</sup> step	GLL Clean & Etch
1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Prime
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

New Ferrous Metal (including steel doors and hollow metal frames)

Pretreatment	GLL Clean & Etch
1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Prime
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

New Galvanized Metal

Pretreatment	GLL Clean & Etch
1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Prime
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

Ceilings

1 <sup>st</sup> coat	SW ProIndustrial WB Dryfall Flat
2 <sup>nd</sup> coat (to cover*)	SW ProIndustrial WB Dryfall Flat

Previously Painted Drywall and Wood "Wall" Surfaces (Semi-Gloss Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProMar 200 Zero VOC Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProMar 200 Zero VOC Semi-Gloss

Previously Painted Drywall and Wood "Wall" Surfaces (Low Sheen Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProMar 200 Zero VOC Low-Sheen
3 <sup>rd</sup> coat (to cover*)	SW ProMar 200 Zero VOC Low-Sheen

Previously Painted Drywall and Wood "Wall" Surfaces – Locker Rooms, Nurses Office, Eggshell Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW Paint Shield Microbicidal Eg-shel
3 <sup>rd</sup> coat (to cover*)	SW Paint Shield Microbicidal Eg-shel

Previously Painted Wood Trim Surfaces (Semi-Gloss Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

Previously Painted Wood Trim Surfaces (Low Sheen Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Low Sheen
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Low-Sheen

Previously Painted Metal Surfaces (Semi-Gloss Finish)

1 <sup>st</sup> coat (spot)	SW ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

Previously Painted Metal Surfaces (Low Sheen Finish)

1 <sup>st</sup> coat (spot)	SW ProCryl Acrylic Metal Prime
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Low-Sheen
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Low-Sheen

Vinyl Covered Walls

1 <sup>st</sup> coat	SW Extreme Bonding Primer
2 <sup>nd</sup> coat	SW ProMar 200 Zero VOC Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProMar 200 Zero VOC Semi-Gloss

Exterior

New Painted Stucco-Plaster-Concrete (Low Sheen Finish)

1 <sup>st</sup> coat	SW Loxon Primer
2 <sup>nd</sup> coat	SW A-100 Satin
3 <sup>rd</sup> coat (to cover*)	SW A-100 Satin

New Painted Wood (Gloss Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

New Painted Wood (Semi-Gloss Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

New Painted Wood (Low Sheen Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Urethane
2 <sup>nd</sup> coat	SW A-100 Satin
3 <sup>rd</sup> coat (to cover*)	SW A-100 Satin

Previously Painted Stucco-Plaster-Concrete (Low Sheen Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW A-100 Satin
3 <sup>rd</sup> coat (to cover*)	SW A-100 Satin

Previously Painted Wood (Gloss Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss



**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

Previously Painted Wood (Semi-Gloss Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

Previously Painted Wood (Low Sheen Finish)

1 <sup>st</sup> coat	SW Preprite ProBlock Primer
2 <sup>nd</sup> coat	SW A-100 Satin
3 <sup>rd</sup> coat (to cover*)	SW A-100 Satin

New Steel Doors / Door and Window Frames

1 <sup>st</sup> step	GLL Clean & Etch
1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

New Ferrous Metal

1 <sup>st</sup> step	GLL Clean & Etch
1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

New Galvanized Metal

Pretreatment	GLL Clean & Etch
1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

Previously Painted Steel Doors / Door and Window Frames

1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

Previously Painted Ferrous Metal

1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

Previously Painted Galvanized Metal

1 <sup>st</sup> coat	SW ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	SW ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

- E. **SPECIAL COATINGS (HIGH PERFORMANCE)** – Exterior metal stairs (including handrails, railings and guard rails), roof sheet metal flashing, roof equipment, metal wall louvers and other metal surfaces requiring High Performance Coatings.

Unprimed or shop primed ferrous metal

1 <sup>st</sup> coat	SW Macropoxy 646
2 <sup>nd</sup> coat	SW Macropoxy 646
3 <sup>rd</sup> coat (to cover*)	SW High Solids Polyurethane

Galvanized or Aluminum

1 <sup>st</sup> coat	SW DTM Wash Primer
2 <sup>nd</sup> coat	SW Macropoxy 646
3 <sup>rd</sup> coat (to cover*)	SW High Solids Polyurethane

Previously Painted Metal

1 <sup>st</sup> coat	SW Macropoxy 646
2 <sup>nd</sup> coat	SW Macropoxy 646
3 <sup>rd</sup> coat (to cover*)	SW High Solids Polyurethane

- F. **Other** – Wood, metal and concrete steps and ramps attached to buildings indicated will be painted as follows:

Concrete Steps/Ramps

1 <sup>st</sup> coat	SW Armorseal 8100
2 <sup>nd</sup> coat (to cover*)	SW Armorseal 8100 w/ sand
3 <sup>rd</sup> coat	Include yellow stripes

Metal Steps/Ramps

1 <sup>st</sup> coat	SW Macropoxy 646
2 <sup>nd</sup> coat	SW Macropoxy 646
3 <sup>rd</sup> coat (to cover*)	SW High Solids Polyurethane w/ sand
4 <sup>th</sup> coat	Include yellow stripes

Wood Steps/Ramps

1 <sup>st</sup> coat	SW Superdeck 3100 Deck & Dock Elastomeric Coating
2 <sup>nd</sup> coat	SW Superdeck 3100 Deck & Dock Elastomeric Coating (6310 Anti-Skid added to 2 <sup>nd</sup> coat) Include yellow stripes

\*\*"to cover" is defined – coverage must meet district's approval

\*\*\*"spot prime" is defined as priming all bare metal areas

I. **Paint Guide**

SURFACES	FRAZEE
Interior	126 Aro-Thane S/G
Interior	129 Aro-Thane L/S
Interior	022 LoGlo
Exterior	215 Royal Supreme
Exterior	146 Aro-Thane Gloss
Exterior	136 Aro-Thane S/G

J. **Primer Guide**

SURFACES	FRAZEE
Interior – New Gypsum Board	Zinsser 123 Primer/Sealer
Interior – New Wood	Zinsser 123 Primer/Sealer
Interior – New Metal Surfaces	C309 Universal Metal Primer
Interior – Previously Painted	Zinsser 123 Primer/Sealer

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

Gyp Board, Wood	
Interior – Previously Painted Plaster, Metal	Zinsser 123 Primer/Sealer
Exterior – New and Previously Painted Wood	Zinsser 123 Primer/Sealer
Exterior – New and Previously Painted Stucco, Concrete, and Plaster	Zinsser 123 Primer/Sealer
Exterior – New and Previously Painted Metal	Zinsser 123 Primer/Sealer

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing of conditions potentially detrimental to proper application. Do not commence until satisfied that defects and deficiencies in surfaces have been rectified.

**3.02 PROTECTION**

- A. Adequately protect other surfaces from paint and damages. Repair damages as a result of inadequate or unsuitable protection.
- B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation areas.
- C. Place cotton waste cloths and materials which may constitute a fire hazard in closed metal containers and remove daily from site.
- D. Remove or cause to have removed, electrical plates, fittings, fastenings, escutcheons, and hardware prior to painting operations. These items are to be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvents or other harsh cleansers on surfaces which could be damaged by such use of materials.

**3.03 PREPARATION OF SURFACES**

- A. Thoroughly clean surfaces to be painted with hydro-cleaning process to remove chalk, dirt and other deleterious materials where such cleaning methods are practical. Spot prime before application of finish coats.
- B. Remove dirt, grease and oil from canvas and cotton covered insulated materials such as pipes and ducts.
- C. On surfaces to be cleaned which cannot be hydro cleaned, where possible, wash with solution of TSP and thoroughly rinse.
- D. Patch and prime cementitious materials.
- E. Remove contamination from gypsum board surfaces and prime to conceal defects. Paint

after defects have been remedied.

- F. Remove surface contamination and oils from zinc coated/galvanized surfaces, wash with solvent, apply etching primer or as recommended by paint manufacturer and confirmed with metal manufacturer.
- G. Remove dirt, loose scale, powder, mortar and other foreign matter from cementitious surfaces which are to be painted or to receive sealer. Remove oil and grease with TSP solution, rinse well and allow to thoroughly dry.
- H. Remove stains from cementitious surfaces caused by weathering of corroding materials with a solution of sodium metasilicate after being thoroughly wetted with water. Allow to thoroughly dry.
- I. Fill hairline cracks, small holes and imperfections. Smooth off to match adjacent surfaces. Smooth off to match adjacent surfaces. Wash and neutralize high alkali where they occur.
- J. Remove grease, rust, scale, dirt and dust from steel and iron surfaces. Where heavy coatings of scale are evident, remove by wire brushing, sandblasting or other method necessary, practical and in accordance with Steel Structures Painting Council.
- K. Clean non-primed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring welded joints, bolts and nuts are similarly cleaned. Prime surfaces to indicate defects. Paint after defects have been remedied.
- L. Sand and scrape shop primed steel surfaces to remove loose primer, and rust. Feather out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare surfaces.
- M. Wipe off sanding dust and grit from miscellaneous wood and carpentry items prior to priming. Spot coat knots, pitch steaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand between coats. Back prime interior and exterior woodwork.
- N. Doors:
  - 1. Painting Contractor shall not remove or reinstall any door hardware.
  - 2. Except for door hinges, painting of doors must be completed prior to installation of hardware.

### 3.04 APPLICATIONS

- A. Apply each coat at proper consistency.
- B. Each coat of paint is to be slightly darker than preceding coat unless otherwise directed, or finish is clear.
- C. Sand lightly between coats to achieve required finish.
- D. Do not apply finishes on surfaces that are not sufficiently dry.
- E. Allow each coat to dry before following coats are applied.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

- F. Backprime wood which is to receive paint or enamel paint, with enamel undercoater paint.
- G. Prime top and bottom edges of wood doors with enamel undercoater when they are to be painted.
- H. Apply flame retardant coating to the wood surface prior to applying stain and/or paint per manufacturer's instructions. Furnish certification of application of flame-retardant coating.

**3.05 MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Refer to mechanical and electrical sections of these specifications, as well as Drawings, with respect to painting and finishing requirements, color coding, identification banding of equipment, ductwork, piping and conduit.
- B. Remove grilles, covers and access panels for mechanical and electrical systems from location and paint separately.
- C. Finish paint primed equipment to colors selected.
- D. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with a pre-finished coating, or are not exposed-to-view.
- E. Replace identification markings on mechanical and electrical equipment when painted over or spattered.
- F. Paint interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sightline. Paint dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels, as applicable.
- G. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
- H. Color code equipment, piping, conduit, and exposed ductwork of mechanical and electrical work. Color banding and identification shall include flow arrows, naming, numbering, stenciling, etc.

**3.06 CLEANING**

- A. As work progresses and upon completion, promptly remove paint where spilled, splashed, smeared and splattered.
- B. During progress of work, keep premises free from unnecessary accumulations of tools, equipment, surplus materials and debris.
- C. Upon completion of work, leave premises neat and clean, to satisfaction of Owner.

**END OF SECTION**

**10 00 00**

**SPECIALTIES**

**SANTEE SCHOOL DISTRICT**

**SECTION 10 11 00**

**VISUAL DISPLAY UNITS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Markerboards and tackboards, fixed units of widths and heights shown including marker trays, map rails, hooks, flag holders, and other components as indicated on the Drawings and specified herein.
- B. Related Work:
  - 1. Markerboards shown on portable or operable walls.
  - 2. Section 06 10 00 – Rough Carpentry.

**1.02 SUBMITTALS**

- A. Provide material list of items proposed to be provided.
- B. Submit data sufficient to demonstrate compliance with specifications and drawing requirements.
- C. Submit shop drawing and catalog cuts of items to be provided. Manufacturer or producer's standard drawings and technical information may be acceptable where complete enough to determine acceptability.
- D. Submit samples of products and materials where options of color, finish, pattern or texture exist.

**1.03 QUALITY ASSURANCE**

- A. Products and materials to be provided are to be from manufacturers and producers regularly engaged full-time in the manufacture or production of this and similar items, with a history of successful manufacture or production acceptable to the Owner.
- B. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material, except where specified product or material is superior in quality to industry and trade standards.

**1.04 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products and materials to the project; and store in a safe, dry place with shop-supplied protection and labeling intact and legible until set, applied, or installed.
- B. Use reasonable means necessary to protect products and materials before, during, and after installation.
- C. In the event of damage, regardless of responsibility and culpability, make repairs and replacements necessary to satisfaction of Owner, and at no additional cost to Owner.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

**1.05 WARRANTY**

- A. Provide owner with a five year written warranty as a condition of work acceptance, signed by Contractor and Installer (where applicable), agreeing to maintain, repair and/or replace products and materials for five years following Notice of Completion date, and without additional cost to Owner, as specified in Section 01 78 30 – Warranties, Guarantees, and Bonds.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURER**

- A. For purpose of determining minimum performance and quality standards, these specifications are based on Claridge Company. Other manufacturers such as PolyVision, and US Markerboard, whose products meet or exceed the requirements of this section, may be submitted for approval, with necessary information and samples.

**2.02 MARKERBOARDS**

- A. Whiteboards LCS II Gauge- No. 32 LCS porcelain enameled steel dry-erase marker writing surface shall comply with the Porcelain Enamel Institute Recommendations PEI-1002 for Porcelain Enamel Chalkboards and be free of projections or depressions, free of dents, cracks and or other similar defects. Color - light gray low gloss finish. Bond under pressure to aluminum foil backed 1/2-inch plywood or 1/2-inch hardboard. Flame test rating per ASTM E84.
- B. 1" tack strip with natural cork insert over marker board.

**2.03 COMPONENTS**

- A. Markertray: Extruded aluminum, alloy No. 6063-T5 anodized, (mill finish not acceptable), with aluminum end closures. Minimum weight .803 lbs. per linear foot. Drill and countersink 24-inches on center maximum, top and bottom flange, ends rounded. Unless otherwise specified, each board shall be equipped with markertray the same length as boards.
- B. Trim at Markerboard and Tackboard: Perimeter trim extruded aluminum alloy shapes in alloy No. 6063-T5 anodized (mill finish not acceptable). Joint strap "H" bar same color as markerboard.
- C. Map Rail and Hooks: Extruded aluminum alloy, with insert (color: Specify Color; submit sample for approval), drill 24 inches on center maximum. Furnish one hook per each 24 inches of board. Provide additional map rails and hooks wall mounted where shown on the drawings; one hook for each 24 inches of rail. Map hooks equipped with spring clips, provide map rail end closures in matching finish; map hooks must be smooth finished non-hazardous type with no rough edges and/or projections.

**2.04 TACKBOARDS**

- A. Cork covered with vinyl fabric with flame spread rating of 25 or less, as specified in Section 09 72 00 – Wall Coverings, 1/4-inch thick cork, bonded to 1/4-inch plywood or 1/4-inch hardwood.



2.05 FASTENINGS

- A. Screws for fastening trim, chalktray and map rail oval head, Phillips type, of proper length for 1-1/2-inch penetration of studs or blocking, 1/4-inch diameter toggle bolts at steel stud wall, spacing for each, 24-inches on center.
- B. Fasteners are to be tamperproof where exposed.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A. Fasten board standards over the wall with screws or bolts as detailed and specified. Trim mitered at corners; chalk trays rounded at ends.
- B. Between finished wall surface and chalkboards wider than four feet, provide spaces or blocks to prevent deflection of boards.
- C. Whiteboards with three sliding panels must be installed to ensure that no cupping or rubbing of boards occurs. Sliding panels shall be checked to ensure there are no clearance issues after installation.

3.02 CLEANING

- A. Keep areas clean during the progress of work. After completion of the work clean up rubbish, containers, debris, etc., and remove from the site.

3.03 WARRANTY

- A. Provide unlimited warranty on writing surface for scratch, damage, ghosting, semi-permanent ink, and abrasion resistance.

**END OF SECTION**

**SECTION 10 14 00**

**SIGNAGE**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Site signs, room identification (door) signs, and code-required informational signs, except electrical light exit signs.
- B. Related Work Not Included: Electrical light exit signs.

**1.02 SUBMITTALS**

- A. Provide all submittals in accordance with the requirements of Section 01 33 00.
- B. Product Data: Submit manufacturer's technical data related to materials, component dimensions, profiles, finishes, and installation.
- C. Shop Drawings: Submit shop drawings for fabrication and erection of site signs. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
  - 1. Submit full-scale layout for each sign larger than 48 inches in any dimension required for review of wording, spacing, and letter design.
- D. Samples: Submit sample of each product and material indicating color, finish, pattern, and texture.
  - 1. Submit samples of each color and finish of exposed materials and accessories required for specialty signs.
  - 2. Submit one full-size sample sign of type, style, and color specified, including method of attachment. If accepted, sample will become part of the job.

**1.03 QUALITY ASSURANCE**

- A. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material.
- B. Design Data: Design, fabricate, and install exterior signs to withstand a wind pressure of 100 mph on the total sign area in all directions.
- C. Mock-up: Construct full-size mock-up, in medium of supplier's choice, of school site sign for approval.

**1.04 DELIVERY, STORAGE AND HANDLING**

- A. Protect signs components and surfaces against damage during transportation and unloading.

**1.05 WARRANTY**

- A. Provide written warranty to maintain, repair and replace products and materials for one year following Notice of Completion date, without additional cost to Owner, as specified in Section 01 78 30 – Warranties, Guarantees, and Bonds. Provide 20-year life

expectancy for legibility, color retention and resistance to climatic elements.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Provide products from Best Sign Systems - 1-800-235-2378, or ASI Sign Systems - 800-247-7732, or equal.

### 2.02 MATERIALS

- A. All signage shall conform to CBC, 2019, Title 24, Part 2, Sections 11B-603.2.3, 11B-604.8.1.2, and 11B-703. Tactile exit signage shall be provided per Section 1013.4.
- B. Fiberglass - Glass fiber reinforced thermosetting resin – 1/4-inch 2.48 lb/SF.
- C. Character and Letters:
  - 1. Character Type: Characters on signs shall be raised 1/32-inch (0.794 mm) minimum and shall be Sans Serif uppercase characters accompanied by California Contracted Grade 2 Braille, see Braille symbols paragraph 2.02D.5.
  - 2. Character Size: Raised characters shall be a minimum of 5/8-inch (15.9mm) and a maximum of 2 inches (51 mm) high.
  - 3. Finish and Contrast: Contrast between characters, symbols and their background shall be non-glare finish. Characters and symbols shall contrast with background, either light on a dark background or dark on a light background, per CBC, Title 24, Part 2, Section 11B-703.5.1, Section 11B-703.6.2, and Section 11B-703.7.1.
  - 4. Proportions: Visual characters on signs shall be selected from fonts where the width of the uppercase letters "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character, per CBC 2019, Title 24, Part 2, Sections 11B-703.2.4, 11B-703.2.6, 11B-703.5.4, and 11B-703.7.

All letters measured must be uppercase. After choosing a type style to test, begin by printing the letters, I, X and O at 1-inch height. Place the template's 1:1.1 square over the X or O, whichever is narrower. If the character is not wider than 1 inch, nor narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the I is too broad, and the 1:1.1 rectangle to see if it is too narrow. If all the tests are passed, the type style is compliant with proportion codes.

- 5. Braille Symbols: California Contracted Grade 2 Braille shall be used wherever Braille is required in other portions of these standards and per CBC 2019, Title 24, Part 2, Sections 11B-703.3, 11B-703.3.1, and 11B-703.3.2.
- D. Signage and Graphics: Raised Characters shall comply with CBC Section 11B-703.2.
  - 1. Depth: It shall be 1/32 inch (0.8mm) minimum above their background and shall be sans serif uppercase and be duplicated in Braille.

2. Height: It shall be 5/8 inch (15.9 mm) minimum and 2 inches (51mm) maximum based on the height of the uppercase letter "I". CBC Section 11B-703.2.5.
3. Finish and Contrast: Characters and their background shall have a non-glare finish. Background or dark characters on a light background. CBC Section 11B-703.5.1.
4. Proportions: It shall be selected from fonts where the width of the uppercase letter "O" is 60% minimum and 110% maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15% maximum of the height of the character. CBC Sections 11B-703.2.7 and 11B-703.2.6.
5. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8.
6. Format: Text shall be in a horizontal format. CBC Section 11B-703.2.9
7. Braille: It shall be contracted (Grade 2) and shall comply with CBC Section 11B-703.3 and 11B-703.4. Braille dots shall have a domed or rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.
8. Mounting Height: Tactile characters on signs shall be located 48" minimum to the baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. CBC Section and Figure 11B-703.4.1.
9. Mounting Location: A tactile sign shall be located per CBC Section and Figure 11B-703.4.2 as follows:
  - a. alongside a single door at the latch side.
  - b. on the inactive leaf at double doors with one active leaf.
  - c. to the right of the right-hand door at double doors with two active leaves.
  - d. on the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leaves.
  - e. so that a clear floor space of 18" x 18" minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

## 2.03 SIGNS

- A. Exterior Room Identification Signs: Equal to Best Sign Systems FG, Graphic Blast®, Format: borderless. Color as selected by Architect from manufacturer's standard colors. Color to contrast building background. Sign material 1/4-inch thick, non-glare, Fiberglass, 6" x 9" (unless detailed otherwise) with 1/2-inch radius rounded corners and beveled edges. Tactile character/symbols shall be raised 1/32-inch from sign face.

All text shall be accompanied by California Contracted (Grade 2) Braille. Provide one (1) sign per exterior door. Each sign to bear a room number and up to 16 letter text.

Unless shown otherwise on the Drawings, room number shall be 2 inches high, text shall be 1 inch high. Letter styles shall be Helvetica, medium. Signs shall comply with CBC 2019, Title 24, Part 2, Sections 11B-216 and 11B-703.

- B. Interior Room Identification Signs: Equal to Best Sign Systems FG, Graphic Blast®, Format- as specified in drawings. Color as selected by Architect from manufacturer's

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

standard colors. Color to contrast building background. Sign material 1/8-inch, non-glare, phenolic ES plastic laminate, 6" x 9" with 1/2-inch radius rounded corners and beveled edges.

Tactile character/symbols shall be raised 1/32-inch from sign face. All text shall be accompanied by California Contracted Grade 2 Braille.

Provide one sign per interior door. Each sign to bear a room number and up to a 16-letter text. Unless shown otherwise on the Drawings, room number shall be 2 inches high, text shall be 3/4-inch high. Letter styles shall be Helvetica, medium. Signs shall comply with CBC 2019, Title 24, Part 2, Sections 11B-216 and 11B-703.

- C. Toilet Room Signs: Equal to Best Sign System FG, Graphic Blast®. Provide 1/4-inch thick, non-glare fiberglass with International symbols for WOMEN and MEN and RESTROOM. Locate 5'-0" above floor to center line of sign. (No Braille or raised Pictograms on door signs.) Sign color to contrast 70% with door leaf.
1. For men provide a door-mounted 12-inch equilateral triangular sign per CBC, Title 24, Part 2, Section 11B-703.7.2.6.1.
  2. For women provide a door-mounted 12-inch diameter circular sign per CBC, Title 24, Part 2, Section 11B-703.7.2.6.2.
  3. For unisex toilets, provide a door-mounted sign consisting of a circle 1/4-inch thick and 12 inches in diameter with a 1/4-inch thick triangle, 12 inches in diameter, with a vertex pointing upward, superimposed on the circle. Triangle shall contrast in color with circle, and circle shall contrast 70% with door leaf. Entire background color of geometric symbol sign must contrast with door. Sign shall comply with CBC, Title 24, Part 2, Section 11B-703.7.2.6.3.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. General: Locate signs where indicated on Drawings, and at heights as detailed, or where required by CBC, Title 24, using mounting methods appropriate to application and in compliance with manufacturer's instructions.
- B. Install signs level, plumb, and at required height.
- C. Interior Wall and Door Mounted Signs:
1. Glass Surfaces or Doors: Use double-sided foam tape and liquid silicone adhesive. At glass surfaces, provide a blank 9" x 9", 1/8-inch sign panel with 1/2-radius corners, at the opposite side of glass. Color to match sign panel.
  2. Irregular, Porous, or Vinyl-Covered Surfaces: Use one-way tamper proof screws, painted to match signs, in pre-drilled holes. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.
  3. Brick, Masonry, and Concrete Surfaces: Use one-way tamperproof screws, painted to match signs, in pre-drilled holes. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.
- D. Exterior Wall and Door Mounted Signs:

1. Wood, or Plaster Surfaces: Use tamper proof screws in pre-drilled holes; one at each corner, and set in liquid silicone adhesive. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.
2. Brick, Masonry, Plaster and Masonry Surfaces: Use tamper proof screws in pre-drilled holes; one at each corner, and set in liquid silicone adhesive. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.

3.02 CLEANING

- A. Clean sign and surrounding surfaces to remove all dirt and debris from work of this section.

**END OF SECTION**

**SECTION 10 28 13**

**TOILET ACCESSORIES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Toilet accessories including attachment devices and required rough-in frames as indicated on the Drawings and specified herein.
- B. Related Work:
  - 1. Blocking and unframed mirrors.

**1.02 SUBMITTALS**

- A. Samples: Submit one sample, if requested, of each item and model specified. If approved sample may be incorporated into project.
- B. Manufacturer's catalog and data sheets, parts list, and installation requirements for each unit specified.
- C. Maintenance, operation instructions and keys required for each type of equipment and lock.

**1.03 QUALITY ASSURANCE**

- A. Manufacturers: Model numbers are for washroom accessories manufactured by Bobrick Washroom Equipment, Inc. and are listed as a standard of quality. Equivalent products of other manufacturers may be acceptable, if, in the judgment of the architect, they meet the intent of the specification in terms of design, function, materials, and quality of workmanship. Products by other manufacturers may be provided, if approved equal by Architect.
- B. Accessories shall be products of a single manufacturer. Keyed (tumbler lock) accessories shall be keyed alike with the exception of coin receiving boxes on vending equipment.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver items in manufacturer's original unopened protective packaging.
- B. Store material in original protective packaging to prevent soiling, physical damage, or wetting.
- C. Handle so as to prevent damage to finished surfaces.
- D. Maintain protective covers on units until installation is complete. Remove covers at final clean-up of installation.

**1.05 GUARANTEE**

- A. Mirrors guaranteed 15 years against silver spoilage. Accessories guaranteed to be free from defects in workmanship and material for a period of one year, as specified in

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER

- A. Contract documents are based on Bobrick Washroom Equipment, Inc., and are listed as a standard of quality. Products by other manufacturers may be acceptable if approved equal by Architect in terms of design, function, materials and quality of workmanship.
- B. Accessories shall be product of one manufacturer. Keyed accessories shall be keyed alike with exception of coin receiving boxes on vending equipment. Provide recessed accessories at all accessible compartments.
- C. Toilet Accessories required to be accessible shall be mounted at heights according to CBC, Title 24, Part 2, Section 11B-213.
- D. Dispensing controls must be accessible without pinching, grasping, or twisting of the wrist, per CBC, Title 24, Part 2, Section 11B-309.4

### 2.02 REFERENCES

- A. Toilet Accessories required to be accessible shall be mounted at heights according to CBC, Title 24, Part 2, Section 11B-213
  - 1. Toilet paper and feminine napkin disposal located on the grab bar side of an accessible toilet room or stall shall not project more than 3 inches from the finish wall surface nor be located closer than 1-1/2-inch clear of the tangent point of the grab bar.
  - 2. Toilet tissue dispensers to be continuous flow type, CBC, Title 24, Part 2, Section 11B-604.7.
  - 3. Toilet paper dispenser in accessible toilet compartment to be recessed, or semi-recessed so as not to project more than 3 inches (76.2 mm) from face of wall.
- B. Grab Bars (CBC, Title 24, Part 2, Section 11B-213.3, 11B-604.5, and 11B-609)
  - 1. Length for rear and side walls:
    - a. 36 inches (914 mm) min. for rear wall, per Section 11B-604.5.2
    - b. 42 inches (1,067 mm) min. for side wall, per Section 11B-604.5.1
  - 2. Maximum and minimum diameters:
    - a. 1 1/4 - 1 1/2 inches (32-38 mm) diameter or equivalent gripping surface
    - b. 1 1/2 inches (38 mm) min. clearance between grab bar and wall.
- C. Following (but not limited to) operable parts (including coin slots) of table room accessories to be mounted within 40 inches (1,016 mm) max above finish floor per CBC 2019, Title 24, Part 2, Section 11B-603.5:
  - 1. Towel dispensers
  - 2. Sanitary napkin dispenser/receptacles



3. Waste receptacles
4. Other similar dispensing and disposal fixtures
5. Bottom of reflective surface of mirrors to be 40 inches (1,0616 mm) maximum above finish floors per CBC, Title 24, Part 2, Section 11B-603.3

2.03 ACCESSORIES

- A. Recessed Toilet Tissue Dispenser: Bobrick B-3888
- B. Surface Mounted Toilet Tissue Dispenser: Bobrick B-2888
- B. Surface Mounted Soap Dispenser: B-2111
- C. Recessed Electric Hand Dryer: World Dryer, SLIMdri, single phase 120V, color coated white, surface mounted not to exceed 4" from face of wall.
- D. Stainless Steel Welded Frame Mirror: B-165  
One-piece channel frame, 1/2" x 1/2" x 3/8" type 430 stainless steel with bright-polished finish and mitered corners. Phillips-head frame screw. No. 1 quality 1/4" glass mirror. See Specifications section 08 83 00 for mirror. Mirror corners and back protected by shock-absorbing material. Back is galvanized steel secured to conceal wall hanger with theft resistant locking device.
- E. Frameless Stainless-Steel Mirrors: B-1556
- F. Recessed Napkin Dispenser: B-3706 25
- G. Surface Mounted Sanitary Napkin Disposal: B-2706 50
- H. Recessed Toilet Seat Cover Dispenser: B-301, Surfaced mounted B-221  
  
Constructed of type 304 Stainless Steel, welded construction. Door shall be equipped with full-length piano hinge and tumbler lock.
- I. Stainless Steel Shelf: B-298  
Constructed of type 304 Stainless steel. Mounting brackets welded to shelf shall be 16-gauge stainless steel. Shelf shall be 8 inches wide with 3/4-inch return edges. Front edge shall be hemmed for safety.
- J. Surface Mounted Paper Towel Dispenser: B-2620
- K. Shower Bench: B-5181  
  
Folding shower seat shall be constructed of type 304 stainless steel. Seat shall be 1/2" thick, solid phenolic with integral slots for water drainage.
- L. Grab Bars:
  1. 1-1/2 inches diameter, 48 inches length: B-6806x48
  2. Same as (1.) above, 36 inches length: B-6806x36
  3. Two-wall Shower Grab Bar: B-68616.99

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

Flanges shall be 1/8" thick stainless-steel plate and each shall have two screw holes for attachment to wall. Flange covers shall be 22-gauge stainless steel and snap over mounting flange to conceal screws.

M. Mop Rack: B-223x36

Constructed of type 304 Stainless Steel, 36 inches in length, and have spring loaded rubber cam holders.

N. Recessed Paper Towel Dispenser and Trash Receptacle Combination: B-43944.

**PART 3 - EXECUTION**

**3.01 INSPECTION**

A. Check wall opening for correct dimensions, plumbness of blocking, or frames, and other preparation that would affect installation of accessories.

**3.02 INSTALLATION**

A. Install manufacturers recommended anchor system for grab bars.

B. Refer to Drawing details for mounting heights.

C. Conceal evidence of drilling, cutting, and fitting on adjacent finishes.

D. Fit flanges of accessories snug to wall surfaces. Provide for caulking in gaps between 90-degree return flanges and finish wall surface after accessories are installed.

**3.03 ADJUSTING**

A. Adjust accessories for proper operation.

**3.04 CLEANING**

A. Clean and polish exposed surfaces prior to final inspection.

**3.05 PROTECTION**

- A. Deliver accessory schedule, keys and parts manual as part of project-closeout documents. For Owner's permanent records, provide two sets of the following items of manufacturer's literature:
1. Technical Data sheets of each item used for the project.
  2. Service and Parts Manuals.
  3. Name of local representative to be contacted in the event of need of field service or consultation.

**END OF SECTION**

**26 00 00**

**ELECTRICAL**

**SANTEE SCHOOL DISTRICT**

SECTION 26 01 00

**ELECTRICAL GENERAL PROVISIONS**

**ARTICLE 1 SUMMARY**

- 1.1 This Division of the specification outlines the provisions of the contract work to be performed under this Division.
- 1.2 This Section applies to and forms a part of each section of specifications in Division 26 and all work performed under Division 26, 27 and 28.
- 1.3 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under general requirements.
- 1.4 These specifications contain statements which may be more definitive or more restrictive than those contained in the General Conditions. Where these statements occur, they shall take precedence over the General Conditions.
- 1.5 Where the words 'provide' or 'provision' are used, it shall be definitely interpreted as 'furnishing and installing complete in operating condition'. Where the words 'as indicated' or 'as shown' are used, it shall mean as shown on contract drawings.
- 1.6 Where items are specified in the singular, this Division shall provide the quantity as shown on drawings plus any spares or extras mentioned on drawings or specifications. All specified and supplied equipment shall be new.

**ARTICLE 2 CONTRACTOR QUALIFICATIONS**

- 2.1 The Contractor shall have a current California C-10 Electrical Contractor's license and all individuals working on this project shall have passed the Department of Industrial Relations Division of apprenticeship Standards – "Electrician Certification Program."

**ARTICLE 3 CODES, PERMITS AND FEES**

- 3.1 Comply with all applicable laws, ordinances, rules, regulations, codes, or rulings of governmental units having jurisdiction as well as standards of NFPA and serving utility requirements.
- 3.2 Obtain permits, fees, inspections, meter and the like, associated with work in each section of this Division.
- 3.3 Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Act (OSHA).

**ARTICLE 4 EXAMINATION OF PREMISES**

- 4.1 Examine the construction drawings and premises prior to bidding. No allowances will be made for not being knowledgeable of existing conditions.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITON  
SANTÉE SCHOOL DISTRICT**

**ARTICLE 5 STANDARDS**

- 5.1 The following standard publications of the latest editions enforced, and supplements thereto shall form a part of these specifications. All electrical work must, as a minimum, be in accordance with these standards.
- 5.1.1 2016 California Electrical Code (CEC), Part 3 Title 24 CCR.
  - 5.1.2 National Fire Protection Association.
  - 5.1.3 Underwriters' Laboratories, Inc. (UL).
  - 5.1.4 Certified Ballast Manufacturers' Association (CBM).
  - 5.1.5 National Electrical Manufacturers' Association (NEMA).
  - 5.1.6 Institution of Electrical & Electronics Engineers (IEEE).
  - 5.1.7 American Society for Testing & Materials (ASTM).
  - 5.1.8 National Board of Fire Underwriters (NBFU).
  - 5.1.9 National Board of Standards (NBS).
  - 5.1.10 American National Standards Institute (ANSI).
  - 5.1.11 Insulated Power Cable Engineers Association (IPECS).
  - 5.1.12 Electrical Testing Laboratories (ETL).
  - 5.1.13 National Electrical Safety Code (NESC).
  - 5.1.14 2016 California Building Code (CBC), Part 2, Title 24 CCR.
  - 5.1.15 2016 California Fire Code (CFC), Part 9, Title 24, CCR.
  - 5.1.16 2016 NFPA 72 with California State Amendments
  - 5.1.17 National Electrical Testing Association (NETA), 2010 or most current

**ARTICLE 6 DEFINITIONS**

- 6.1 Concealed: Hidden from sight, as in trenches, chases, hollow construction, or above furred spaces, hung ceilings - acoustical or plastic type, or exposed to view only in tunnels, attics, shafts, crawl spaces, unfinished spaces, or other areas solely for maintenance and repair.
- 6.2 Exposed, Non-Concealed, Unfinished Space: A room or space that is ordinarily accessible only to building maintenance personnel, a room noted on the 'finish schedule' with exposed and unpainted construction for walls, floors, or ceilings or specifically mentioned as 'unfinished'.
- 6.3 Finish Space: Any space ordinarily visible, including exterior areas.

**ARTICLE 7 WORK AND MATERIALS**

- 7.1 Unless otherwise specified, all materials must be new and of the best quality. Materials previously incorporated into other projects, salvaged, or refurbished are not considered new. Perform all labor in a thorough and workmanlike manner.
- 7.2 All materials provided under the contract must bear the UL label where normally available. Note that this requirement may be repeated under equipment specifications. In general, such devices as will void the label should be provided in separate enclosures and wired to the labeled unit in proper manner.

**ARTICLE 8 SHOP DRAWINGS AND SUBMITTALS**

- 8.1 Submit shop drawings and all data in accordance with Division 1 of these specifications and as noted below for all equipment provided under this Division.
- 8.2 Shop drawings submittals demonstrate to the Architect that the Contractor understands the design concept. The Contractor demonstrates their understanding by indicating

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITON  
SANTEE SCHOOL DISTRICT**

which equipment and material they intend to furnish and install and by detailing the fabrication and installation methods of material and equipment he intends to use. If deviations, discrepancies, or conflicts between submittals and specifications are discovered either prior to or after submittals are processed, notify the Architect immediately.

- 8.3 Manufacturer's data and dimension sheets shall be submitted giving all pertinent physical and engineering data including weights, cross sections and maintenance instructions. Standard items of equipment such as receptacles, switches, plates, etc., which are cataloged items, shall be listed by manufacturer.
- 8.4 Index all submittals and reference them to these specifications. All submittal items shall be assembled and submitted, one for each specification section. (Multiple specification sections may be grouped together in one common submittal binder, as long as each individual section is clearly identified.) Partial or incomplete submittal sections will not be reviewed.

**ARTICLE 9 EQUIPMENT PURCHASES**

- 9.1 Arrange for purchase and delivery of all materials and equipment within 20 days after approval of submittals. All materials and equipment must be ordered in ample quantities for delivery at the proper time. If items are not on the project in time to expedite completion, the Owner may purchase said equipment and materials and deduct the cost from the contract sum.
- 9.2 Provide all materials of similar class or service by one manufacturer.

**ARTICLE 10 COOPERATIVE WORK**

- 10.1 Correct without charge any work requiring alteration due to lack of proper supervision or failure to make proper provision in time. Correct without charge any damage to adjacent work caused by the alteration.
- 10.2 Cooperative work includes: General supervision and responsibility for proper location and size of work related to this Division, but provided under the other sections of these specifications, and installation of sleeves, inserts, and anchor bolts for work under each section in this Division.

**ARTICLE 11 VERIFICATION OF DIMENSIONS**

- 11.1 Scaled and figured dimensions are approximate only. Before proceeding with work, carefully check and verify dimensions, etc., and be responsible for properly fitting equipment and materials together and to the structure in spaces provided.
- 11.2 Drawings are essentially diagrammatic, and many offsets, bends, pull boxes, special fittings, and exact locations are not indicated. Carefully study drawings and premises in order to determine best methods, exact location, routes, building obstructions, etc. and install apparatus and equipment in manner and locations to avoid obstructions, preserve headroom, keep openings and passageways clear, and maintain proper clearances.

**ARTICLE 12 CLOSING-IN OF UNINSPECTED WORK**

- 12.1 Cover no work until inspected, tested, and approved by the Architect. Where work is covered before inspection and test, uncover it and when inspected, tested, and approved, restore all work to original proper condition at no additional cost to Owner.

**ARTICLE 13 EXCAVATION AND BACKFILL**

- 13.1 All excavation and backfill shall be in accordance with Division 1 of these specifications and as noted below.
- 13.2 Perform all necessary excavation, shoring, and backfilling required for the proper laying of all conduits inside the building and premises, and outside as may be necessary.
- 13.3 Excavate all trenches open cut, keep trench banks as nearly vertical as practicable, and sheet and brace trenches where required for stability and safety. Excavate trenches true to line and make bottoms no wider than necessary to provide ample work room. Grade trench bottoms accurately. Machine grade only to the top line of the conduits, doing the remainder by hand. Do not cut any trench near or under footings without first consulting the Architect. All trenches shall be done in accordance with OSHA standards and regulations.
- 13.4 Backfilling shall be done with each layer compacted before another layer is added. No stones or coarse lumps shall be laid directly on a conduit or conduits.
- 13.5 Trenches shall be filled with the specified material. Sod, if any, shall be removed in cut sections and replaced in same manners.
- 13.6 Provide pumps and drainage of all open trenches for purposes of installing electrical duct and wiring.
- 13.7 Perform all backfilling in accordance with the requirements of and under the direction of the Geotechnical Engineer.
- 13.8 Where new underground trenching is required on sites or in any area where existing underground utilities exist, the Contractor shall provide an independent professional utility locating service to locate exact vertical and horizontal locations of all existing utilities. Where existing utilities are found the Contractor shall hand dig those areas to avoid disruption. The Contractor shall be responsible for immediate repairs to existing underground utilities damaged during construction. The Contractor shall repair all existing asphalt, concrete and landscape surfaces damaged or removed during construction to match their original conditions. Where trenching extends through public streets or roadways, the Contractor shall notify underground service alert in addition to the independent locating service 48 hours before start of construction to determine location of existing utilities by calling (800) 422-4133.

**ARTICLE 14 CONCRETE**

- 14.1 Where used for structures to be provided under the contract such as bases, etc., concrete work, and associated reinforcing shall be as specified under Division 3 of these specifications.
- 14.2 See other sections for additional requirements for underground vaults, cable ducts, etc.

**ARTICLE 15 ACCESSIBILITY**

- 15.1 Install all control devices or other specialties requiring reading, adjustment, inspection, repairs, removal, or replacement conveniently and accessibly throughout the finished building.

- 15.2 All required access doors or panels in walls and ceilings are to be furnished and installed as part of the work under this Section. Refer to Division 1 of these specifications and as noted below.
- 15.3 Where located in fire rated assemblies, provide doors which match the rating of the assembly and are approved by the jurisdictional authority.
- 15.4 Refer to 'finish schedule' for types of walls and ceilings in each area and the architectural drawings for rated wall construction.
- 15.5 Coordinate work of the various sections to locate specialties requiring accessibility with others to avoid unnecessary duplication of access doors.

#### **ARTICLE 16 FLASHING**

- 16.1 Flash and counter flash all conduits penetrating roofing membrane as shown on Architectural drawings. All work shall be in accordance with Division 7 of these specifications.

#### **ARTICLE 17 IDENTIFICATION OF EQUIPMENT**

- 17.1 All electrical equipment shall be labeled, tagged, stamped, or otherwise identified in accordance with the following schedules:

##### **17.1.1 General:**

- 17.1.1.1 In general, the installed laminated nameplates as hereinafter called for shall also clearly indicate its use, areas served, circuit identification, voltage and any other useful data.
- 17.1.1.2 All auxiliary systems, including communications, shall be labeled to indicate function.

##### **17.1.2 Lighting and Local Panelboards:**

- 17.1.2.1 Panel identification shall be with white and black micarta nameplates. Letters shall be no less than 3/8" high.
- 17.1.2.2 Circuit directory shall be two column typewritten card set under glass or glass equivalent. Each circuit shall be identified by the room number and/or number of unit and other pertinent data as required.

##### **17.1.3 Distribution Switchboards and Feeders Sections:**

- 17.1.3.1 Identification shall be with 1" x 4" laminated white micarta nameplates with black lettering on each major component, each with name and/or number of unit and other pertinent data as required. Letters shall be no less than 3/8" high.
- 17.1.3.2 Circuit breakers and switches shall be identified by number and name with 3/8" x 1-1/2" laminated micarta nameplates with 3/16" high letters mounted adjacent to or on circuit breaker or switch.

##### **17.1.4 Disconnect Switches, Motor Starters and Transformers:**



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CLASSROOM ADDITON  
SANTEE SCHOOL DISTRICT**

17.1.4.1 Identification shall be with white micarta laminated labels and 3/8" high black lettering.

17.1.5 All communication system terminal boxes including T.V., telephone/intercom, security, fire alarm, clock, and computer networking shall be provided with white micarta laminated labels and 3/8" high black lettering.

**ARTICLE 18 CONSTRUCTION FACILITIES**

18.1 Furnish and maintain from the beginning to the completion all lawful and necessary guards, railings, fences, canopies, lights, warning signs, etc. Take all necessary precautions required by City, State Laws, and OSHA to avoid injury or damage to any persons and property.

18.2 Temporary power and lighting for construction purposes shall be provided under this Section. All work shall be in accordance with Division 1 of these specifications.

**ARTICLE 19 GUARANTEE**

19.1 Guarantee all material, equipment and workmanship for all sections under this Division in writing to be free from defect of material and workmanship for one year from date of final acceptance, as outlined in the general conditions. Replace without charge any material or equipment proven defective during this period. The guarantee shall include performance of equipment under all site conditions, conditions of load, installing any additional items of control and/or protective devices, as required.

**ARTICLE 20 PATENTS**

20.1 Refer to the General Conditions for Contractor's responsibilities regarding patents.

**ARTICLE 21 EQUIPMENT ROUGH-IN**

21.1 Rough-in all equipment, fixtures, etc. as designed on the drawings and as specified herein. The drawings indicate only the approximate location of rough-ins. Mounting heights of all switches, receptacles, wall mounted fixtures and such equipment must be coordinated with the Architectural Designs. The Contractor shall obtain all rough-in information before progressing with any work for rough-in connections. Minor changes in the contract drawings shall be anticipated and provided for under this Division of the specifications to comply with rough-in requirements.

**ARTICLE 22 OWNER FURNISHED AND OTHER EQUIPMENT**

22.1 Rough-in and make final connections to all Owner furnished equipment shown on the drawings and specified, and all equipment furnished under other sections of the specifications.

**ARTICLE 23 EQUIPMENT FINAL CONNECTIONS**

23.1 Provide all final connections for the following:

23.1.1 All equipment furnished under this Division.

23.1.2 Electrical equipment furnished under other sections of the specification.

23.1.3 Owner furnished equipment as specified under this Division.

**ARTICLE 24    INSERTS, ANCHORS, AND MOUNTING SLEEVES**

- 24.1    Inserts and anchors must be:
  - 24.1.1    Furnished and installed for support of work under this Division.
  - 24.1.2    Mounting of equipment that is of such size as to be free standing and that equipment which cannot conveniently be located on walls, such as motor starters, etc., shall be rigidly supported on a framework of galvanized steel angle of Unistrut or B-line systems with all unfinished edges painted.
  - 24.1.3    Furnish and install all sleeves as required for the installation of all work under all Sections of this Division and for all communication systems including any communication systems described in this Section which are bid to the General Contractor. Sleeves through floors, roof, and walls shall be as described in "Conduit and Fittings" Section 26 05 33.

**ARTICLE 25    SEISMIC ANCHORING**

- 25.1    All switchgear and other free-standing electrical equipment or enclosures shall be anchored to the floor and braced at the top of the equipment to the structure. The Contractor shall submit drawings signed by the Contractors registered structural Engineer indicating method of compliance prior installation.
- 25.2    All sound systems, communication, signal or data networking equipment or enclosures shall be anchored to the structure. The Contractor shall submit drawings signed by the Contractors registered Structural Engineer indicating method of compliance prior to installation.

**ARTICLE 26    RUST PROOFING**

- 26.1    Rust proofing must be applied to all ferrous metals and shall be in accordance with Section 05500 of these specifications and as noted below.
  - 26.1.1    Hot-dipped galvanized shall be applied and after forming of angle-iron, bolts, anchors, etc.
  - 26.1.2    Hot-dipped galvanized coating shall be applied after fabrication for junction boxes and pull boxes cast in concrete.

**ARTICLE 27    GENERAL WIRING**

- 27.1    Where located adjacent in walls, outlet boxes shall not be placed back to back, nor shall extension rings be used in place of double boxes, all to limit sound transmission between rooms. Provide short horizontal nipple between adjacent outlet boxes, which shall have depth sufficient to maintain wall coverage in rear by masonry wall.
- 27.2    In those instances where outlet boxes, recessed terminal boxes, or recessed equipment enclosures are installed in a fire rated assembly, provide "Flamesafe FSD 1077" fire stopping pads or approved equal, over the outlet or box.
- 27.3    Complete rough-in requirements of all equipment to be wired under the contract are not indicated. Coordinate with respective trades furnishing equipment or with the Architect

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CLASSROOM ADDITON  
SANTEE SCHOOL DISTRICT**

as the case may be for complete and accurate requirements to result in a neat, workmanlike installation.

**ARTICLE 28 SEPARATE CONDUIT SYSTEMS**

- 28.1 Each electrical and signal system shall be contained in a separate conduit system as shown on the drawings and as specified herein. This includes each power system, each lighting system, each signal system of whatever nature, telephone, standby system, sound system, control system, fire alarm system, etc.
- 28.2 Further, each item of building equipment must have its own run of power wiring. Control wiring may be included in properly sized conduit for equipment feeders of #6 AWG and smaller, having separate conduit for larger sizes.

**ARTICLE 29 CLEANUP**

- 29.1 In addition to cleanup specified under other sections, thoroughly clean all parts of the equipment. Where exposed parts are to be painted, thoroughly clean off any spattered construction materials and remove all oil and grease spots. Wipe the surface carefully and scrape out all cracks and corners.
- 29.2 Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.
- 29.3 During the progress of the work, keep the premises clean and free of debris.

**ARTICLE 30 PAINTING**

- 30.1 Paint all unfinished metal as required in accordance with Division 1 of these specifications. (Galvanized and factory painted equipment shall be considered as having a sub-base finish.)

**ARTICLE 31 GENERAL DEMOLITION REQUIREMENTS**

- 31.1 Remove existing work and items which are required to be removed in such manner that minimum damage and disturbance is caused to adjacent and connection work scheduled to remain. Repair or replace existing work schedule.
- 31.2 Include preparation of existing areas to receive new materials and removal of materials and equipment to alter or repair the existing building as indicated and as specified.
- 31.3 Perform demolition exercising proper care to prevent injury to the public, workmen and adjoining property.
- 31.4 Perform the removal, cutting, drilling of existing work with extreme care and use small tools in order not to jeopardize the structural integrity of the building.
- 31.5 Rebuild to existing condition or better, existing work which has to be removed to allow the installation of new work as required.
- 31.6 Remove, protect and reinstall existing items as indicated. Replace materials scheduled for reuse which are damaged by the Contractor to the extent that they cannot be reused, with equal quality material, and installation.

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITON  
SANTEE SCHOOL DISTRICT

- 31.7 Do not reuse in this project materials and items removed from existing site or building, except with specific written approval by the Architect in each case, unless such removed material or item is specifically indicated or specified to be reused.
- 31.8 Remove materials and equipment indicated to be salvaged for reinstallation and store to prevent damage and reinstall as the work progresses. Do not reuse in this project, other materials and equipment removed from existing site or building, except with specific written approval by the Architect in each case.
- 31.9 Patch areas requiring patching, including damage caused by removing, relocating or adding fixtures and equipment, damages caused by demolition at adjacent materials.
- 31.10 Do not stockpile debris in the existing building, without the approval of the Architect. Remove debris as it accumulates from removal operations to a legal disposal area.
- 31.11 Contractor to assume existing oil filled and dry transformers, oil switches, ballasts, lamps, wooden poles, cross arms, computers, computer monitors, and conductor insulation containing materials considered hazardous. Comply with local, state and federal regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution. Contractor shall be responsible for removal of the above hazardous materials where encountered. Include all costs for such removal as part of this contract.
- 31.12 All fluorescent, compact fluorescent, high intensity discharge, metal halide, mercury vapor, high and low-pressure sodium, and neon lamps are to be disposed of as required by the California Waste Rule Regulations as described in the California Code of Regulations, Title 22, Division 4.5 and Chapter 23.
- 31.13 **Communication System:** Where new communication systems, (including telephone, intercom, clock, security, fire alarm, data, multimedia, CATV or lighting controls) are installed to replace existing systems, unless where otherwise directed the existing systems shall remain fully operational until the new system has been installed and tested. Demolition of the existing systems shall include removal of all equipment and associated wiring and exposed conduits and providing new blank covers for all abandoned device locations.
- 31.14 **Salvage Power Equipment:** The Contractor shall carefully remove all existing switchboards, panelboards, transformers, and confirm in writing which items the Owner wishes to keep. These items shall be transported to the Owner's maintenance facilities by the Contractor. All remaining items shall be disposed of by the Contractor.
- 31.15 **Salvage Lighting Equipment:** The Contractor shall confirm in writing which items the Owner wishes to keep. These items shall be transported to the Owner's maintenance facilities by the Contractor. All remaining items shall be disposed of by the Contractor.
- 31.16 **Salvage Communication Equipment:** The Contractor shall carefully remove all communication devices (telephone, intercom, clock, security, fire alarm, data, multimedia, CATV or lighting controls) and box each type of devices separately. The Contractor shall deliver all items to the Owner's maintenance facility.

**ARTICLE 32 PROJECT CLOSEOUT**

- 32.1 Prior to completion of project, compile a complete equipment maintenance manual for all equipment supplied under sections of this Division, in accordance with Division 1 of these specifications and as described below.

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CLASSROOM ADDITON  
SANTEE SCHOOL DISTRICT

32.2 Equipment Lists and Maintenance Manuals:

32.2.1 Prior to completion of job, Contractor shall compile a complete equipment list and maintenance manuals. The equipment list shall include the following items for every piece of material equipment supplied under this Section of the specifications:

32.2.1.1 Name, model, and manufacturer.

32.2.1.2 Complete parts drawings and lists.

32.2.1.3 Local supply for parts and replacement and telephone number.

32.2.1.4 All tags, inspection slips, instruction packages, etc., removed from equipment as shipped from the factory, properly identified as to the piece of equipment it was taken from.

32.3 Maintenance manuals shall be furnished for each applicable section of the specifications and shall be suitably bound with hard covers and shall include all available manufacturers' operating and maintenance instructions, together with "as-built" drawings to properly operate and maintain the equipment. The equipment lists and maintenance manuals shall be submitted in duplicate to the Architect for approval not less than 10 days prior to the completion of the job. The maintenance manuals shall also include the name, address, and phone numbers of all subcontractors involved in any of the work specified herein. Four copies of the maintenance manuals bound in single volumes shall be provided.

**ARTICLE 33 RECORD DRAWINGS**

33.1 The Division 26 Contractor shall maintain record drawings as specified in accordance with Division 1 of these specifications, and as noted below.

33.2 Drawings shall show locations of all concealed underground conduit runs, giving the number and size of conduit and wires. Underground ducts shall be shown with cross section elevations and shall be dimensioned in relation to permanent structures to indicate their exact location. Drawing changes shall not be identified only with referencing CORs and RFIs, the drawings shall reflect all of the actual additions or changes made. All as-built drawing information shall be prepared by the contractor in AutoCAD, updating the contract computer files as needed to reflect actual installed conditions for all site plans, lighting, power, communication, networking, audio visual, security or fire alarms systems included in the scope of work for this project.

33.3 One set of these record drawings shall be delivered to the Architect. The engineer will review documents for completeness and will not be responsible for editing contractor computer files.

**ARTICLE 34 CHANGES AND EXTRA WORK**

34.1 When **changes** in work are requested, the Division 26 Contractor shall provide unit prices for the work involved in accordance with Division 1 of these specifications, and the following:

34.1.1 The material Costs shall not exceed the latest edition of the "Trade Service" end column "C" price list. The materials prices may be higher only where the Contractor can produce invoices to substantiate higher material costs. The

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CLASSROOM ADDITON  
SANTEE SCHOOL DISTRICT

Contractor shall submit a print out copy of the trade service sheets with the change order to substantiate these values.

- 34.1.2 The labor Costs shall not exceed the latest edition of the "NECA Manual of Labor Units" normal column.
- 34.2 When **credits** in work are requested, the Division 26 Contractor shall provide unit prices for the work involved in accordance with Division 1 of these specifications, and the following:
- 34.2.1 The Material Costs shall not be less than 80% of the latest edition of the "Trade Service" end column price list. The materials prices may be lower only where the Contractor can produce invoices to substantiate lower material costs. Restocking fees may also be included in this amount where applicable.
- 34.2.2 The Labor Costs shall not be less than 80% of the latest edition of the "NECA Manual of Labor Units" normal column.
- 34.3 Conduit pricing for conduits of all types sized 3" or smaller.
- When changes in the scope of work require the Contractor to estimate conduit Installations, they shall NOT include labor values (only material cost may be included) for any of the below items. The labor values for conduit installation represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.
- 34.3.1 Couplings.
- 34.3.2 Set Screw or Compression Fittings, locknuts, Bushings and washers.
- 34.3.3 Conduit straps and associated screws or nails.
- 34.3.4 LB fittings or other specialty fittings or specialty mounting hardware may be included where needed.
- 34.4 Wire pricing for all types and sizes.
- When changes in the scope of work require the Contractor to estimate wire installations, they shall NOT include labor values (only material cost may be included) for any of the below items. The labor values for wire installation represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.
- 34.4.1 Locknuts, Bushings, tape, wire markers.
- 34.5 When changes in the scope of work require other equipment installations such as lighting fixtures, panelboards, switchboards, wiring devices, communications equipment etc. the Contractor shall NOT include labor values (only material cost may be included) for any of the below items. The labor values for these equipment items represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.
- 34.5.1 Associated screws, nails, bolts, anchors or supports.
- 34.5.2 Locknuts, washers, tape.

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITON  
SANTEE SCHOOL DISTRICT

34.6 The total labor hours for extra work will be required to be calculated as follows:

34.6.1 Change orders with 1 to 30 total labor hours

General Laborer	10%	of total labor hours
Journeyman	10%	of total labor hours
Foreman	80%	of total labor hours

34.6.2 Change orders with 31 to 100 total labor hours

General Laborer	20%	of total labor hours
Journeyman	40%	of total labor hours
Foreman	40%	of total labor hours

34.6.3 Change orders with over 100 total labor hours

General Laborer	30%	of total labor hours
Journeyman	50%	of total labor hours
Foreman	20%	of total labor hours

34.7 When change orders are issued which allow the work to be completed in the normal sequence of construction, the labor rates shall be based on the most current "Prevailing Wage" – straight time total hourly rate. When change orders require the Contractor to work out of sequence the "Prevailing Wage"– daily overtime hourly rate shall apply. Special condition situations shall be reviewed on an individual basis for alternate hourly rate schedules.

34.8 Costs will not be permitted for additional supervision on site or office time for processing any change order other than the 10% overhead allowance as described in Division 1. Cost for special equipment required to install items for an individual change order are permitted and must be individually identified. Lump Sum cost for small tools or any other cost not specifically required for the change order are not permitted.

34.9 Contractor estimates shall be formatted to clearly identify each of the following:

34.9.1 Line item description of each type of material or labor item.

34.9.2 Description of quantity for each item.

34.9.3 Description of (material cost per / quantity).

34.9.4 Description of (labor cost per / quantity).

34.9.5 Description of total labor hour breakdown per Foreman, Journeyman or General Laborer as described above.

**ARTICLE 35 ELECTRONIC FILES**

35.1 The Contractor shall make a written request directly to Johnson Consulting Engineers for electronic drawing files. As a part of the written request, please include the following information:

35.1.1 Clearly indicate each drawing sheet needed (i.e., E1.1, E2.1, etc.).

35.1.2 Identify the name, phone number, mailing address and e-mail address of the person to receive the files.

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITON  
SANTÉE SCHOOL DISTRICT

- 35.1.3 Provide written confirmation and agreement with the requirements described for payment of computer files, as described below.
- 35.2 Detail or riser diagram sheets, or any other drawings other than floor plans or site plans, **will not be made available to the Contractor.**
- 35.3 Files will only be provided in the AutoCAD format in which they were created.
- 35.4 Requests for files will be processed as soon as possible; a minimum of 7 working days should be the normal processing time. The Contractor shall be completely responsible for requesting the files in time for their use.

**END OF SECTION**



SECTION 26 05 19

**POWER CONDUCTORS**

**PART 1 – GENERAL**

- 1.1 Furnish and install wire and cable for branch circuits and feeders specified herein and as shown on the electrical drawings.
- 1.2 Submittals: Submit manufacturers' data for the following items:
  - 1.2.1 All cables and terminations
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining, or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed

**PART 2 – PRODUCTS**

- 2.1 Wire and cable Rated 120 volt to 600 volt.
  - 2.1.1 All wire and cable shall be new, 600 volt insulated copper, of types specified below for each application. All wire and cable shall bear the UL label and shall be brought to the job in unbroken packages. Wire insulation shall be the color as specified herein and shall be type THWN-2. Insulated conductors shall be installed in all exterior exposed raceways. Conductors for branch circuit lighting, receptacle, power and miscellaneous systems shall be a minimum of No. 12 AWG. Increase conductor size to No. 10 AWG for 120 volt circuits greater than 100 feet from the panel to the load and for 277 volt circuits greater than 200 feet from the panel to the load. Circuit home-runs indicated to be larger than No. 12 must be increased the entire length of the circuit, including equipment grounding conductor. Wire sizes No. 14 through No. 10 shall be solid. No. 8 and larger shall be stranded.
  - 2.1.2 Aluminum conductors will be permitted (only where specifically identified on the drawings. See "600 Volt Feeder Schedule") in sizes 2/0 or larger. Conductors shall be listed by Underwriters Laboratories (UL) and suitable for operation at 600 volts or less, at a maximum operating temperature of 90N C maximum in wet or dry locations. Conductors shall be marked "SUN-RES". Aluminum alloy conductors shall be compact stranded conductors of STABILOY® (AA-8030) as manufactured by Alcan Cable or Listed equal. AA-8000 Series aluminum alloy conductor material shall be recognized by The Aluminum Association.
  - 2.1.3 MC type armored cable reference Section 26 05 33.

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

2.2 Wire and cable for systems below 120 volts.

2.2.1 All low voltage and communications systems cables routed underground shall be provided with a moisture resistant outer jacket, West Penn "Aquaseal" or equal, unless otherwise specified.

**PART 3 - EXECUTION**

3.1 Wire and cable shall be pulled into conduits without strain using powdered soapstone, mineralac, or other approved lubricant. In no case shall wire be repulled if same has been pulled out of a conduit run for any purpose. No conductor shall be pulled into conduit until conduit system is complete, including junction boxes, pull boxes, etc.

3.2 All connections of wires shall be made as noted below:

3.2.1 Connections to outlets and switches: Wire formed around binding post of screw.

3.2.2 No. 10 wire and smaller: Circuit wiring connections to lighting fixtures and other hardwired equipment shall be made with pressure type solderless connectors, Buchanan, Scotchlock, Wing Nut, or approved equal. Alternate "WAGO" #773 series or "IDEAL" #32, 33, 34 and 39 series push wire style connectors are also acceptable.

3.3 All wiring shall be continuous without splicing unless where specifically noted on the drawings or where permitted below.

3.3.1 No. 10 wire and smaller above grade: Quantities as needed, connection made with pressure type solderless connectors, Scotchlock or equal.

3.3.2 No. 10 wire and smaller below grade: Quantities as needed, connection made with 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.3.3 No. 8 wire and larger above grade: Quantities only where indicated, 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.3.4 No. 8 wire and larger below grade: Quantities only where indicated, 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.4 All wiring throughout shall be color coded as follows:

	<u>480 volt system</u>	<u>208 or 240 volt system</u>
A Phase	Brown	Black
B Phase	Orange	Red
C Phase	Yellow	Blue

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

Neutral  
Ground

Grey  
Green

White  
Green

- 3.5 Wiring must be color coded throughout its entire length, except feeders may have color coded plastic tape at both ends and any other accessible point.
- 3.6 All control wiring in a circuit shall be color coded, each phase leg having a separate color, and with all segments of the control circuit, whether in apparatus or conduit, utilizing the same color coding.
- 3.7 At all terminations of control wiring, the wiring shall have a numbered T&B or Brady plastic wire marker.
- 3.8 Cables when installed are to be properly trained in junction boxes, etc., and in such a manner as to prevent any forces on the cable which might damage the cable.
- 3.9 All conductors to be installed into a common raceway, shall be pulled into the raceway at the same time.
- 3.10 All conductors shall be installed in such a manner as to not exceed the manufacturers' recommended pulling tension and bending radius. The equipment used for pulling must be specifically designed for the purpose. Motorized vehicles such as pickup trucks, are not acceptable.

**END OF SECTION**

SECTION 26 05 26

**GROUNDING**

**PART 1 – GENERAL**

- 1.1 Furnish and install grounding and grounding conductors and electrodes as specified herein and as shown on the drawings.
- 1.2 Submit catalog data for all components.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

**PART 2 – EXECUTION**

- 2.1 Grounding
  - 2.1.1 All panelboard cabinets, equipment, enclosures, and complete conduit system shall be grounded securely in accordance with pertinent sections of CEC Article 250. Conductors shall be copper. All electrically operated equipment shall be bonded to the grounded conduit system. All non-current carrying conductive surfaces that are likely to become energized and subject to personal contact shall be grounded by one or more of the methods detailed in CEC Article 250. All ground connections shall have clean contact surfaces. Install all grounding conductors in conduit and make connections readily accessible for inspection.
  - 2.1.2 Provide an insulated equipment grounding conductor in all branch circuit and feeder raceway systems, sized in accordance with CEC 250-122.
  - 2.1.3 Provide an additional individual insulated grounding conductor for each circuit which contains an isolated ground receptacle or surge suppression receptacle.
  - 2.1.4 Grounding of metal raceways shall be assured by means of provisions of grounding bushings on feeder conduit terminations at the panelboard, and by means of insulated continuous stranded copper grounding wire extended from the ground bus in the panelboard to the conduit grounding bushings.
  - 2.1.5 Except for connections which access for periodic testing is required, make grounding connections which are buried or otherwise inaccessible by exothermic type process.
  - 2.1.6 The following ohmic values shall be test certified for each item listed. A written report signed and witnessed by the project IOR shall be provided to the engineer.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

If the ohmic value listed cannot be obtained additional grounding shall be installed to reach the value listed.

2.1.6.1 Service. .... 10 ohms.

2.1.6.2 Step down transformers and non-current carrying metal parts  
..... 25 ohms.

2.1.6.3 Manholes, handholes, etc.  
..... 10 ohms.

**END OF SECTION**

SECTION 26 05 33

CONDUIT AND FITTINGS

PART 1 – GENERAL

- 1.1 Furnish and install conduit and fittings as shown on the drawings and as specified herein.
- 1.2 Submit Manufacturer's data on the following:
  - 1.2.1 Conduit.
  - 1.2.2 Fittings
  - 1.2.3 Fire stopping Material.
  - 1.2.4 Surface Raceways.
  - 1.2.5 Type MC or MC-PCS cable, provide construction details and UL "E" number.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

- 2.1 Rigid steel conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT) and flexible metallic conduit shall be steel, hot dipped galvanized after fabrication.
- 2.2 PVC conduit shall be Carlon or approved equal.
- 2.3 Liquid tight flexible metal conduit shall be Anaconda Sealtite type UA or approved equal. Fittings shall be Appleton, Crouse-Hinds, Steel City, T&B, or equivalent.
- 2.4 MC type armored cable, when utilized, shall be provided with the following:
  - 2.4.1 Comply with UL 1479 and CEC 330
  - 2.4.2 90°C, copper, THHN conductors.
  - 2.4.3 Minimum #12 insulated grounding conductor.
  - 2.4.4 Conductors sized No. 10 and smaller shall be solid, No. 8 and larger shall be stranded.

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

- 2.4.5 Oversized (150%) neutrals or separate neutrals shall be provided.
- 2.4.6 Increase phase conductors to No. 10 AWG for 120 volt circuits greater than 100 feet from panel to load and for 277 volt circuits greater than 200 feet from panel to load. Where required increase conductor sizes for entire length of circuit.
- 2.4.7 Interlocked armored aluminum sheath.
- 2.4.8 AC or BX type armored cable shall not be substituted in lieu of MC type cable.
- 2.4.9 Color code cable according to cable type and configuration.
- 2.4.10 Acceptable manufacturers are AFC and Alfex.
- 2.5 MC-PCS luminary armored cable, when utilized, shall be provided with the following:
  - 2.5.1 Comply with UL 1479 and CEC 330
  - 2.5.2 90°C, copper, THHN conductors.
  - 2.5.3 Minimum #12 insulated grounding conductor.
  - 2.5.4 Lighting phase conductors sized No. 10 and smaller shall be solid, lighting control conductors shall be sized no. 16 solid.
  - 2.5.5 Interlocked armored aluminum sheath.
  - 2.5.6 AC or BX type armored cable shall not be substituted in lieu of MC type cable.
  - 2.5.7 Color code phase cable according to cable type and configuration. color code control conductors purple/gray.
  - 2.5.8 Acceptable manufacturers are AFC and Alfex.
- 2.6 Fire stopping material shall provide an effective seal against fire, heat, smoke and fire gases. Fire stopping material shall be tested to comply with ASTM E 814 and UL 1479. The submittal for this product shall include the UL listed system number and installation requirements for each type of penetration seal required for this project.
- 2.7 Each length of conduit shall be stamped with the name or trademark of the manufacturer and shall bear the UL label.
- 2.8 All plastic conduit shall be rigid, schedule 40, heavy wall PVC. All PVC conduit shall be UL listed. Underground utility company conduits shall comply with local utility co. requirements.
- 2.9 Plastic conduit shall be stored on a flat surface and protected from the direct rays of the sun.
- 2.10 Where branch circuit or communication raceways cannot be concealed in ceilings or walls and are required to be exposed in interior spaces, provide nonmetallic surface raceway system sized per the manufacturer capacity requirements. A full complement of nonmetallic fittings must be available and matching device boxes and cover plates must be provided. The color of the raceway system, components and boxes shall be (white). Where data networking cabling is to be installed, all raceway fittings shall meet Category

5 radius requirements. Where specific raceway types have been noted on the drawings they shall be as follows:

2.10.1	System 'SR'	Hubbell Wiremold Panduit Hellerman-Tyton	WALLTRAK 1 series ECLIPSE PN05series LD5 series TSR2 series
2.10.2	System 'SR2'	Hubbell Wiremold Panduit Hellerman-Tyton	WALTRAK 22 2300D Series D2P10 TSR3 series
2.10.3	System 'SR3'	Hubbell Wiremold Panduit Hellerman-Tyton	BASETRAK series 5400 - series 70 series MCR Infostream" series

Provide with offset boxes, inline boxes may only be used where specifically shown on the drawings.

### PART 3 – FITTINGS

- 3.1 All metallic fittings, including those for EMT, flexible conduit, or malleable iron. Die cast fittings of any other material are not permitted.
- 3.2 Locknuts shall be steel or malleable iron with sharp clean cut threads.
- 3.3 Entrance seals shall be 0.Z. type FSK or equivalent.
- 3.4 Bushings and locknuts: Where conduits enter boxes, panels, cabinets, etc., they shall be rigidly clamped to the box by locknuts on the outside, and a lock nut and plastic bushing on the inside of the box. All conduits shall enter the box squarely.
- 3.5 Furnish and install insulated bushings as per CEC article No. 300 - 4 (F) on all conduits. The use of insulated bushings does not exclude the use of double locknuts to fasten conduit to the box.
- 3.6 Transition from plastic to steel conduits shall be with PVC female threaded adaptors.
- 3.7 Couplings and connectors for rigid steel or IMC conduit must be threaded, or compression type (set screw fittings are not permitted).
- 3.8 Couplings and connectors for EMT shall be compression, watertight. Set screw connectors are not acceptable, except for systems below 120 volts.
- 3.9 MC or MC-PCS type armored cable shall be provided with listed clamp type die cast zinc set screw connectors. Anti-short bushings shall be provided at all cable ends.
- 3.10 Connectors for flexible metal conduit shall be steel or malleable iron with screw provided to clinch the conduit into the adapter body. For sizes up to ¾" a screw-in, "Jake type," fitting may be used.
- 3.11 Install approved expansion fittings, or liquid tight flex conduit with a minimum 6" slack for conduits passing through all expansion and seismic joints.



**PART 4 - EXECUTION**

- 4.1 All branch circuits shall be installed concealed in walls or above ceilings or in concrete floor slabs. PVC conduits installed in concrete floor slabs shall transition to PVC coated rigid steel where conduits penetrate above finished grade or finished floor.
- 4.2 Conduit sizes for various numbers and sizes of wire shall be as required by the CEC, but not smaller than 1/2" for power wiring and 3/4" for communications and fire alarm systems unless otherwise noted. Conduit in slab or below grade shall be 3/4" minimum trade size, unless otherwise identified.
- 4.3 Conduit size shall be such that the required number and sizes of wires can be easily pulled in and the Contractor shall be responsible for the selection of the conduit sizes to facilitate the ease of pulling. Conduit sizes shown on the drawings are minimum sizes in accordance with appropriate tables in the CEC. If because of bends or elbows a larger conduit size is required, the Contractor shall so furnish without further cost to the Owner.
- 4.4 The Contractor shall be entirely responsible for the proper protection of this work from the other trades on the job. When conduit becomes bent or holes are punched through same, or outlets moved after being roughed-in, the Contractor shall replace same, without additional cost to the Owner.
- 4.5 Rigid steel conduit or IMC shall be used as follows:
  - 4.5.1 Exposed exterior locations.
  - 4.5.2 Exposed interior locations below eight feet above floor, except in electrical rooms and closets.
  - 4.5.3 In hazardous or classified areas as required by CEC.
- 4.6 EMT conduit shall be used for areas as follows:
  - 4.6.1 All interior communications, signal, and data networking systems.
  - 4.6.2 All interior power wiring systems where not required to be in rigid steel, IMC or flexible conduit.
- 4.7 Flexible conduit shall be used for areas as follows:
  - 4.7.1 To connect motors, transformers, and other equipment subjected to vibration or where specifically detailed on the drawings.
  - 4.7.2 Flexible conduit shall not be used to replace EMT in other locations where the conduit will be exposed.
  - 4.7.3 Flexible metal conduit shall be ferrous. Installation shall be such that considerable slack is realized. The conduit shall contain separate code sized grounding conductor.
  - 4.7.4 Liquid tight flexible conduit shall be used in conformance with CEC in lengths not to exceed 4'. For equipment connections, route the conduit at 90 degrees to the adjacent path for point of connection. The conduit shall contain separate code sized grounding conductor. Use liquid tight flexible conduit for all equipment

connections exposed in possible wet, corrosive or oil contaminated areas, e.g., shops and outside areas.

- 4.8 MC armored cable may be used as follows:
- 4.8.1 All branch circuit wiring for lighting and power circuits where permitted and installed in compliance with UL 1569 and CEC 330.
- 4.9 MC-PCS luminary armored cable may be used as follows:
- 4.9.1 All Lighting branch circuit wiring for lighting circuits where permitted and installed in compliance with UL 1569 and CEC 300-22(c), 330. This cable permits conductors of control circuits to be placed in a cable with lighting power circuits or class 1 circuits.
- 4.9.2 It shall not be considered an acceptable option to install lighting control class 1 circuits as an open wire installation.
- 4.10 MC and MC-PCS armored cable shall **not** be used for the following areas:
- 4.10.1 Any exterior, underground or buried in concrete circuits.
- 4.10.2 Any circuits feeding HVAC equipment or pumps or any circuit with 30 AMPs or greater overcurrent protection.
- 4.10.3 Any exposed interior locations except in electrical, communication or mechanical equipment rooms.
- 4.10.4 Any exposed interior damp/wet locations, kitchens, science classrooms, shop areas, or concealed in science classroom casework, unless provided with approved PVC jacket.
- 4.10.5 Any hazardous rated area.
- 4.11 Plastic conduit shall be used for all exterior underground, in slab, and below slab on grade conduit installations. Install bell ends at all conduit terminations in manholes and pull boxes. Where plastic conduit transitions from below grade to above grade, no plastic conduit shall extend above finished exterior grade, or above interior finished floor level.
- 4.12 Plastic conduit joints shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected. Conduit joint couplings shall be made watertight. Plastic conduit joints shall be made up by brushing a plastic solvent cement on the inside of a plastic fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly.
- 4.13 All underground conduit depths shall be as detailed on the drawings or a minimum of 30" below finished grade (when not specifically detailed otherwise), for all exterior underground conduits. Where concrete slurry or concrete encasement is provided, include "Red" color dye in mixture.
- 4.14 All underground conduits for power systems (600v and higher), shall be concrete encased and a minimum of 48" below grade or as detailed on the drawings. Where concrete slurry or concrete encasement is provided, include "Red" color dye in mixture.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 4.15 Conduit shall be continuous from outlet to outlet, cabinet or junction box, and shall be so arranged that wire may be pulled in with the minimum practical number of junction boxes.
- 4.16 All conduits shall be concealed wherever possible. All conduit runs may be exposed in mechanical equipment rooms, electrical equipment rooms, electrical closets, and in existing or unfinished spaces. No conduit shall be run exposed in finished areas without the specific approval of the Architect.
- 4.17 All raceways which are not buried or embedded in concrete shall be supported by straps, clamps, or hangers to provide a rigid installation. Exposed conduit shall be run in straight lines at right angles to or parallel with walls, beams, or columns. In no case shall conduit be supported or fastened to other pipes or installed to prevent the ready removal of other trades piping. Wire shall not be used to support conduit.
- 4.18 It shall be the responsibility of the Contractor to consult the other trades before installing conduit and boxes. Any conflict between the location of conduit and boxes, piping, duct work, or structural steel supports, shall be adjusted before installation. In general, large pipe mains, waste, drain, and steam lines shall be given priority.
- 4.19 Conduits above lay-in grid type ceilings shall be installed in such a manner that they do not interfere with the "lift-out" feature of the ceiling system. Conduit runs shall be installed to maintain the following minimum spacing wherever practical.
  - 4.19.1 Water and waste piping not less than 3".
  - 4.19.2 Steam and steam condensate lines not less than 12".
  - 4.19.3 Radiation and reheat lines not less than 6".
- 4.20 Provide all necessary sleeves and chases required where conduits pass through floors or walls as part of the work of this section. Core drilling will only be permitted where approved by the Architect.
- 4.21 All empty conduits and surface mounted raceways shall be provided with a ¼" polypropylene plastic pull cord and threaded plastic or metal plugs over the ends. Fasten plastic "Dymo" tape label to exposed spare conduit to identify "power" or "communication" system, and to where it goes.
- 4.22 The ends of all conduits shall be securely plugged, and all boxes temporarily covered to prevent foreign material from entering the conduits during construction. All conduit shall be thoroughly swabbed out with a dry swab to remove moisture and debris before conductors are drawn into place.
- 4.23 Bending: Changes in direction shall be made by bends in the conduit. These shall be made smooth and even without flattening the pipe or flaking the finish. Bends shall be of as long a radius as possible, and in no case smaller than CEC requirements.
  - 4.23.1 For power conduits for conductors (600v and below), provide minimum 36" radius (vertical) and 72" radius (horizontal) bends.
  - 4.23.2 For power conduits for conductors (greater than 600v), provide minimum 72" radius (vertical) and 72" radius (horizontal) bends.
- 4.24 Supports: Conduit shall be supported at intervals as required by the California Electrical Code. Where conduits are run individually, they shall be supported by approved conduit

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

straps or beam clamps. Straps shall be secured by means of toggle bolts on hollow masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction. **[No perforated straps or wire hangers of any kind will be permitted. Where individual conduits are routed, or above ceilings, they shall be supported by hanger rods and hangers.]** Conduits installed exposed in damp locations shall be provided with clamp backs under each conduit clamp, to prevent accumulation of moisture around the conduits.

- 4.25 Where a number of conduits are to be run exposed and parallel, one with another, they shall be grouped and supported by trapeze hangers. Hanger rods shall be fastened to structural steel members with suitable beam clamps or to concrete inserts set flush with surface. A reinforced rod shall be installed through the opening provided in the concrete inserts. Beam clamps shall be suitable for structural members and conditions. Rods shall be galvanized steel 3/8" diameter minimum. Each conduit shall be clamped to the trapeze hanger with conduit clamps.
- 4.26 All concrete inserts and pipe clamps shall be galvanized. All steel bolts, nuts, washers, and screws shall be galvanized or cadmium plated. Individual hangers, trapeze hangers and rods shall be prime-coated.
- 4.27 Openings through fire rated floors/walls and/or smoke walls through which conduits pass shall be sealed by Fire stopping material to comply with Division 1 to seal off flame, heat, smoke and fire gases. Sleeves shall be provided for power or communication system cables which are not installed in conduits, and shall be sealed inside and out to comply with manufacturers UL system design details. Where multiple conduits and/or cable tray systems pass thru fire-rated walls at one location, the Contractor shall submit copies of the manufacturers UL system design details proposed for use on this project. All Fire stopping material shall have an hourly fire-rating equal to or higher than the fire rating of the floor or wall through which the conduit, cables, or cable trays pass.
- 4.28 Provide cap or other sealing type fitting on all spare conduits. Conduits stubbed into buildings from underground where cable only extends to equipment, the conduit/cable end shall be sealed to prevent moisture from entering the room or space.
- 4.29 All conduits which are part of a paralleled feeder or branch circuit shall be installed underground.
- 4.30 All conduits which are required as a part of systems specified in Divisions 27 or 28, or any other low voltage communication systems, shall be furnished and installed by the Division 26 Contractor.
  - 4.30.1 The Contractor shall coordinate all conduit requirements with each system supplier prior to bid to determine special conduit system requirements.
  - 4.30.2 The Contractor shall provide a pull rope in all conduits for these systems.
  - 4.30.3 The Contractor shall provide conduit sleeves for all open cable installations thru rated walls or block walls. Provide conduit from each building main termination cabinet or backboard to the nearest accessible ceiling for access into all electrical or communications rooms.
- 4.31 In addition to the above requirements, the following requirements shall apply to all data networking conduits:
  - 4.31.1 Flexible metal conduit may only be used where required at building seismic and/or expansion joints.

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

- 4.31.2 All underground conduits shall be provided with minimum 24" radius elbows (vertical) and 60" (horizontal).
- 4.31.3 No length of conduit above grade shall be installed to exceed 150 feet between pull boxes, or points of connection, unless where specifically detailed on the drawings.
- 4.31.4 No length of conduit shall be installed to exceed two 90 degree bends between pull boxes, or points of connection, unless where specifically detailed on the drawings.
- 4.32 Where surface raceways are installed in interior spaces, the Contractor shall take care to route in straight lines at right angles to or parallel with walls, beams, or columns. All raceways and device boxes shall be securely screwed to the finish surface with zinc screw "Auger" anchors Stk #ZSA1K by Gray Bar Electric or equal. Tape adhesive application will not be permitted.
- 4.33 The Contractor who installs surface raceway systems shall provide and install complete with wire retention clips, one for every (8) vertical feet or (5) horizontal feet or portion thereof. This Contractor shall also provide each raceway channel with pull strings.
- 4.34 It shall be the responsibility of the Contractor installing the raceway to coordinate the installation of raceway device plates and inserts with the communications or data contractors.
- 4.35 MC or MC-PCS cable shall be cut using a specific metallic sheath armor stripping tool. The use of hacksaws, dikes or any other tools not specifically designed to remove the armor sheath will not be permitted.
- 4.36 MC or MC-PCS cables installed in attic spaces or above lay-in ceilings shall be installed to be protected from physical damage. The cable shall be mounted along the sides or bottom of joists, rafters or studs.
- 4.37 Support wires used for supporting ceilings, lighting fixtures or other equipment items shall not be used to support MC or MC-PCS cables. Conduits, duct work, piping or any other equipment shall not be used to support or mount MC cables.
- 4.38 MC or MC-PCS cable supports, fasteners and clips shall be designed specifically for use with MC cables. Standard conduit supports, fasteners and clips, nails or other items are not permitted for installing MC cables.

END OF SECTION

SECTION 26 05 34

OUTLET AND JUNCTION BOXES

PART 1 – GENERAL

- 1.1 Furnish and install electrical wiring boxes as specified and as shown on the electrical drawings.
- 1.2 Submit manufacturer's data for all items.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

- 2.1 Boxes shall be as manufactured by Steel City, Appleton, Raco, or approved equal.
- 2.2 All boxes must conform to the provisions of Article 370 of the CEC. All boxes shall be of the proper size to accommodate the quantity of conductors enclosed in the box. Minimum box size shall be 4" square x 1-½" deep.
- 2.3 Boxes generally shall be hot dipped galvanized steel with knockouts. Boxes on exterior surfaces or in damp locations shall be corrosion resistant, cast ferrous and shall have threaded hubs for rigid conduit and neoprene gaskets for their covers. Boxes shall be Appleton Type FS, Crouse-Hinds, or the approved equal. Conduit bodies shall be corrosion resistant, cast malleable iron. Conduit bodies shall have threaded hubs for rigid conduit and neoprene gaskets for their covers. Conduit bodies shall be Appleton Unilets, Crouse-Hinds, or the approved equal. Where recessed, boxes shall have square cut corners.
- 2.4 Deep boxes shall be used in wall covered by wainscot or paneling and in walls or glazed tile, brick, or other masonry which will not be covered with plaster. Through the wall type boxes shall not be used unless specifically called for. All boxes shall be nongangable. Boxes in concrete shall be of a type to allow the placing of conduit without displacing the reinforcing bars. All lighting fixture outlet boxes shall be equipped with the proper fittings to support and attach a light fixture.
- 2.5 All light, switch, receptacle, fire alarm devices and similar outlets shall be provided with approved boxes, suitable for their function. Back boxes shall be furnished and installed as required for the equipment and/or systems under this contract.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 2.6 Pull and junction boxes shall be code gauge boxes with screw covers. Boxes shall be rigid under torsional and deflecting forces and shall be provided with angle from framing where required. Boxes shall be 4" square with a blank cover in unfinished areas and with a plaster ring and blank cover in finished areas. Covers for flush mounted oversize boxes shall extend  $\frac{3}{4}$ " past boxes all around. Covers for 4" square boxes shall extend  $\frac{1}{4}$ " past box all around.
- 2.7 All terminal cabinets and junction boxes or equipment back boxes which are required as a part of systems specified in Divisions 27 or 28, or any other low voltage communication systems, shall be furnished and installed by the Division 26 Contractor.
  - 2.7.1 The Division 26 Contractor shall coordinate all box requirements with each system supplier prior to bid to determine special cabinet or back box requirements. The Contractor shall also provide stainless steel blank cover plates for all low voltage systems installed for future equipment.
  - 2.7.2 The Contractor shall provide all plywood backboards indicated on walls or inside equipment enclosures. All backboards shall be a minimum of  $\frac{3}{4}$ " thick fire rated type plywood.
  - 2.7.3 The Contractor shall coordinate exact rough in locations and requirements with each system supplier.
- 2.8 In addition to the above requirements, boxes for data networking wiring and equipment shall comply with the following:
  - 2.8.1 All boxes shall be a minimum of 4-11/16" square x 2-1/8" deep.
  - 2.8.2 Where pull boxes are required on individual conduits 1-1/4" or smaller, provide 4-11/16" square x 2-1/8" deep boxes. Where pull boxes are required on conduits larger than 1-1/4" for straight pull through, provide eight times the conduit trade size for box length. Where pull boxes are required on conduits larger than 1-1/4" for an angle or a U-pull through installation, provide a minimum distance of six times the conduit trade size between the entering and exiting conduit run for each cable.
- 2.9 Recessed boxes installed in fire rated floors/walls and /or smoke walls shall be sealed by Fire stopping material to comply with Division 1 to seal off flame, heat, smoke and fire gases. The Contractor shall submit copies of the manufacturers UL system design details proposed for use on this project. All Fire stopping material shall have an hourly fire-rating equal to or higher than the fire rating of the floor or wall through which the conduit, cables, or cable trays pass.

**PART 3 – EXECUTION**

- 3.1 Boxes shall be installed where required to pull cable or wire, but in finished areas only by approval of the Architect. Boxes shall be rigidly attached to the structure, independent of any conduit support. Boxes shall have their covers accessible. Covers shall be fastened to boxes with machine screws to ensure continuous contact all around. Covers for surface mounted boxes shall line up evenly with the edges of the boxes.
- 3.2 Outlets are only approximately located on the plans and great care must be used in the actual location of the outlets by consulting the various detailed drawings and specifications. Outlets shall be flush with finished wall or ceiling, boxes installed

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

symmetrically on such trim or fixture. Refer to drawings for location and orientation of all outlet boxes.

- 3.3 Furnish and install all plaster rings as may be required. Plaster rings shall be installed on all boxes where the boxes are recessed. Plaster rings shall be of a depth to reach the finished surface. Where required, extension rings shall be installed so that the plaster ring is flush with the finished surface.
- 3.4 All cabinets and boxes shall be secured by means of toggle bolts on hollow masonry; expansion shields and machine screws or standard precast inserts on concrete or solid masonry; machine screws or bolts on metal surfaces and wood screws on wood construction. All wall and ceiling mounted outlet boxes shall be supported by bar supports extending from the studs or channels on either side of the box. Boxes mounted on drywall or plaster shall be secured to wall studs or adequate internal structure.
- 3.5 Boxes with unused punched-out openings shall have the openings filled with factory-made knockout seals.
- 3.6 Where standby power and normal power are to be located in the same outlet box or 480V in a switch box, install partition barriers to separate the various systems.
- 3.7 All device boxes and junction boxes for fire alarm system shall be painted red and shall be 4-11/16" square by 2-1/8" deep. No exceptions.

**END OF SECTION**



**SECTION 26 24 16**

**PANEL BOARDS**

**PART 1 – GENERAL**

- 1.1 Furnish and install branch circuit panel boards as specified herein and as indicated on the drawings. Submit manufacturers' data on all items.
- 1.2 Submit manufacturers' data on all panel boards and components including:
  - 1.2.1 Enclosures and covers
  - 1.2.2 Breakers
  - 1.2.3 Surge Protective Device (SPD) equipment
  - 1.2.4 Incident energy level calculations
  - 1.2.5 Common submittal mistakes which will result in the submittals being rejected:
    - 1.2.5.1 Not arranging the circuit breakers in panels to match the orientations indicated on the drawings. In other words, if a 30 amp breaker is shown on the drawing in Space #2, this must be the location it appears on the submittal schedule. Standard factory arrangements will not be accepted.
    - 1.2.5.2 Not including all items listed in the above itemized description.
    - 1.2.5.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
    - 1.2.5.4 Not including actual manufacturer's catalog information of proposed products.
    - 1.2.5.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements or "to be determined later" statements. The products being submitted must be the products installed.

**PART 2 – PRODUCTS**

- 2.1 The interrupting rating of circuit breakers shall be 10,000 amps for the 120/208 system and 14,000 amp for 277/480 volt systems. Refer to drawings for higher interrupting rating requirements. All components and equipment enclosures shall be manufactured by the same manufacturer. Circuit breakers shall be permitted to be series rated to limit the available fault current to no more than the above ratings.
- 2.2 All panels shall be fully bussed. Recessed panel enclosures shall be a maximum of 20" wide and 5-3/4" deep for all panels 600 amp rated and less.
- 2.3 All busses shall be tin-plated aluminum and shall be located in the rear of the panelboard cabinet. Individual circuit breakers shall be bolt on type and removable from the cabinet without disturbing the bussing in any way. All panel boards shall contain ground busses.
- 2.4 Panel covers shall be door in door style, with one lock. Door lock shall allow access to breakers only. Access to wireways without removal of cover shall be permitted by (non removable) screws

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

behind the locked door. Panel cover shall be provided with full length piano hinge. All locks for all panels provided in this project shall be keyed alike.

- 2.5 Each panel shall have a two-column circuit index card set under glass or glass equivalent on the inside of the door. Each circuit shall be identified as to use and room or area. Areas shall be designated by room numbers. Room numbers shown on the drawings may change and contractor shall verify final room numbers with the architect prior to project completion.
- 2.6 Tandem mounted or wafer type breakers are not acceptable.
- 2.7 Multiple breakers shall have one common trip handle or be internally connected. Handle ties are not acceptable.
- 2.8 Breaker arrangements shown in the drawings shall be maintained. The circuit breakers in panels must match the orientations indicated on the drawings. In other words, if a 30 amp breaker is shown on the drawing in Space #2, this must be the location it appears on the submittal schedule. Standard factory arrangements will not be accepted.
- 2.9 Where conductor sizes exceed the standard breaker lug wire range, or where multiple conductors per phase are required, the panelboard manufacturer shall provide the breaker with suitable lugs for terminating the specified conductors.
- 2.10 Acceptable manufacturers are Square D, Eaton, Siemens or General Electric.
- 2.11 Equipment manufactured by any other manufacturers not specifically listed in Section 2.10 are not considered equal, or approved for use on this project.

**Surge Protective Device (SPD)**

- 2.12 Surge Protective Device (SPD) panelboards, shall be provided with an integrated circuit breaker panelboard and parallel connected suppression / filter system in a single enclosure. The SPD panelboard shall meet the following parameters: IEEE C62.41.1, IEEE C62.41.2, IEEE C62.45, UL 1283 and the UL 1449, Third Edition, effective September 29, 2009.
- 2.13 The panelboard shall be UL 67 Listed and the SPD shall be UL 1449 labeled as Type 1 or Type 2 or as Type 4 intended for Type 1 or Type 2 applications. SPD shall be factory installed integral to the panel board.
- 2.14 The SPD panelboard shall be top or bottom feed according to requirements. A circuit directory shall be located inside the door.
- 2.15 SPD shall meet or exceed the following criteria:
  - 2.15.1 For standard areas supply SPD having 100kA per phase surge current capacity. For mountain and desert areas (areas with over 5 lightning strikes per year), SPD shall have a per phase surge current capacity of 200kA.
  - 2.15.2 UL 1449 – Third Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

<u>VOLTAGE</u>	<u>L-N</u>	<u>L-G</u>	<u>N-G</u>	<u>L-L</u>	<u>MCOV</u>
208Y/120	700V	700V	700V	1200V	150V
480Y/277	1200V	1200V	1200V	2000V	320V
  - 2.15.3 SPD shall be UL labeled with 100kA Short Circuit Current Rating (SCCR).

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 2.16 UL 1449 - Third Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

<u>VOLTAGE</u>	<u>L-N</u>	<u>L-G</u>	<u>N-G</u>	<u>L-L</u>	<u>MCOV</u>
208Y/120	700V	700V	700V	1200V	150V
480Y/277	1200V	1200V	1200V	2000V	320V

- 2.17 SPD shall be UL labeled with a minimum 100kVA short circuit rated (SCCR).
- 2.18 UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

<u>System Voltage</u>	<u>Allowable System Voltage Fluctuation (%)</u>	<u>MCOV</u>
208Y/120	25%	150V
480Y/277	15%	320V

- 2.19 SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of - 50dB at 100 kHz. No filtering is required for a 100kA SPD.
- 2.20 Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30mm diameter.
- 2.21 Type 4 SPD shall include a serviceable, replaceable module.
- 2.22 SPD shall be equipped with the following diagnostics:
- 2.22.1 Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
- 2.22.2 No other test equipment shall be required for SPD monitoring or testing before or after installation.
- 2.23 SPD shall have a response time no greater than 1/2 nanosecond
- 2.24 SPD shall have a 10 year warranty
- 2.25 The SPD panelboard shall have removable interior
- 2.26 The SPD panelboard main bus shall be aluminum and rated for the load current required
- 2.27 The SPD panelboard shall include a 200% rated neutral assembly with copper neutral bus
- 2.28 The unit shall be provided with a safety ground bus

**(SPD) Quality Assurance**

- 2.29 Manufacturer Qualifications: Engage a firm with at least 5 years experience in manufacturing transient voltage surge suppressors.
- 2.30 Manufacturer shall be ISO 9001 or 9002 certified.
- 2.31 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 2.32 The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

**PART 3– EXECUTION**

- 3.1 Painting of panelboard covers in finished areas shall be done by the general contractor.
- 3.2 Provide a spare 3/4" conduit stubbed to an accessible area for each of every three (3) spares or spaces provided in recessed panel boards.
- 3.3 All lugs shall be torque tested in the presence of the inspector of record.

**Arc Flash and Shock Hazard**

- 3.4 The Contractor is to provide, and submit to the engineer for approval, incident energy level calculations as determined using the methodologies described in NFPA 70E or IEEE standard 1584-2002.
- 3.4.1 **All studies shall be performed by "Emerson Electric" (858) 695-9551, MTA (858) 472-0193, or Terra Power Solutions (858) 380-8170. Studies performed by manufactures or other engineering or testing companies must submit qualifications for approval by Johnson Consulting Engineers, 7 days prior to bid for this project.**
- 3.5 A warning label, as specified in the above standard, shall be placed on each switchboard, panelboard, and safety switch indicating the incident energy levels on the equipment to warn qualified personnel in accordance with NFPA 70E, section 110.16 Labels shall be laminated white micarta with black lettering on each. Letters shall be no less than 3/8" high.
- 3.6 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department
- 3.7 The design goal is to minimize the incident energy to which a maintenance employee may be exposed.

**END OF SECTION**

SECTION 26 27 26

SWITCHES AND RECEPTACLES

PART 1 – GENERAL

- 1.1 Furnish and install all wiring devices as shown on drawings and as herein specified. Unless otherwise noted, device and plate numbers shown are Hubbell and shall be considered the minimum standard acceptable. Other acceptable manufacturers are Pass and Seymour, Leviton, General Electric and Bryant.
- 1.2 Submit manufacturers' data on all items.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
- 1.3.1 Not correctly indicating ampacity rating of proposed devices.
- 1.3.2 Not including all items listed in the above itemized description.
- 1.3.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
- 1.3.4 Not including actual manufacturer's catalog information of proposed products.
- 1.3.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

- 2.1 All switches shall be of the quiet mechanical type, Specification Grade, 20 amp, 120/277 volt AC as follows:

	<u>HUBBELL</u>	<u>LEVITON</u>	<u>PASS &amp; SEYMOUR</u>
Single Pole	CS120	CS1202	CS20AC1
Two Pole	CS1222	CS2202	CSB20AC2
Three-way	CS320	CS3202	CS20AC3
Key Switch	HBL1221L	1221-2L	PS20AC1-L

- 2.2 All switches shall have the "on" and the "off" position indicated on the handle. If switches of higher ampere ratings are required, they shall be of similar type and quality as those shown above. Groups of switches shown at one location shall be installed under a single plate up to a maximum of six where more than six switches are shown coordinate arrangement with the Architect.
- 2.3 Dimmer switches for incandescent lamp loads shall be square-law type, slide control dimmer with OFF position, Lutron or Hubbell "Nova-T" Series NT-600 (0-500 watt load), NT-1000 (501-900 watt load), NT-1500 (901-1500 watt load), or equal (no known equal).
- 2.4 All convenience receptacles and special outlets throughout shall be grounding type. Convenience receptacles shall be side wired, parallel slot, two pole, three wire, 20 amp as follows:

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

	<u>HUBBELL</u>	<u>LEVITON</u>	<u>PASS &amp; SEYMOUR</u>
Duplex	5352	5362	PS5362
GFCI	GFR5362	7899	2097
Isolated Ground	IG5362	5362IG	IG6300
Tamper Proof		8300SG	TR63H

- 2.5 All safety or tamper proof receptacles shall have no exposed external current carrying metal parts and shall have integral wiring leads suitable for two or three wire installations.
- 2.6 Special receptacles shall be as noted on the drawings.
- 2.7 Weatherproof plates shall be designed to meet CEC Article 410-57, wet location listed with cover "open." Where weatherproof receptacles have been identified to be provided with locking covers, the cover shall be as manufactured by Pass & Seymour #4600-8 or Cole Lighting 310 Series. Rough-in requirements vary between manufacturers. Contractor to field verify requirements prior to installation.
- 2.8 All plates throughout shall be stainless steel. Where wiring devices are installed in concrete block walls, provide oversized 3-1/2" x 5" cover plates.
- 2.9 All devices shall be white unless otherwise noted or a special purpose outlet.
- 2.10 Unless where specifically detailed on the drawings, floor boxes shall be PVC suitable for concrete poured floors of minimum 3-1/2" depth, with a modular design to gang two or three sections together.
  - 2.10.1 Carlon #E976 series or approved equal
  - 2.10.2 Provide brass cover with brass carpet flange unless otherwise detailed.

**PART 3 – EXECUTION**

- 3.1 Switches for room lighting shall be located no more than 12" center line from door jamb at plus 48" center line above finished floor or +46" to top of devices where located over casework, reference CBC Figure 11B-5D.
- 3.2 All receptacles shall be mounted at plus 18" to center line above finished floor unless noted or shown otherwise. All receptacles shall be installed with the ground pin up, at the top of the receptacle to comply with IEEE 602-1986.
- 3.3 Furnish and install wall plates for all wiring devices, and outlet boxes, including special outlets, sound, communication, signal, and telephone outlets, etc. as required. All cover plates shall be appropriate for type of device.

**END OF SECTION**

**SECTION 26 90 90**

**ELECTRICAL CLOSEOUT**

**PART 1 – GENERAL**

- 1.1 Upon completion of the electrical work, the entire installation shall be tested by the Contractor, and demonstrated to be operating satisfactorily to the Architect, Engineer, Inspector and Owner.
- 1.2 All testing and corrections shall be made prior to demonstration of operation to the Architect, Engineer, Inspector and Owner.
- 1.3 In addition to the demonstration of operation, the Contractor is also required to review the content and quality of instructions provided on items demonstrated with the Architect, Engineer, Inspector and Owner.

**PART 2 – EXECUTION**

- 2.1 Wiring shall be tested for continuity, short circuits and/or accidental grounds. All systems shall be entirely free from "grounds," "short circuits," and any or all defects.
- 2.2 Motors shall be operating in proper rotations, and control devices functioning properly. Check all motor controllers to determine that properly sized overload devices are installed, and all other electrical equipment for proper operation.
- 2.3 Tests and adjustments shall be made prior to acceptance of the electrical installation by the Architect, and a certificate of inspection and acceptance of the electrical installation by local inspection authorities shall be provided.
- 2.4 All equipment or wiring provided which tests prove to be defective or operating improperly shall be corrected or replaced promptly, at no additional cost to the Owner.
- 2.5 Test all motor and feeder circuits with a "megger" tester to determine that insulation values conform to Section 110-20, California Electrical Code (CEC). Test reports must be submitted and approved by the engineer before final acceptance.
- 2.6 Test all grounding electrode connections to assure a resistance of no more than 10 ohms is achieved. Augment grounding until the ohmic value stated above is achieved. Provide certified test results to the Architect, Engineer and Inspector.

**END OF SECTION**

**27 00 00**

**COMMUNICATION**

**SANTEE SCHOOL DISTRICT**



**SECTION 27 01 00**

**COMMUNICATIONS GENERAL PROVISIONS**

**ARTICLE 1 - SUMMARY**

- 1.1 This Division of the specifications outlines the provisions of the contract work to be performed as a sub contract under the Division 26 scope of work. Reference the Division 26 Electrical General Provisions for scope of work and general requirements.
- 1.2 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under Division 1 requirements.

**END OF SECTION**

SECTION 27 10 00

VOICE / DATA/ IP PAGE INFRASTRUCTURE

PART 1 – GENERAL

- 1.1 Include all labor, equipment and materials necessary for providing a complete networking infrastructure system as described herein and/or as indicated on the drawings.
- 1.2 Related specification sections:
  - 1.2.1 Section 26 01 00 – General Provisions
  - 1.2.2 Section 26 05 19 – Conductors
  - 1.2.3 Section 26 05 33 – Conduit and Fittings
  - 1.2.4 Section 26 05 34 – Outlet and Junction Boxes
- 1.3 Approved minimum Product and Contractor Extended Warranty Certifications.
  - 1.3.1 All components shall be manufactured by one of approved manufacturers, the installing Contractor must have the accompanying certification from the product manufacturer(s) for installation of an "Extended Warranted System" as required by each manufacturer and as indicated in these specifications.
    - 1.3.1.1 Specified system warranties are to be established between the component and cable manufacturers and the District, warranties between the cable manufacturer only or installing Contractor and the District are not considered equal.
    - 1.3.1.2 Warranty shall be a full "Performance Warranty" installed by a "Certified Contractor" as specified by one of the approved manufacturers. A "Component Warranty" will not be considered equal. All components, labor, and "Performance Criteria" shall be warranted by one of the approved manufacturers.
- 1.4 Acceptable manufacturers are:
  - 1.4.1 **LEVITON / BERK-TEK**
    - 1.4.1.1 Installing Contractor must be LEVITON Network Solutions Premier certified to install this system.
    - 1.4.1.2 Warranty provision and training must be for the Leviton/Berk-Tek – Limited Lifetime Premium Performance Warranty program.
  - 1.4.2 **COMMSCOPE**
    - 1.4.2.1 Commscope's Training and Warranty programs encompass the brand names known as Systimax and Uniprise.
    - 1.4.2.2 Installing Contractor must be PartnerPro certified to install any of the systems under the Commscope Family of brand names. Alternate certification that apply as well is Systimax Premier Certification for products installed with the Systimax brand name.

- 1.4.2.3 Warranty provision and training must be for the Commscope (Uniprise and Systimax) – 25-Year Premium Performance Warranty program.
- 1.4.3 **ORTRONICS (Legrand) /Superior Essex**
  - 1.4.3.1 Installing Contractor must be CIP-ESP or IP certified to install this system.
  - 1.4.3.2 Warranty provision and training must be for the nCompass – Lifetime Premium Performance program.
- 1.4.4 **Panduit/General Cable**
  - 1.4.4.1 Installing Contractor must be PanGen certified to install this system.
  - 1.4.4.2 Warranty provision and training must be for the PanGen Certification Plus – 25-Year Siemon Premium Performance program.
- 1.4.5 **Siemon**
  - 1.4.5.1 Installing Contractor must be Siemon Certified Installers (CI) certified to install this system.
  - 1.4.5.2 Warranty provision and training must be for the Premium 6 Certification – 20-Year Premium Performance program.
- 1.4.6 Warranty shall be to the District, for the period as defined by the Network Infrastructure System selected for installation, after District acceptance and sign-off of the completed system. The Contractor must provide documentation from one of the approved manufacturers, as indicated in Section 1.3, indicating their qualifications for installation of this system in compliance with the manufacturer/s warranty period requirements as warranted Contractor.
- 1.4.7 Equipment qualifications: It is the intent of these specifications that each bidder provides all hardware, components and installation services that are necessary to ensure a fully operational wiring system including warranties, as shown in the EIA/TIA Category-6 guidelines.
- 1.4.8 All components, parts, infrastructure, patch cables, termination panels and cables must be classified by the manufacturer or manufacturers as a part of the "Extended Warranty" program. Contractor may not mix in components from other certified programs or materials that are not considered part of the "Lifetime" warranty.
- 1.4.9 Systems or components as manufactured by any other manufacturer which, are not specifically listed in 1.3 are **not** approved for use on this project.
- 1.5 **Installing Contractor qualifications:** Firms and their personnel must be regularly engaged in the installation of data networking cabling and equipment for systems of similar type and scope. The Contractor must have a full-service office able to respond to emergency callouts during the warranty period. The Contractor must also provide complete installation of all wiring and devices or equipment. **Subcontractors with Electrical Contractors or other warranted or non-warranted Contractors for supervised installation of any part of this system are not approved.**

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

- 1.5.1 Contractor shall have on staff a minimum of (1) BICSI RCDD as full-time employees.
- 1.5.2 The successful Contractor shall be a California licensed C7 or C10 Premise Wiring Contractor as defined in this specification.
- 1.5.3 All work shall be performed under the supervision of a company accredited and trained by the Manufacturer of the components and cable and such accreditation must be presented with the bid submittal. All personnel performing work on this project must have successfully completed the manufacturer's training courses to completely comply with the extended warranty requirements prior to performance of any work on this project. Accreditation will consist of individual employee certifications issued by the manufacturer or manufacturers.
- 1.5.4 All personnel engaged in the testing of premises fiber optic and copper UTP cable systems must have successfully completed the test equipment manufacturer's training courses. Certification of such training must be presented with the bid submittal. Cut sheets of the test equipment to be utilized shall be provided with Phase I project material submittals.
- 1.5.5 This project shall employ Category-6 cabling. The Contractor shall install the related components in relation to the performance requirements for the type of cable installed.
- 1.5.6 If Contractor routes cable and/or associated pathways in another route than indicated on the drawings, they shall maintain all maximum cable installation distances as required by the manufacturer's distance limitations.
- 1.6 In order to ensure project cohesion, a single point of contact is required to provide a "TURNKEY" solution. The work covered under this section of the specification consists of furnishing all: labor, cabling, equipment, supplies, materials, and training.
- 1.7 The drawings indicate a schematic routing of cables above-ceiling cable prior to bid. Where cables penetrate through walls a conduit sleeve shall be provided. Where cables pass through fire rated walls, the conduit sleeve shall be sealed to maintain the rating of wall assembly.
- 1.8 Unless otherwise noted in the project drawings or these specifications, the Division 26 Contractor shall provide the installation of all conduits, outlet and junction boxes, trenching and pull box installation.
- 1.9 General Submittal Requirements
  - 1.9.1 **Group #1 Submittal** shall be made in electronic format within (20) working days after the award of the contract by the District. This submittal shall include the following:
    - 1.9.1.1 Complete Bill of Materials in Excel Spreadsheet format with bills of quantities, including all materials, components, devices, and equipment required for the work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each Section listed - Description and quantity of each product, Manufacturer's Name and Model Number, Manufacturer's Specification Sheet or Cut Sheet and Specification Item Number referenced for each required product or if

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

not shown in the specifications, Drawing Detail Number being referenced. (ie; Spec. 27 20 00 Item 2.1.3 and/or Detail #1/E4.15).

- 1.9.1.2 Material Cut Sheets shall provide detailed product information and shall be original manufacturer product bulletins.
  - 1.9.1.3 Copies of material information from vendor websites shall not be considered equal and will not be accepted. Copies of Web pages which include multiple pages of irrelevant information not associated with the product cut sheet shall not be considered equal and will not be accepted.
  - 1.9.1.4 Material Cut Sheet part number provided shall be highlighted or provided with an arrow directed at the corresponding part number.
  - 1.9.1.5 Equipment items which have individual components will require that all component parts be listed individually.
  - 1.9.1.6 Description of any specialty backbox requirements
  - 1.9.1.7 All wiring types required for installation of this system
  - 1.9.1.8 Spare parts shall be listed individually to verify proposed quantity
  - 1.9.1.9 Include with submittals all warranty information and a description of support and maintenance services to be provided. Also include all licenses and maintenance agreements required for continued operation of the equipment.
- 1.9.2 **Group #2 Submittal** shall be provided within (20) working days after the approval of the Group # 1 submittals and prior to any fabrication or field conduit installations. All shop drawings shall be engineered and drawn on a CAD System. Each submission shall include 'D' or 'E' size print copies to match the contract drawings, and (1) USB Flash Drive copy with files in a AutoCAD format. Building floor plan CAD files will be made available. Contractor shall make the request for drawings in writing directly to Johnson Consulting Engineers, confirmation of the request and a release form will be forwarded to the contractor to include a signed copy prior to release of files. Detail or riser diagram sheets or any other drawings other than floor or site plans, will not be made available to the contractor. Phase II Submittals drawings shall include the following:
- 1.9.2.1 MDF and IDF equipment rack or cabinet elevations will be required to be provided including cable routing, grounding, support, UPS, network electronics, etc. and position of all components in the rack or cabinet.
  - 1.9.2.2 Provide labeling plan which identifies the proposed scheme for identifying all components including racks, patch panels (fiber and copper), site distribution feed cables, horizontal station cables and site conduit systems (handholes, pullboxes, etc.).
  - 1.9.2.3 Provide shop drawings showing all end device locations, tap values, paging zones and amplifier sizing for each zone for analog speakers and horns, including devices connected to IP-Based zone controllers.

- 1.9.3 Common submittal mistakes which will result in submittals being rejected:
  - 1.9.3.1 Not including the qualifications of the installing Contractor Company and Contractor's Staff.
  - 1.9.3.2 Not including all items listed in the above itemized description.
  - 1.9.3.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlights, underlining or clouding the items to be reviewed (provided for the project) or crossing out the items which are not applicable.
  - 1.9.3.4 Not including actual manufacturer's cut sheets or catalog information of proposed products.
  - 1.9.3.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.
- 1.9.4 The Contractor shall make a written request directly to Johnson Consulting Engineers for electronic drawing files (CAD). As a part of the written request, please include the following information:
  - 1.9.4.1 Clearly indicate Project Name and Client, Johnson Consulting Job Number (located in the bottom left corner of JCE Engineering Stamp) and each drawing Sheet Number required (i.e. E1.1, E2.1, E4.1 etc.)
  - 1.9.4.2 Identify the Name, Company, Title, phone number, mailing address and e-mail address of the person to receive the files.
  - 1.9.4.3 Detail or Riser diagram sheet, System Schematic drawings or any other drawings other than floor plans or site plans, will not be made available to the Contractor.
  - 1.9.4.4 Files will only be provided in the AutoCAD format in which they were created (i.e. version 2015 or version 2016). Files will not be made available in REVIT format.
  - 1.9.4.5 Requests for files will be processed as soon as possible; a minimum of (7) working days should be the normal processing time. The Contractor shall be completely responsible for requesting the files in time for their use and delays in requesting files will not alleviate the Contractor from submitting required documents within the required timeline.

## PART 2 – PRODUCTS

- 2.1 Equipment racks have been detailed on the drawings and additional component information requirements have been described in the following sections and on the drawings. The following is a list of approved manufacturers for each type of rack to be furnished.
  - 2.1.1 Alternate equipment manufacturers other than those indicated will not be reviewed or approved for use on this project.

2.1.2 *Existing IDF has an existing wall mount rack.*

**IDF Location Requirements**

- 2.2 The Intermediate Distribution Frame (IDF) is existing. The Contractor shall include the following items at this location:
- 2.3 Category-6 Modular Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each Voice/Data/IP-Page device outlet served from this location. Provide 25% spare capacity for future wiring requirements. All patch panels shall be 24 or 48-ports maximum. Provide cable support bars at the rear of each patch panel. All cable shall be secured to bars with Velcro straps.

**Copper Patch Cords**

- 2.4 Copper patch cords shall be furnished and installed by the Contractor.
- 2.5 Provide Category-6 (Patch Panel End) patch cords with pre-molded boot, provide quantity equal to:
  - 2.5.1 Provide 100% of the total Category-6 cable ports provided on the patch panels.
  - 2.5.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (4) feet in length.
- 2.6 Provide Category-6 (Workstation End) patch cords with pre-molded boot provide quantity equal to:
  - 2.6.1 Provide 100% of the total Category-6 cable ports provided on the patch panels.
  - 2.6.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required for data drop locations to be (10) feet in length, unless otherwise noted.
  - 2.6.3 Patch cords installed at WAP (Wireless Access Point) locations IP Camera and IP Intercom locations shall be (2) feet in length.
- 2.7 Requirements for all copper patch cords furnished:
  - 2.7.1 Color of patch cords shall be determined by the color code shown in detail drawings.
  - 2.7.2 Patch cords shall as manufactured by Leviton, Commscope, Panduit, Ortronics or Siemon based on the network infrastructure system furnished by the Contractor.
  - 2.7.3 Patch cords furnished must be in compliance with the manufacturer's "Channel" warranty requirements. Patch cords not warranted through the selected manufacturer Channel warranty program will not be approved for use with the network infrastructure.
  - 2.7.4 Provide all other items as detailed on the drawings.

### Category-6 Station Cable

- 2.8 Contractor shall provide Category-6 UTP cable to each Data, Voice, IP Page, Audio-Visual Data Connection, IP Camera or any other location as indicated on the drawings and specifications. Provide quantity of cables as indicated on the drawings at each location.
- 2.9 Provide one Category-6, 4-pair unshielded twisted pair (UTP) cable from the nearest MDF or IDF location to each RJ45 data outlet port indicated on the drawings. Dual port outlets will require two such cables. Four port outlets will require four cables. Refer to the drawing details for jacket color requirements for each type of connection. Color of cable jacket for each type of connection shall be determined by the drawing details. Confirm color of cable jacket prior to ordering with the District IT Director. Contractor shall be responsible for providing the correct jacket color per the drawings per District Standards.
- 2.10 Unless otherwise shown in drawing details, the color of the Category 6 UTP cables shall be blue, shall be copper wire, individually insulated and color coded.
- 2.11 The cable shall be UL or ETL rated and UL verified in compliance Category-6 EIA/TIA standards. Approved cables for Network Infrastructure System:
- |        |                      |   |                               |
|--------|----------------------|---|-------------------------------|
| 2.11.1 | Commscope (Systimax) | – | GigaSpeed XL – 1071E Series   |
| 2.11.2 | Commscope (Uniprise) | – | CS37R                         |
| 2.11.3 | Superior Essex       | – | NextGain Cat 6eX - #54-246-xA |
| 2.11.4 | Berk-Tek             | – | LANMARK 2000 – 10167477       |
| 2.11.5 | General Cable        | – | GigaSpeed 6500 71339XX–       |
| 2.11.6 | Siemon               | – | 9C6R4-E4-XX-RBA               |
- 2.12 Where data cables are indicated to run underground, Contractor shall use a Category-6 OSP-rated cable. Approved cables for Network Infrastructure System: Commscope #CS34O OSP-Rated with black PE jacket (or Cat-6 OSP-Rated versions by the Approved Manufacturers)
- 2.13 Manufacturer names and part numbers are shown as a point of reference and do not specifically designate required packaging or color for the cable. Contractor shall verify colors and packaging options shall be determined by Contractor preferences.

### Category-6 Outlets

- 2.14 Unshielded twisted pair Category-6 outlets shall be an RJ45 Enhanced performance type 8-position / 8-conductor modular jacks and shall comply with Category-6 performance requirements. Provide single port, dual port, four port or quantity as indicated on the floor plans at each outlet location. All outlets shall be wired in an EIA/TIA 568B configuration.
- 2.15 Provide Category-6 insert installation kits for all locations furnished with Category-6 UTP cabling.
- 2.16 Refer to the detail drawings for color of the Category-6 outlets required. Contractor shall be responsible for confirming all color requirements prior to ordering or installing.



**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 2.17 Provide the following Category-6 UTP data connector per Network infrastructure warranty requirements:
  - 2.17.1 Leviton eXtreme Cat6+ Quick Port Series 61110-R
  - 2.17.2 Systimax (Commscope) GigaSpeed XL Series MGS400
  - 2.17.3 Uniprise (Commscope) UNJ 600 Series UNJ600
  - 2.17.4 Ortronics Clarity 6 Tracjack Series OR-TJ600
  - 2.17.5 Panduit MiniCom TX6 Plus Series CJ688TG
  - 2.17.6 Siemon MAX-6 Series MX6-F

**Outlet Faceplates**

- 2.18 Provide a two-port faceplate for all one and two-port outlet locations. Provide blanks for all unused openings.
- 2.19 Provide a four-port faceplate for all three and four port outlet locations. Provide blanks for all unused openings.
- 2.20 All fax/modem locations shall be provided as single port outlets. Requirements shall be the same as a single port data outlet as shown on the Technology Legend.
- 2.21 For single port voice outlet locations intended for wall telephone connections, a wall telephone type faceplate with attachment studs shall be provided. The wall telephone jack shall be 8-pin, RJ45 type and use IDC wire terminations only. Provide Category-6 insert, within stainless steel wall plate faceplate. Provide faceplate from the approved manufacturers listed in the specifications.
- 2.22 Provide single port or dual port small surface mounted outlet box for IP Speaker data outlets. Provide surface mount box by Leviton QuickPort Series 41089-xxx or equal by one of the approved manufacturers listed in the specifications. Provide surface box for all IP Speaker data locations mounted in the backcan for the speaker as shown in the detail drawings.
- 2.23 Provide single port or dual port small surface mounted outlet box for IP Camera data outlets inside the J-Box for the camera location. Provide surface mount box by Leviton QuickPort Series 41089-xxx or equal by one of the approved manufacturers listed in the specifications. The location shall also be furnished with a blank weather-tight faceplate to protect the data termination until the cameras are installed.
- 2.24 All faceplates and surface mount outlet boxes shall be furnished with label windows. All labeling shall be installed within the label window.
- 2.25 Confirm color of all faceplates prior to ordering. All data outlet faceplates shall have a unique sequential identification number in the label window of the faceplate. Hand-written labels are not permitted. All color schemes shall be approved by the customer prior to installation.
- 2.26 Colored inserts are required for this project. Refer to the detail drawings for the exact color scheme to be provided. Inserts submitted that do not follow the color and

identification requirements will be rejected. Inserts installed that do not follow the color coding as shown in the detail drawings will be replaced at the Contractor's expense.

- 2.27 All labels will be installed under label window. Labels adhered to the surface of the faceplate will not be accepted. Contractor must provide clear laminating type of cover material over the surface mounted labels where used.
- 2.28 Reference the drawings for special outlet configurations or plate requirements.

### **PART 3 – IP PAGING REQUIREMENTS**

- 3.1 The Contractor shall furnish and install all IP-based speakers, horns, all associated hardware and software.
- 3.2 Data Contractor shall be responsible for furnishing enclosures for all IP-based speakers and horns. Contractor shall provide vandal-resistant screws with all enclosures for attachment of the speaker grill or exterior horn baffle. Exterior horn locations shall be provided with stainless steel vandal resistant screws and baffle. Provide (2) tools with the project for removal of the vandal-resistant hardware, delivered to the District IT Department.
- 3.3 All surface mounted enclosures shall be furnished and installed by the 27 10 00 Contractor in all areas shown in the floor plans including exterior surface mounted enclosures.
- 3.4 Recessed flush mount enclosures shall be furnished by the 27 10 00 Contractor and installed by the Division 26 Contractor, unless otherwise noted on the Legend or Floor Plans. Recessed enclosures shall be furnished with manufacturer provided "wing" bracket panels that attach to the side of the enclosure and shall be used for attachment to the structural members. The 271000 Contractor must procure and deliver the recessed enclosures to the Division 26 Contractor during the rough-in phase of the project.
- 3.5 IP-Based paging speakers, horns and associated enclosures shall be as manufactured by Atlas/IED IPX-Series.
- 3.6 Provide IP-Based Paging Speakers and Horns for the following types of locations as shown on the drawing floor plans and legend:
  - 3.6.1 Interior POE+ surface mounted IP-Based Speaker with microphone, Atlas/IED Part #IP-SM - provide surface mount angled speaker enclosure Part #IP-SEA-SD in white finish.
  - 3.6.2 Interior POE+ IP-Based 1-foot by 2-foot drop-in type Speaker with microphone in an accessible ceiling, Atlas/IED Part #IP-12SYSM. Speaker shall be provided with integrated enclosure. Speaker shall include T-bar attachment for cut-in location in accessible ceiling.
    - 3.6.2.1 IP-Based speaker in accessible ceiling shall be secured to the structure above with a single 12-AWG support wire attached to the backcan of the speaker. Contractor shall field modify the backcan to allow for connection of the support wire.
  - 3.6.3 Exterior POE+ vandal and weather resistant surface mounted IP-Based Page Horn Atlas/IED Part #IP-HVP - provide weather resistant, stainless steel surface mount straight enclosure Part #IP-SEST-HVP finished with white textured epoxy.

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

Exterior Page Horn shall be furnished with a powder coated aluminum grill and vandal resistant zinc plated steel baffle. Grill and baffle shall be included with page horn.

- 3.6.4 Provide a 2-foot long, CAT-6, UTP patch cord, for the speaker/horn location to connect to the data drop located in the enclosure, color of patch cord per District IT Department instructions. Provide patch cords for 100% of IP-based paging speaker and horn locations. Provide (10) spare patch cords delivered to the District IT Department.
- 3.6.5 IP speakers/horns shall be connected to a POE port on a network switch in the MDF / IDF Room or Cabinet. Coordinate the connection of the POE powered devices with the District IT Department. IP-Based Speakers/Horns must be patched to a POE powered switch to allow for proper operation.
- 3.6.6 All speaker/horn connections to be terminated at the data patch panel and identified with a colored insert or color tabbed label, per the District Standards, or as shown in the detail drawings and the specifications.

**IP-Based Paging Software and Server**

- 3.7 *The IP-Based Paging software is existing for the project. The Server is existing in the MDF Room. Existing Software as manufactured by Atlas/SingleWire "Informacast Advanced" platform.*
- 3.8 Contractor shall provide all programming for the paging announcements, pre-recorded emergency announcements and pass class bell notifications. Coordinate the pass class bell schedules and desired paging tone to be used with the District IT Department and the Site Principal
- 3.9 Contractor is responsible for providing all licensing requirements and software updates (as required to bring product up to date) to drive the speakers, horns, program tones, bell schedules and announcement controls. Speakers and Horns shall be furnished with "Lifetime" licenses in the project bid. Annual license fees are not an acceptable alternative.
- 3.10 Programming of speakers and horns for page coverage zones, tones, time schedules, pass class bells, pre-recorded emergency announcements and VoIP interface to be completed by the Contractor. The District will be responsible for providing IP addressing to the Contractor for the network to identify all system IP devices.
- 3.11 Contractor's responsible for providing MAC addressing and identification of individual speakers and horns or any other IP based device in the system. Provide a spreadsheet list to the District IT Department of all devices with the MAC addresses, locations, page zone, speaker/horn type and Room Number.
- 3.12 Contractor to provide a minimum of ~~2~~ 6-hours of meeting time with the District to confirm all programming requirements. The Contractor shall provide Meeting Minutes and proposed bell schedules, access control codes, pre-recorded message requirements and proposed bell tones to the District and the Project Engineer for approval. Contractor shall not program system until programming proposals have been approved.

**PART 4 – VIDEO SURVEILLANCE REQUIREMENTS**

- 4.1 Provide (2) Category-6 UTP cables from the IDF closet to each camera location. All cables installed in underground conduit shall be rated for Wet Location. The cables shall be terminated in the junction box on a surface mount box. The camera locations shall be provided with a weatherproof grommated stainless steel faceplate for future use. Label the faceplates on the inside with an adhesive label so the labels won't fall off. All cameras and associated mounting and programming shall be provided by the District

#### **PART 5 – WIRELESS ACCESS POINTS (WAP) REQUIREMENTS**

- 5.1 The District will provide all Wireless Access Point units and programming will be by the District IT Department. The Contractor shall install each Wireless Access Point as required and provide patch cord installation at the WAP. The Contractor shall provide a list including the room number, location, and MAC address of each device installed to the District IT Department. Provide minimum 10' slack cable at each WAP location stored above the WAP location on J-Hooks as shown in the detail drawings.
- 5.2 Refer to drawing details for installation requirements for WAP locations. The Contractor shall furnish and install all mounting brackets for the WAP locations in the accessible ceiling and for the wall mounted locations.
- 5.3 Contractor shall install the Exterior WAP units at the locations shown on the drawings. Coordinate with the District IT Department for all mounting brackets and connection of all WAPs.

#### **PART 6 – INSTALLATION**

- 6.1 Upon completion of 10% of the cabling installation, the Contractor shall notify the Project Engineer for an inspection of the methods and types of materials used on the project. The Contractor shall give a minimum of 72 hours notification to the Project Engineer for the scheduling of the inspection. The Contractor will be given a written review of the findings, so if adjustments are required, they can be done before the project proceeds. The Contractor shall be responsible for adhering to the findings and a follow-up inspection will not be provided.
- 6.2 Pull strings shall be provided with all cable runs including but not limited to: conduit stub ups, conduit sleeves, cable trays, open wiring routes, innerduct and point-to-point conduits. Pull strings shall be free from cable bundles in open wiring routes. Pull strings shall not be substituted for pull ropes for the exterior site conduits.
- 6.3 Velcro cable management straps are required on all Category-6 cable bundles, the last 20 feet or upon entry into equipment closet, a maximum of 12" apart. Cable bundles shall also be routed through cable managements or "D" rings in the equipment closet.
- 6.4 Data Contractor shall supply protective bushings or slide on rings at the ends of all exposed conduits used for data system cabling. This is to include all conduits installed for any future data cabling requirements. Contractor shall submit planned protection bushings prior to installation of cabling for approval.
- 6.5 Velcro cable management straps are required on the cabling in the rear section of the vertical managers in the equipment racks. Straps shall be a maximum of 12" apart. At a minimum, Velcro straps shall be provided at each point the cables are routed to the patch panels from the main bundle.
- 6.6 Every fiber in every fiber optic cable must be terminated at both ends of a fiber patch panel in the MDF/IDF closet or cabinet location. Termination shall be accomplished using

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

the correct style of connectors as directed by the specifications with a strain relief boot. All connectors shall be of the same manufacture to ensure compatibility. Polarity of fiber strands must be observed at all times.

**6.7 Labeling**

6.7.1 Each cable run shall be permanently labeled at each end with a unique sequential number which corresponds to a similar number provided for each data outlet and patch panel point. A printed label shall be placed at each of the following locations:

6.7.1.1 On the cable at the rear of the patch panel or termination block. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).

6.7.1.2 On each cable in the j-box behind the faceplate location. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).

6.7.1.3 On the cable at the terminal strip prior to termination point. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).

6.7.1.4 On the face of the patch panel, provide a 3/4" by 3/4" label with a letter or number identifying the patch panel designation. For special purpose data connections such as WAP, Audio-Visual, IP Page and IP Camera ports, the label shall be designated with colored label icon or marker.

6.7.1.5 On the face of the faceplate in the label holder window. The label shall be clearly defined with a minimum #10 font size.

6.7.2 Handwritten labels are not permitted. Where cable ID includes room number identification, the Contractor shall obtain written verification of final room numbers prior to beginning labeling (numbers on plans do not always match final room numbers). Cable pulling cross reference lists will not be accepted with final documentation.

6.7.3 Each patch panel port shall be identified with a unique sequential labeling scheme. Port identification labeling pattern shall be consistent throughout the project.

6.7.4 All faceplates shall be identified with permanent printed labels. Labels must not be subject to removal by incidental contact. Contractor shall be responsible for replacing defective labeling for a period of one year from date of final sign-off of project.

6.7.5 Labeling will follow recommended EIA/TIA standards or as requested by the customer. Contractor will confirm labeling pattern prior to final identification or testing. All test results will be identified by the final labeling scheme. Contractor shall be required to have the labeling scheme approved in writing by the District IT Director prior to manufacture or installation of the labeling.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 6.8 Where open wiring cables are run through the ceiling space (only permitted where specifically noted on the drawings), the wire shall be bundled together and supported above the ceiling.
- 6.9 All cables must be fastened to the building structure via "j-hooks" or an approved Category 6 suspension system, and not directly in contact with ceiling system. For "j-hooks" maximum fill capacity is as follows: 1-5/16" hooks – 35 cables; 2" hooks – 60 cables; 4" hooks – 120 cables. For quantities beyond 120 cables, use a sling support system such as "Erico Cable Cat" or equal. Maximum fill capacity 200 cables. D-rings, "Caddy #WMX cable hangar", "Caddy Bridle Rings", drive rings or any other type of wire ring support is not allowed.
- 6.10 Where cables pass through a fire-resistant portion of the structure, conduit sleeves shall be provided to maintain the rating of wall penetrated. Sealing of all penetrations with an approved fire barrier is required. Conduits and sleeves must remain accessible for future use. Permanent sealants may not be used to seal sleeves and conduits.
  - 6.10.1 The 27 10 00 Contractor shall be responsible for fire-stopping all unused conduit sleeves in the ceiling or through rated walls. The Electrical Contractor shall be responsible for fire-stopping around the conduit or sleeve, unless the sleeve is installed by the 27 10 00 Contractor, in which case, the 27 10 00 Contractor shall be responsible for all fire-stopping requirements.
  - 6.10.2 Expanding foam is not an acceptable sealant for any conduit opening. Contractor shall be responsible for complete replacement of the conduit and cabling in any conduit filled with expanding foam used as a sealant.
- 6.11 Provide 6 inches of cable slack at computer data system outlets inside conduit box.
- 6.12 In an accessible ceiling area, provide a 10-foot (stored in a Figure-8 configuration) service loop above the all data/voice outlet locations. Service loop must be securely tied up off of ceiling tiles or ceiling surface and supported at two opposite points. Neatly coil cable without exceeding minimum bend radius limitations. Do not provide length in excess of 15 feet, as it may cause improper test results and errors.
- 6.13 Do not provide a service loop in the MDF/IDF Room on the UTP cables, unless otherwise noted. Cables shall be neatly routed around the perimeter of the room to the cable runway from the point of entrance into the room.
- 6.14 The minimum bending radius for all cables and the maximum pulling tension shall not exceed manufacturer's recommendations.
- 6.15 Cables installed in manholes and pullboxes shall be supported with Velcro ties or loosely fitted UV rated tie wraps, on wall mounted cable support racks. The cables shall be clearly labeled in the manhole or pullbox.
- 6.16 Provide a full 360-degree loop of slack cable around manhole and pullbox interiors. Cables entering handholes from the bottom, shall not be allowed to touch the bottom of the cover when closed and shall not be pinched or crushed in any way.
- 6.17 Cable pulling shall use a split mesh grip over the cable jacket. Connection directly to optical fibers and copper wire conductors shall not occur.
- 6.18 When pulled through conduits, cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the manufacturer.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 6.19 Where cables are pulled through or pulled from a center run, pull without splices or terminations, lead out the cables at all manholes, pullboxes, and conduits, taking care to feed them in again by hand for the next run.
- 6.20 For each cable pull where a cable direction change is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves, etc., shall be used to ensure proper cable pulling tension and side wall pressures. Cables shall not be pulled directly around a short right-angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified minimum installed cable bending radius. The maximum possible size radius sheaves and feed-in tubes, usable in the available working space shall be provided in all situations, to ensure the minimum possible cable sidewall pulling pressure. Do not use devices with multi-segment "roller" type sheaves.
- 6.21 Cable lengths over 250 feet shall be machine pulled, not hand pulled. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum pulling speed shall be greater than 15 feet per minute.
- 6.22 A pull string shall be placed with all UTP and paging station cables at the time of installation. Conduit runs and surface raceway for station cabling shall be furnished with a minimum 2-Ply spiral wrap style, pull string rated for 240 ft/lbs. pulling strength, such as manufactured by Greelee #431 or approved equal. Includes all conduit stubs and cables routed through open ceiling and cable trays. Pull strings shall be tied off in the junction box and in the ceiling. Provision for the installation of the pulls string shall apply to all empty and spare conduits as well. Single ply type pull string will not be accepted as a substitute for the 2-ply pull string.
- 6.23 A measuring pull tape shall be placed with all feed cables at the time of installation. Indoor riser and outdoor conduit runs between buildings designated for feed cabling, in excess of 150 feet shall be provided with a minimum ½" polyaramid style, measuring true tape pull string annotated with footage increments rated for 2500 ft/lbs. pulling strength, such as manufactured by Greenlee #39245 or approved equal. Conduit runs less than 150 feet shall be furnished with a ¼" polyaramid style, measuring true tape pull string annotated with footage increments rated for 1250 ft/lbs. pulling strength, such as manufactured by Greenlee #39243 or approved equal. Provision for the installation of the measuring pull tape shall apply to all empty and spare conduits as well. Standard twine style pull strings and standard nylon or polypropylene style pull ropes will not be accepted as a substitute for the polyaramid measuring tape pull string.
- 6.24 When pulling cable through conduit, cables shall be pulled straight into or out of the raceway without bends at the raceway entrance or exit. Pull in cable from the end having the sharpest bend (i.e., bend shall be closest to the reel). Keep pulling tension to minimum by liberal use of lubricant, hand turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one at manhole or pullbox during this operation. Cables shall be pulled directly from cable reels.
- 6.25 All cables shall be new and extend continuous from each MDF or IDF backboard or rack to all outlet locations.
- 6.26 Where cables are not installed in a conduit or other raceway system, they shall not be routed parallel with other line voltage equipment or wiring (120 volt and above) with 36" or within 12" of line voltage equipment or wiring where crossing.

- 6.27 Where OSP-Rated UTP cables or OSP-Rated fiber optic cables are routed exposed through ceiling for more than 50'-0", Contractor shall install the cable in innerduct or EMT conduit in the ceiling. Innerduct installed in the accessible ceiling space shall be a minimum of riser rated and minimum of 1" in diameter. Innerduct shall be supported minimum of every 3-feet to the structural members.

#### TESTING

- 6.28 All Category-6 cables shall be point to point (link) tested after installation/termination and verified to operate at minimum 1000Mbps. Performance of installed cables shall satisfy all current addendums to the EIA/TIA 568A standard for Category-6 wiring. In addition, testing shall satisfy all proposed amendments to the existing ISO/IEC requirements. The wiring shall support all specified communication protocols. Testing shall support the Category-6 requirements by the EIA/TIA.
- 6.29 Upon completion of testing cable links for both copper and fiber optic cabling, the Contractor shall supply a copy of the original database files downloaded from the tester in original format on a USB Flash Drive. Contractor shall provide with the testing database files, an original copy of the tester's manufacturer software program (included in original cost) for record management and archiving, in a Windows format (i.e., Fluke Linkware software program).
- 6.29.1 The manufacturer's software program will be used by the Project Engineer to review all test results, and then turned over to the District to keep as their record copy with the final approved test results. Provide (3) copies of tests on USB Flash Drives. Do not submit test results for review in Excel or PDF file formats, as the submittal will be rejected and not reviewed.
- 6.30 Contractor will repair or replace cable runs or connecting hardware that do not meet specified criteria.
- 6.31 Final As-Built Drawing Submittals – Provide (1) hard bound copy of "E-size" As-Built drawings and (3) copies on USB Flash Drive in AutoCad (2014 or newer version) format. A Hand marked-up copy of the original construction drawings will not be accepted as the final As-Built drawing submittal. Final As-Built drawings shall include copies of the floor plan drawings of each building, detailed elevations of each MDF or IDF locating all equipment, quantities outlets and speaker locations, locations of all sleeves and identification of all final cable routes. In addition, the drawings shall include all outlet locations with cable identification numbers.

#### END OF SECTION



SECTION 27 20 00

INTEGRATED AUDIO-VISUAL SYSTEM

PART 1 – GENERAL

SUMMARY

- 1.1 The Contractor shall furnish all labor, project management, materials, tools, equipment, and resources necessary for the installation, startup, and testing of the system shown on the plans and described in the specifications.
- 1.2 Related Specification Sections:
  - 1.2.1 Section 26 01 00 -General Provisions
  - 1.2.2 Section 26 05 33 -Conduit and Fitting
  - 1.2.3 Section 26 05 19 -Conductors
  - 1.2.4 Section 26 05 34 -Outlet and Junction Boxes
- 1.3 The Contractor shall furnish and install the system as defined by the plans and specifications. The Contractor must demonstrate to the Owner that the system is complete and complies with all operational requirements set forth in the plans and specifications.
- 1.4 The work covered under this section of the specifications consists of furnishing all labor, equipment, supplies and materials, and in performing all operations necessary for the turnkey and fully completed installation of an audio/ video system in accordance with the specifications and accompanying drawings, except as specifically noted otherwise.
- 1.5 Cables for the system shall be pulled through the conduit systems furnished by the building contractor. The 27 20 00 Contractor shall be responsible for providing all cables required and for coordinating and supervising the cable installation. The 27 20 00 Contractor shall be responsible for insuring the integrity of the cables before and after installation.
- 1.6 In order to ensure project cohesion a single point of contact is required to provide a "TURNKEY" solution. The work covered under this section of the specification consists of furnishing all labor; cabling; equipment; software; supplies; materials and training. The contractor will perform all operations necessary for the "TURNKEY" and fully completed installation in accordance with the specifications herein. As such, the successful contractor must be factory trained on all aspects of system hardware. The successful contractor shall be a California licensed C7 or C10 premise wiring contractor as defined in this specification. Subcontractors may not be utilized in the implementation of the plant wiring installation.
- 1.7 Approval to bid shall not release the Contractor from full specification compliance requirements. Final system acceptance testing shall govern final system acceptance and compliance with the specifications.
- 1.8 Failure to provide a functional equivalent shall result in the removal of the alternate system at the contractor's expense.

**RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 1.9 These specifications contain statements which may be more definitive or more restrictive than those contained in the General Conditions. Where these statements occur, they shall take precedence over the General Conditions.
- 1.10 Where the words 'provide' or 'provision' is used, it shall be definitely interpreted as 'furnishing and installing complete in operating condition'. Where the words 'as indicated' or 'as shown' are used, it shall mean as shown on contract drawings.
- 1.11 Where items are specified in the singular, this division shall provide the quantity as shown on drawings plus any spares or extras mentioned on drawings or specifications. All specified and supplied equipment shall be new.

**DEFINITIONS**

- 1.12 Concealed: Hidden from sight, as in trenches, chases, hollow construction, or above furred spaces, hung ceilings - acoustical or plastic type, or exposed to view only in tunnels, attics, shafts, crawl spaces, unfinished spaces, or other areas solely for maintenance and repair.
- 1.13 Exposed, Non-Concealed, Unfinished Space: A room or space that is ordinarily accessible only to building maintenance personnel, a room noted on the 'finish schedule' with exposed and unpainted construction for walls, floors, or ceilings or specifically mentioned as 'unfinished'.
- 1.14 Finish Space: Any space ordinarily visible, including exterior areas.

**Contractor Qualifications**

- 1.15 The successful bidder shall be a California licensed C7 or C10 premise wiring contractor as defined in this specification. Subcontractors may not be utilized in the implementation of the installation or programming.
- 1.16 The successful bidder shall have design staff with a minimum of the following and shall include all certifications with their bid.
  - 1.16.1 (1) BICSI certified (RCDD) Registered Communications Distribution Designer.
  - 1.16.2 CTS Certification
  - 1.16.3 Extron XTP Systems Engineer,
  - 1.16.4 Extron TLP programming certifications,
  - 1.16.5 Extron Global Configuration Certification.
- 1.17 The successful bidder shall have installation staff with a minimum of the following and shall include all certifications with their bid.
  - 1.17.1 CTS-I certification
  - 1.17.2 Extron Advanced A/V Certifications.
  - 1.17.3 Contractor must have a minimum of (4) full time certified installation technicians with Extron Certifications.

RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

- 1.18 All bidders must provide a listing of two similar size projects having the same scope of work using the proposed information delivery equipment. This listing shall be complete with facility names, completion dates, names of contacts, and their telephone numbers. Referenced projects must have been completed in the past 18 months.
- 1.19 The bidder shall have a factory trained service department the service department shall be on call 24 hours a day, 365 days a year, to arrive and initiate onsite service the specified equipment upon (24) hours' notice.
- 1.20 The Contractor shall employ factory-trained technical/service personnel for service and maintenance of the system. Their résumés will be required. The factory-trained technical/service personnel shall have a minimum of two-years' experience installing the proposed system. The Bidder shall submit the names and copies of the certificates issued by the factory. The bidder shall instruct the Owner's technical personnel in the operation, care, and maintenance of the system.

CODE COMPLIANCE

- 1.21 All material and equipment shall be clearly listed, labeled, or certified by Underwriters Laboratories, Inc. All power supplies and computers shall be clearly UL Listed. Any system which is not UL Listed at time of bid will be rejected.
- 1.22 All acceptable systems shall be approved under Part 15, Subpart B, Section 15.107b of the FCC Rules and Regulations. Bidders must provide the FCC Registration Number of the proposed system. Systems that are not in compliance with the FCC will not be considered. Any system that is not FCC compliant at time of bid will be rejected. All equipment must be clearly labeled with FCC compliance stickers.
- 1.23 The system shall be installed in accordance with local and national electrical codes.
- 1.24 The manufacturer and contractor shall provide the Owner with a release for use of all copyright materials, corporate logos, and corporate trademarks at time of bid.

SUBMITTALS

- 1.25 Index all submittals and reference to these specifications. All submittal items shall be assembled and submitted in a single complete binder per submittal group. Partial submittals will not be reviewed. Submit items in groups as indicated below: All submittals, warranty information, close - out documents, and as built documents must be submitted independently for owner, in order to provide record documentation for the project owner.
- 1.26 **Group # 1 Submittal** shall be made within (20) working days after the award of the contract. This submittal shall include the following:
  - 1.26.1 Complete bills of quantities, including all materials, components, devices, and equipment required for this work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each item listed:
    - 1.26.1.1 Complete Bill of Materials in Excel Spreadsheet format with bills of quantities, including all materials, components, devices, and equipment required for the work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each Section listed - Description and quantity of each product, Manufacturer's Name and

Model Number, Manufacturer's Specification Sheet or Cut Sheet and Specification Item Number referenced for each required product or if not shown in the specifications, Drawing Detail Number being referenced. (ie; Spec. 27 20 00 Item 2.1.3 and/or Detail #1/E4.15).

- 1.26.1.2 Material Cut Sheets shall provide detailed product information and shall be original manufacturer product bulletins.
  - 1.26.1.3 Copies of material information from vendor websites shall not be considered equal and will not be accepted. Copies of Web pages which include multiple pages of irrelevant information not associated with the product cut sheet shall not be considered equal and will not be accepted.
  - 1.26.1.4 Material Cut Sheet part number provided shall be highlighted or provided with an arrow directed at the corresponding part number
  - 1.26.1.5 Equipment items which have individual components will require that all component parts be listed individually.
  - 1.26.1.6 Description of any specialty backbox requirements
  - 1.26.1.7 All wiring types required for installation of this system
  - 1.26.1.8 Include with submittals all warranty information and a description of support and maintenance services to be provided. Also include all licenses and maintenance agreements required for continued operation of the equipment
  - 1.26.1.9 Spare parts shall be listed individually to verify proposed quantity
- 1.27 **Group # 2 Submittal** shall be provided within (20) working days after the approval of the Group # 1 submittals and prior to any fabrication or field conduit installations. All shop drawings shall be engineered and drawn on a CAD System. Each submission shall include 'D' or 'E' size print copies to match the contract drawings, and (1) USB Flash Drive copy with files in a AutoCAD format. Building floor plan CAD files will be made available. Contractor shall make the request for drawings in writing directly to Johnson Consulting Engineers, confirmation of the request and a release form will be forwarded to the contractor to include a signed copy prior to release of files. Detail or riser diagram sheets or any other drawings other than floor or site plans, will not be made available to the contractor. Phase II Submittals drawings shall include the following:
- 1.27.1 Furnish complete shop drawings for all systems specified. Each drawing shall have a descriptive title and all sub parts of each drawing shall be completely described. All drawings shall have the name of the project, architect, consultant, and electronics Contractor in the title block.
  - 1.27.2 Furnish complete scaled drawings of all equipment racks, consoles, special assemblies, etc. Each drawing shall show all equipment with its manufacturer and model number.
  - 1.27.3 Furnish complete scaled installation drawings detailing locations of all equipment such as control panels, plug panels, video monitors, video projectors, equipment

racks, speakers, etc. All conduits with cable quantities and types and all terminal block locations shall be shown also.

- 1.27.4 Provide single line riser diagrams of all racks, consoles, control panels, speaker assemblies, etc. Each drawing shall delineate circuit numbers for all cables and terminal connections. Provide typical wiring termination for all devices.
- 1.28 All equipment items referenced by manufacturer name and model number shall be the only approved product to be furnished for use on this project. Where alternate items are acceptable (or approved alternate) will be noted with the product description.
- 1.29 Products as manufactured by "Extron" have been specified to coordinate with an existing facility and other contracts to be issued for this project. Alternate products will not be approved.

#### SEISMIC ANCHORING

- 1.30 All sound systems, A/V equipment or enclosures shall be anchored to the structure. Where details have not been provided on the drawings, anchorage shall comply with CBC Section 1632A and Table 16-A0. The Contractor shall submit drawings signed by the Contractor's registered structural engineer indicating method of compliance prior installation.

#### CLEANUP

- 1.31 In addition to cleanup specified under other sections, thoroughly clean all parts of the equipment. Where exposed parts are to be painted, thoroughly clean off any spattered construction materials and remove all oil and grease spots. Wipe the surface carefully and scrape out all cracks and corners.
- 1.32 Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.
- 1.33 During the progress of the work, keep the premises clean and free of debris.

#### GENERAL COORDINATION

- 1.34 The A/V drawings may reference components by manufacturer which conflict with the written specification requirements, where this occurs the written specifications shall be followed.
- 1.35 Warranty: All components and installation shall be warranted by the Contractor to the School District for a period of **2-years** after District acceptance and from date of sign-off of the completed project. Additional Extended Equipment warranties shall be provided as follows;
  - 1.35.1 **Provide a (3) three-year warranty for all Laser Projectors provided for the project.**
  - 1.35.2 **Provide a (3) Three-year warranty for all Commercial Grade Flat Panel Displays provided for the project.**

#### PART 2 — CLASSROOM PRODUCTS

- 2.1 Refer to the floor plans for the extent of the Audio-Visual System that is to be furnished for each of the classrooms or teaching spaces.

RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTÉE SCHOOL DISTRICT

- 2.2 Provide detailed drawings of the proposed mounting systems for all speakers. The design drawings shall include independent structural calculations to verify compliance with seismic zone 4 requirements.
- 2.3 Contractor shall provide engraving on portable components with an example of the following text - "Property of SSD". Engraving shall be clear and legible and shall be professionally applied.
- 2.4 The Contractor shall refer to the Audio/Video Patch Cable section of this specification for the descriptions of the type and style of patch cable to be furnished for the different Audio-Visual and data patch cable connections. Patch Cable Section includes the different requirements for cable runs based on length and style of connector. HDMI cables shall be furnished as outlined in this section based on the length of the cable and the model of HDMI cable required will vary. Individual patch cord specifications are not shown in the room system descriptions, only the type of cable required will be shown.
- 2.5 Contractor shall furnish and install all Audio-Visual system components as shown in the A/V system details and these specifications. Refer to the Audio-Visual System Diagrams, for each of the different room system requirements, for additional information. The drawing details and specifications shall be considered as one overall document. Contractor shall provide all systems as complete turn-key operational Audio-Visual systems.
- 2.6 **Provide lump sum of \$4,500 for the purchase of (4) LED/Laser Projectors as shown in the specifications.** The projectors shall be furnished in size based on the requirements shown in this specification. The final projector will be determined by the Contractor's final submittal for the approved purchase with the Lump Sum allowance.
  - 2.6.1 **Lump sum amount shall cover Projectors invoice cost only plus tax.** Shipping, Contractor mark-up, installation, patch cables, programming and set-up, all mounting hardware and labor costs shall be included as part of the Contractor bid and not part of the lump sum amount. Actual make, model and final size of the Projectors will be determined prior to installation and shall be approved by the Project Engineer and District Project Manager prior to purchase.
  - 2.6.2 Contractor shall submit an itemized spreadsheet to the Project Engineer, Architect, Construction Manager and District Project Manager for the projectors being proposed for purchase including the following information; Make, Model, Size (Diagonal), Native Resolution, Invoice Cost and Tax. The submittal shall include manufacturer cut sheets for each type and size of each model submitted, with proper part numbers highlighted. The itemized spreadsheet shall detail each location with Room Number. The spreadsheet shall be provided to the Construction Team a minimum of 12 weeks prior to the first proposed purchase date to allow enough time for approval, purchase and delivery of the Projectors. The Contractor shall not proceed with purchase or warehousing of the equipment without written approval.
  - 2.6.3 The specified projectors shall be installed Classrooms #1-7 ceiling mounted in the accessible ceiling. Refer to the Electrical and Architectural floor plans for additional information on the location of the projectors.
  - 2.6.4 Projector specifications based on Optoma Model #ZW506-W with a Laser DMD (Laser Phosphor) type projection system. Any suggested projector equivalent must contain at a minimum all input/output connections as the specified projector; display shall provide as good or better minimum brightness, contrast

ratio, native resolution, lamp life, native aspect ratio and lens shift capability as the specified projector. Models not currently in production (discontinued) at the time of the submittal, will not be considered for approval.

- 2.7 Provide installation of projection screens for the Classroom Audio-Visual Systems. The projection screens will all be manual type non-tensioned recessed screens. Projection screens shall be located per the drawings.
  - 2.7.1 Contractor shall provide all hardware and structural support including, but not limited to, channel strut, brackets, seismic bracing and hardware. All screens must be installed to comply with local codes and seismic requirements.
  - 2.7.2 All new projection screens will require a structural support mechanism to the building structure. The basic requirements will be shown in the detail drawings, but the exact requirements must be field verified by the Contractor. Contractor shall refer to the drawing details for the type of structural support system to be provided based on the type of screen used and the building conditions. The Contractor shall furnish and install all support.
  - 2.7.3 Coordinate the screen's location with the installation of the projectors. The location of both the projector and screen must be properly coordinated to insure the proper image size and orientation. Projector and screen locations shown on the floor plans are diagrammatical. Exact locations must be field verified by the Contractor prior to the installation of either component.

#### Standard Projector System AV Requirements

- 2.8 Standard Projector System shall be furnished with a Standard Throw Laser DMD Projector with a recessed tensioned projection screen. The Projector System shall be provided with a new Amplified Speaker System and an ADA Assistive Listening System Transmitter. The modifications shall be furnished by the Contractor as shown in the drawing details. The system shall be designed to allow for the seamless addition of a Teacher's microphone system in the future.
- 2.9 Provide installation of projectors with audio/video components, mounting systems and all local wiring as shown in the drawing details. Projectors shall be located per the drawings and specifications.
  - 2.9.1 Standard Throw Projectors – Projectors shall be furnished and installed by the Contractor. Projectors must be able to fill a 109" diagonal screen or surface (16:10 aspect ratio) from a distance not greater than 16 feet from the surface. Projectors shall be the non-interactive type. Contractor shall be responsible for furnishing and installing the all software, tools and control systems as required for proper operation. Each of the projection systems must be properly calibrated during the installation process to allow for the images and inputs to be presented properly.
  - 2.9.2 The Contractor shall install the projector using the complete manufacturer installation instructions in the installation manual. The Contractor shall follow all the steps shown for complete calibration of the image size and position on the screen. **Projectors shall be leveled to insure a proper image shape.** Projectors may not be tilted or skewed to align the image with the projection area on the screen. Do not make the adjustments to the image size with the keystone functions.

**RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 2.9.3 The Contractor shall be responsible for the image size and proper operation of the projector until the project is signed off by the District Project Manager and the Project Engineer. Changes in the orientation of the projector due to incidental contact during construction shall be resolved by the Contractor.
- 2.10 Provide manual front projection screen at the front of the classroom where shown on the drawings. Contractor shall provide all hardware including, but not limited to; manufacturer adapter hardware, unistrut, hardware, support systems, seismic bracing and mounting brackets. The projection screen shall be mounted recessed above the accessible ceiling.
  - 2.10.1 Coordinate the screen location with the installation of the projector. Screen shall be mounted to allow for the projector to be mounted with the proper image drop of the screen's usable image area or with a drop as recommended by the manufacturer's throw calculator. Screen must be aligned with projector to create the proper image size and orientation.
  - 2.10.2 Mount screen to the structural members of the ceiling area above the screen. The structural support members are above the screen in the accessible ceiling. Additional structural support shall be furnished and installed by the Contractor as shown in the project drawings. The support of the screens will require a unistrut support system to be constructed or additional bracing members to be installed between the building support members. Contractor to field verify the exact conditions prior to installation of the screen.
    - 2.10.2.1 The screen must be provided with seismic bracing cables from the projector's attached to the structural members above the screen location. Provide 1/8" stainless steel wire rope bracing
  - 2.10.3 The projection screen shall have the Auto-Return function and screen drop distance set as required in the installation instructions from the manufacturer and the detail drawings installation requirements. The black-out area at the top of the screen shall be set to match the drop distance shown in the projector calculator.
  - 2.10.4 Draper Model "Access Fit/Series M" with Auto-Return manual projection screen, 57-1/2" High by 92" Wide by 109" Diagonal at 16:10 aspect ratio loaded with front projection screen surface by Draper Model "TecVision XH900X ALR" with a 0.9 Gain and 130-Degree Viewing Cone.
  - 2.10.5 Order screen to provide standard 12" of black out drop at the top of the screen. Verify ceiling height shown on the Architectural drawings. Image area shall begin at the top of the screen, based on the throw of the projector. The actual quantity of screen drop required for viewing shall be adjusted and pre-set to drop the exact same distance each time the screen is pulled down.
  - 2.10.6 Provide option for (2) additional mounting brackets for the projection screen, with a total of (4) mounting brackets being used for the installation as shown in the manufacturer's installation instructions.
  - 2.10.7 Provide the optional 4-foot long Aluminum Operating Pole for each projection screen provided for the project. The poles shall be delivered to the Site Administrative Contact for distribution to the Teaching Staff. Contractor shall be responsible for submitting a Transmittal to the Construction Manager and the Project Engineer confirming delivery to the site



- 2.10.8 Provide any additional items as shown on the A/V wiring details and diagrams
- 2.11 Document Cameras, Laptops and Personal Computers with Monitors shall be furnished by the District and installed by the District. Provide cable loom wrap around all patch cables from devices to the wallplates. AppleTV Devices and required ceiling mount bracket shall be furnished by the District and installed by the Contractor. Coordinate the installation timeline with the District IT Department for delivery of the AppleTV devices and the ceiling mount bracket.
- 2.12 Contractor shall furnish and install all projection system components as shown in the A/V system details and specifications. System shall consist of components that will use the projector as the audio-visual switch. All video inputs shall be directly wired to the projector. Audio shall be routed as shown in the AV Wiring Diagrams, in the detail drawings, to allow the Amplified Speaker System to serve as a system-wide amplification device. Refer to the detail drawings for additional installation configuration requirements, mounting systems and additional parts.
- 2.13 Teacher's interface wall plate; The Teacher's PC wallplate will serve as the main input location to the projector system. Provide all patch cables for the system. See Projector System A/V diagram for wall plate requirements. Provide the following interfaces at each of the Teacher's wallplate locations;
- 2.13.1 Provide (1) Single Gang wallplate at each of the Teacher's Input location (Shown as the "LO" symbol on the drawings). The input location may also occur at rooms that are not classrooms, with the input wallplate still being designated with the "LO" symbol. Provide (1) HDMI with audio passive feed-through digital input wallplate Extron Model #WPD-110A on a single gang Decora Style faceplates at Teacher's Desk (LO) location. Refer to the AV Wiring Diagrams for the exact wallplate configuration.
- 2.13.2 Contractor shall furnish and install the High Speed 90° Swivel-Type HDMI patch cable and 3.5mm audio patch cable to the Teacher's PC (or other input device). The 90° HDMI end of the patch cable shall be connected to the faceplate to allow the cable to drop straight down along the wall. All patch cables shall be 12 feet in length at the Teacher's wallplate location. Refer to the patch cable section for the exact patch cable requirements.
- 2.13.3 Provide an HDMI (Female) to DisplayPort (Male) adapter for each of the Teacher's Wallplate locations. The adapter shall be provided with the HDMI and Audio patch cable assemblies.
- 2.13.4 Provide (1) HDMI fiber optic/copper hybrid with detachable ends (video) and (1) 3.5mm (audio) cable from the pass through wallplate to the projector location. The HDMI cable shall be directly connected to HDMI Input #1 on the projector. The 3.5mm audio cable shall be directly connected to the 3.5mm audio Input #1 on the projector. Cables shall be a maximum overall length of 66-feet. Do not install cables exceeding this distance limitation without providing an external HDMI cable equalizer. Provide cables as shown in the patch cables section of this specification.
- 2.13.4.1 Notify Project Engineer prior to installation of any cables for any rooms where the distance limit may be exceeded to discuss a resolution. Contractor may furnish an external cable equalizer for HDMI cables over 66-feet in length or provide a HDMI signal regenerator wallplate Decora Insert in lieu of the HDMI pass-through

**RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

insert. The actual resolution must be approved by the Project Engineer and the District Project Manager prior to ordering or installation of the alternate equipment.

- 2.13.5 Connect the Audio Output from the projector to the input connection on the DSP Mixer for routing of the System Audio to the speakers. Provide stereo audio connection cable from the projector to the DSP Mixer in the ceiling enclosure.
- 2.13.6 All wallplates shall be the Extron Decora style. Color of plates is to be confirmed by the Contractor prior to installation.
- 2.14 Provide ceiling mounted enclosure in the accessible ceiling of the Classrooms to house the Amplifier for the Speaker System, the DSP/Mixer, ADA Assistive Listening Transmitter, equipment power supplies and future accessories.
  - 2.14.1 Each enclosure will be furnished with power by the 260000 Contractor. The enclosure shall be provided with a quad outlet in the ceiling enclosure. The power shall be hard wired to the outlet in the ceiling enclosure. The enclosure shall also be furnished with a surge suppressor as shown in the detail drawings. Refer to the detail drawings for additional requirements.
  - 2.14.2 The Ceiling enclosure, Premier Mounts Model #GB-AVSTOR3, shall be installed in the accessible ceiling near the projector location. The 2-foot by 2-foot enclosure fits directly into the ceiling grid system. The enclosure shall also be furnished with seismic bracing installation kit by Premier Mounts Model #QLCS, "Quick-Lock" cable support system for seismic bracing from the deck above. In addition, the enclosure shall be provided with threaded rod for structural support into deck above. Provide threaded rod based on distance to deck above and the structural members, refer to the drawing details for installation requirements.
  - 2.14.3 The power supplies for all AV equipment must be installed inside the AV enclosure.
  - 2.14.4 Confirm typical placement of the enclosure prior to installation of any AV cabling. The enclosure shall be no more than three feet from the projector location (distance on ceiling, not actual distance).
  - 2.14.5 Speaker System Amplifier, DSP/Mixer and the ADA Assistive Listening Transmitter shall be placed in the Ceiling Mounted AV Enclosure. Refer to the Classroom AV Diagram for additional requirements and for the location of the Ceiling Enclosure.
  - 2.14.6 Field modify the ceiling enclosure to mount the antenna for the ADA System transmitter on the outside of the enclosure. Confirm location of the antenna with the other components to be installed in the enclosure prior to installing the antenna or drilling any holes. Refer to the ADA Assistive Listening System specifications for additional instructions.
  - 2.14.7 Provide surge suppressor at the ceiling enclosure location for the devices installed in the enclosure. Surge suppressor shall be rated for 15A, six outlets, and shall have outlet sections that swivel. Provide Cyber Power Model #CSB600WS

**RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 2.15 A 4-Port Category-6 UTP data outlet shall be provided at the ceiling enclosure by the 27 10 00 Contractor. The data outlet shall be used for network connections to the WAP, AppleTV and the IP-Based Paging Speaker. Coordinate the data outlet location with the 27 10 00 Contractor. Patch cables for the WAP and IP-Based Paging Speaker will be furnished and installed by the 27 10 00 Contractor.
- 2.16 District shall furnish and install an AppleTV device at the Ceiling AV Enclosure location. Coordinate the installation of the AppleTV device with the District IT Department. The AppleTV shall be connected to the projector with an HDMI cable. Connect the AppleTV device to the LAN via the data outlet installed in the AV Enclosure. Refer to the Library Audio-Visual Diagram in the detail drawings.
- 2.16.1 Provide an HDMI patch cable for the connection from the AppleTV device to the projector. The cable shall be furnished per the AV Patch Cable section of this specification. The District shall connect the cable to the projector and the AppleTV device.
- 2.16.2 Provide Category-6 patch cable for the District furnished AppleTV device, length as required to connect to the data outlet in the AV Ceiling Enclosure. Coordinate connections at the enclosure with District IT Department.
- 2.17 Provide a DSP/Mixer Audio router and processor for distribution and control of audio signals in the Classroom. Provide a 3 input X 2 output Audio Digital Matrix Processor by Extron Model MVC 121 Plus in the ceiling enclosure.
- 2.17.1 Provide audio input to the DSP/Mixer Processor from the 3.5mm Audio Main Audio Output from the Projector. Refer to the specifications for each individual device for additional requirements.
- 2.17.2 Provide audio output channels from the DSP/Mixer Processor to the amplifier and the ADA System Transmitter. Refer to the Classroom AV System Diagram for additional requirements.
- 2.17.3 Provide variable line level audio output to the Speaker System Amplifier mounted in the ceiling enclosure. The audio level shall be set with the DSP function while the speakers are installed and operational. The DSP processing shall be set for each source input into the Mixer. Provide the audio cable required for the connection. Test the audio output at the speakers for each input device.
- 2.17.4 Provide fixed line level audio output to the ADA Assistive Listening Systems Transmitter mounted in the ceiling enclosure. The audio level shall be set flat to allow the users to control volume on the receivers. Provide the 3.5mm audio cable required for the connection.
- 2.17.5 The DSP/Mixer shall be set up for a plug-and-play connection of a future microphone system for the Teacher. The Contractor shall program the third input as a balanced microphone input through the programming settings. The District shall be able to connect the future microphone system without having to re-program the DSP.
- 2.17.6 The DSP Matrix Processor via the DSP software shall be used to set the routing and equalization of all of the audio inputs/outputs. The Contractor shall balance each individual input and output to provide optimum signal quality. The Music Type Presets on the Control Panel shall each be set with individual EQs to match the music or audio type chosen.

**RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTÉE SCHOOL DISTRICT**

- 2.17.7 System shall be provided with Extron's DSP Configurator Software for management of the complete speaker system. Contractor shall provide all programming and software and shall provide the District with all software presets. Set Administrator Password access to prevent inadvertent changes to the programming after the installation.
- 2.18 Provide an Amplified Speaker System in each classroom for audio support for the projector. See the detail drawings and diagrams for additional requirements for the system. The Amplified Speaker System shall be provided the following;
  - 2.18.1 Provide a compact 70-Volt Amplifier in the Ceiling AV Enclosure to power the ceiling speakers in the room. Route the Audio Output from the Projector to the Input on the Amplifier. The speakers shall be connected to both outputs from the Amplifier to insure a balanced power load. Provide Extron Model #XPA U 1002-70V Amplifier.
  - 2.18.2 The ceiling mounted speakers shall be wired with 18-AWG speaker wire from the amplifier. Each classroom shall be provided with (4) ceiling speakers. Ceiling speakers shall be wired to the amplifier at 70-Volts in pairs, with the speakers each tapped at 12-watts. Provide recessed ceiling speakers by JBL Model #Control CT Micro+ (or Approved Equal).
  - 2.18.3 The ceiling mounted speakers shall be furnished with the optional support backing plates from JBL Model #MTC-24NC and a seismic support wire. The backing plates shall be secured to the ceiling tile grid system as shown in the manufacturer's instructions. Contractor shall be responsible for providing seismic restraints for the ceiling speakers as shown in the drawing details.
- 2.19 Provide a complete Assistive Listening System in each room furnished with an AV System. The Assisted Listening System shall be furnished and installed to meet CBC Section 11B-219 and comply with CBC Section 11B-706 and the ADA requirements for hard-of-hearing. The ADA system shall be integrated into the sound reinforcement system. Mount the RF base transmitter in the ceiling mounted AV Enclosure, at the location shown on the floor plans.
  - 2.19.1 Per ADA Assistive Listening System CBC Section 11B-706.3 – "The minimum number of receivers to be provided shall be equal to 4% of the total number of seats, but in no case less than two. 25% minimum of receivers provided, but no fewer than two, shall be hearing aid compatible".
- 2.20 Provide Williams AV Assistive Listening System for each classroom.
  - 2.20.1 Provide (1) ADA System Stationary FM Transmitter – Model #PPA T45
  - 2.20.2 (1) Remote Antenna Kit – Model ANT 034
  - 2.20.3 (1) Signage Kit – Model IDP 008 Assistive Listening Notification Signage
  - 2.20.4 The antenna shall be mounted to the top side of the ceiling enclosure with the antenna pointed inside the accessible ceiling. Contractor shall drill a small hole in the top to install the F-Type female to female bulkhead for the antenna. Plug the short RG-59 coaxial extension cable into the Transmitter and bulkhead. Install antenna on bulkhead.

- 2.21 Provide ADA System Receivers to be used for the entire building. The Receivers shall be delivered to the Librarian for distribution on an "as-needed" basis to the users.
  - 2.21.1 (6) 17-Channel FM Receivers – Model PPA R37 with (2) NiMH "AA" rechargeable batteries, Model #BAT 026
  - 2.21.2 (6) Neck Loop Induction Accessory with 3.5mm male plug Model NKL 001
  - 2.21.3 (6) Folding Headphones with 3.5mm male plug Model HED 024
  - 2.21.4 Provide (1) 12-Bay Body-Pack Charger Model CHG 3512 for use with all the ADA Systems furnished for the Classroom Building. The Charger shall be provided at the Library Media Center Desk location accessible to all of the Teachers. Provide Charger with power supply.
  - 2.21.5 Provide (1) 100-Count Pack of replacement headphone earpads for use with all the ADA Systems furnished for the Classroom Building. The earpads shall be used as sanitary replacements for the earphones
- 2.22 Provide spare parts to be used for the ADA Systems installed in the Classroom Building. Provide the following spare parts:
  - 2.22.1 (1) 17-Channel FM Receiver – Model PPA R37
  - 2.22.2 (2) Neck Loop Induction Accessory with 3.5mm male plug Model NKL 001
  - 2.22.3 (2) Folding Headphones with 3.5mm male plug Model HED 024
  - 2.22.4 (4) NiMH "AA" rechargeable batteries, Model #BAT 026
  - 2.22.5 (2) Signage Kits – Model IDP 008 Assistive Listening Notification Signage
- 2.23 Complete documentation of the materials provided, and all warranty information shall be furnished, along with the serial numbers shall and MAC addresses to the District on the As-Built documentation to support the warranty information. Deliver all equipment in the original manufacturer's supplied packaging.

### PART 3 - TRAINING

#### 3.1 Training

- 3.1.1 **Contractor will provide a minimum of 8 clock hours of on-site training for site staff on the Classroom and Library A/V systems. Training time may be split to provide multiple training sessions by the District as required to fully train the staff.** Training for personnel shall be provided by certified technology specialists. The scope of training shall encompass system operation and procedures. Staff training shall include an integrated information overview, media retrieval procedures as well as operational procedures for local control configurations. The contractor shall provide a detailed written outline clearly describing the proposed plan for all training, for approval by the Engineer and Owner's representative. The Staff shall be trained for use of all AV System accessories such as proper microphone storage and charging, document camera set-up and use and volume control options.

RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

- 3.1.1.1 In Addition; Training for staff will include the following basic system concepts; Faculty and staff will need to know how to power on/off the system; how to access one or more media resources via the remote control; use and operation of audio/video input/output devices and techniques; operational procedures and "what not to do" to prevent system malfunctions; procedures for recovery after a power outage; control of the flat panel and projector systems and trouble-shooting tips. Trainers should incorporate hands-on techniques to maximize staff opportunity to incorporate and develop curriculum that is both meaningful and targeted for their student needs. Clearly written support materials shall be provided to all training participants along with a laminated quick reference guide that will be retained after the training classes. Manuals describing operation and use of the system shall also be provided to the staff for future reference.
- 3.1.2 Schedule final training within 2-weeks of all of classroom systems being completed.
- 3.1.3 All System Types - Contractor shall record at least (1) training session per School site, of each type of Audio-Visual System, in minimum High Definition Video (1080p format), and save to a flash drive to turn over to the District. Training video shall be retained as property of the District.
- 3.1.4 **Contractor will provide a minimum of 4 clock hours of on-site training for District Technical Staff on the Classroom and Library A/V systems.** Training for Technical Personnel shall be provided by certified technology specialists. The scope of training shall encompass system operation and procedures, basic programming, trouble-shooting minor problems, projector set-up and settings, flat panel settings, mount adjustments, audio component connections and programming, etc. Technician training should include an integrated information overview, operational procedures for local control configurations. The contractor shall provide a detailed written outline clearly describing the proposed plan for all training, for approval by the Engineer and Owner's representative.
- 3.1.5 Contractor shall furnish the District IT Department with a full spreadsheet list of the device MAC Addresses, Switch Ports used and Cable ID (Labeling) information that all Audio-Visual equipment is connected to in the IDFs and AV cabinets. The information shall be provided to the District before all systems are activated and shall be coordinated with the District IT Department.
- 3.1.6 Contractor shall provide a laminated quick reference guide for the Teacher's, and/or Staff using the Classroom and Library AV Systems, that outlines the operational procedures for starting up the system, selection of inputs, volume control, use of system microphones and charging procedures, use of ADA Assistive Listening System receivers and use of a Document Camera. The quick reference guide shall be given to each person that attends a training class and each classroom system shall be left with a quick reference guide given with the system components distributed by the Principal. Coordinate with the Principal for distribution and quantity of guides required.
- 3.1.7 A separate laminated quick reference guide shall be produced for the flat panel monitor system and left with the system at the time of installation. Coordinate with the School Administration for distribution and quantity of guides required.

## PART 4 - PATCH CABLE ASSEMBLIES

### 4.1 Audio/Video Patch Cables

- 4.1.1 All patch cables must be factory manufactured. All patch cables shall be in a length as required to provide the proper operation of the equipment, unless otherwise noted. Contractor is responsible for confirming all connector gender requirements prior to ordering.
- 4.1.2 **Audio Patch Cables 2-feet to 25-feet in length for Installation Connections;** All 3.5mm stereo audio cable assemblies shall be a male to male cable fully shielded cable with 3.5mm bayonet style connectors. Extron Mini Audio Cables Series (Or Approved Equal). Provide minimum length of 2 feet.
- 4.1.3 **Audio Patch Cables 12 feet in length for Input Wallplate Connections;** All 3.5mm stereo audio cable assemblies shall be a male to male cable fully shielded cable with 3.5mm bayonet style connectors. Extron Mini Audio Cables Series (Or Approved Equal). See the AV System Diagrams in the drawings and AV Input Wallplate requirements in the specifications for further instructions.
- 4.1.4 **HDMI Cable Assemblies 12 feet in length for Input Wallplate Connections;** All HDMI patch cables must be 4K/30 verified and must conform to the HDMI Premium and High Speed cable standards. Cables shall be furnished with 180° swivel head design, Vanco Pro Digital High Speed HDMI Swivel Cable Model #299012 (Or Approved Equal), UL and CL3 rated. See the AV System Diagrams in the drawings and AV Input Wallplate requirements in the specifications for further instructions.
- 4.1.5 **HDMI Patch Cables 1.5-feet to 15-feet in length for Installation Connections;** All HDMI patch cables must be 4K verified, ultra-flexible construction and must conform to the HDMI High Speed cable standards. Patch cable shall be Extron HDMI Ultra Series High Speed patch cable assemblies (Or Approved Equal). Length of patch cable shall be as required for proper operation.
- 4.1.6 **HDMI Cable Assemblies 33-feet to 66-feet in length for Installation Connections;** All HDMI patch cables must be 4K/30 verified and must conform to the HDMI Premium and High Speed cable standards. HDMI cable assemblies must be a fiber optic/copper hybrid construction with detachable ends. Cables shall be Hall Research CHD-DE\* 4K Javelin™ Active HDMI Cable w/Detachable Ends or Kramer CP-AOCH Series High Speed. Length of patch cable shall be as required for proper operation.
  - 4.1.6.1 HDMI cable assembly must be installed with the manufacturer furnished "cable pulling sock". Damaged or inoperable cable assemblies due to improper installation procedures shall be replaced by the Contractor at no expense to the District. Please note Manufacturer's Cautionary Warning on product specification sheet – *"DAMAGED DUE TO CONNECTOR BEING PULLED HARDER THAN 20 kg, IS NOT COVERED BY WARRANTY - To pull cable through conduits or tight spaces, never grab the connector, as it is easy to exceed the force limit on the connector, instead, remove the detachable end, protect the connector using a cable pulling sock and make sure the force is applied directly to the cable jacket."*

RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

- 4.1.7 **HDMI (Female) to DisplayPort (Male) Adapter;** HDMI to DisplayPort adapter for HDMI patch from the AV Input Wallplate to the Input Device (Laptop, PC, etc.) at the Teacher or Instructor's location. HDMI (Female) to DisplayPort (Male) Adapter as manufactured by Hall Research Model #GC-DP-HDMI-P (Or Approved Equal).
- 4.1.8 **Category-6 Patch Cables 25-feet or Less;** Category-6 UTP patch cables shall be as manufactured by Commscope, Panduit, Leviton or Ortronics, (Or Approved Equal).
- 4.1.9 All patch cables shall be provided for each type of connection required to provide a complete and operational system. All patch cables shall be factory manufactured.

**PART 5 - INSTALLATION AND EXECUTION**

- 5.1 Verify that all electrical requirements including junction boxes, empty conduit and power circuits and receptacles are in place as shown on the drawings.
- 5.2 Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as part of the contract. Store in areas as directed by the owner's representative. Include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components, equipment alignment and adjustment, and other related work whether or not expressly defined herein.
- 5.3 Installation practices shall follow "standard broadcast wiring" and installation practices, as excerpted from "Recommended Wiring Practices, "Sound System Engineering", (2<sup>nd</sup> Edition) D. Davis, and Performed to the highest standards of acknowledged industry practices. Upon request the A/V contractor shall furnish all equipment and labor to verify the compliance with the following:

Optical:

- 5.3.1 Center to corner light fall off shall be less than 50% for video/data projectors.
- 5.3.2 Center to corner light fall off shall be less than 35% for optical projectors.
- 5.3.3 Images shall be level and square with the appropriate aspect ratio.
- 5.3.4 Image shall be free from visible vibration.

Audio System:

- 5.3.5 Signal-to-noise ratio (including crosstalk): 55-dB minimum.
- 5.3.6 Total harmonic distortion: 0.1% maximum from 30 Hz to 15,000 Hz.
- 5.3.7 System frequency response:  $\pm 1.0$  dB, 20 Hz to 20,000 Hz.
- 5.3.8 Program reproduction system with point-source loudspeakers: Flat response from 63 Hz to 2.5 kHz  $\pm 2$ -dB, decreasing uniformly from a relative level of 0-dB at 2.5 kHz to a relative level of -10-dB at 10 kHz as measured on axis of loudspeaker.



- 5.3.9 Sound output capability: Program levels of not less than 100 dB without objectionable distortion, rattles, or buzzes.
- 5.3.10 Hum and noise is inaudible (below the background noise level of the space) under normal operation and as observed in normal seat locations.

Video System:

- 5.3.11 Signal-to-noise ratio (peak to RMS, unweighted DC to 4.2 MHz): 55-dB minimum.
- 5.3.12 Crosstalk (unweighted DC to 4.2 MHz): 45-dB minimum.
- 5.3.13 Frequency response:  $\pm 0.5$  dB to 4.2 Mhz.
- 5.3.14 Line and field tilt: 2% minimum.
- 5.3.15 Differential gain: 3% maximum.
- 5.3.16 Differential phase:  $2^\circ$  maximum.
- 5.3.17 System timing sync coincidence: within 50 nanoseconds.
- 5.3.18 Color timing:  $\pm 2^\circ$  at 3.58 Mhz.

Radio Frequency (RF) System:

- 5.3.19 Visual Carrier level: +0 dBmV minimum and +16 dBmV maximum at system outlets for utilized channels.
- 5.3.20 Adjacent Channel Visual Carrier: 3-dB maximum differential at system outlets.
- 5.3.21 Non-adjacent Channel Visual Carrier: 0-dB maximum differential at system outlets.
- 5.3.22 Carrier-to-Noise Ratio: 42-dB minimum
- 5.3.23 Amplitude Response: Flat  $\pm 1.0$  Db
- 5.3.24 Signal-to-Noise Ratio: 45-dB minimum for the maximum level of the signal and the interference resulting from cross modulation from other signals on the system, after demodulation.
- 5.3.25 Outlet-to-Outlet Isolation: 25-dB minimum.
- 5.4 Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.
- 5.5 Where manufacturer does not provide bending radius information, minimum bending radius shall be 10 times cable diameter. Arrange and mount equipment and materials in a manner acceptable to the engineer and the owner.
- 5.6 Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables installed above removable ceilings. Install adequate support structures for 10-foot cable service loops at each TC.

**RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 5.7 Furnish screw-type terminal blocks, boards, strips or connectors for cables that interface with racks, cabinets, consoles or equipment modules. Attach wires terminating at screw-type terminals with crimp-on lugs. "Telephone-style" punch down blocks are not acceptable for signal or data wiring.
- 5.8 Group cables according to signals being carried. To reduce signal contamination, form separate groups for the following:
  - 5.8.1 Power cables.
  - 5.8.2 Control cables.
  - 5.8.3 Video cables.
  - 5.8.4 Camera cables.
  - 5.8.5 Audio cables for signals less than minus 20 dBm.
  - 5.8.6 Audio cables for signals between minus 20 dBm and plus 30 dBm.
  - 5.8.7 Audio cables for signals above plus 30 dBm.
- 5.9 All wire and cable shall be continuous and splice-free for the entire length of run. For equipment mounted in drawers or on slides, provide the interconnecting cables with a service loop of appropriate length.
- 5.10 Install no cable with a bend radius less than that recommended by the manufacturer.
- 5.11 Provide strain relief for cables. Provide connectors with metal shell/casings. Provide a minimum of three feet of free cable coiled in a floor pocket. Use spiral wrap to group similar cable types.
- 5.12 All shielded cables shall be insulated. Do not permit shields to contact conduit, raceway, boxes, panels, or equipment enclosures. Tin all terminated shield drain wires and insulate with heat-shrink tubing.
- 5.13 Separately dress, route and land microphone and line level cables directly to equipment.
- 5.14 Use only rosin core 60/40 tin/lead solder for all solder connections.
- 5.15 All cables shall be neatly labeled with wrap around type written labels.
  - 5.15.1 On the cable at the rear of the faceplate or termination location at the control location. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part # 29689 (NO ACCEPTABLE EQUAL)
- 5.16 All faceplates shall be labeled with type-written permanent labels securely attached to the faceplates identifying all A/V connections. (ie; Doc Cam, PC, Audio Only, etc.) Cables at the projector and A/V switch shall be also be labeled to match the faceplates.
- 5.17 Lace, tie or harness wire or cable in accordance with accepted professional practice. Dress, lace or harness all wire and cable to prevent mechanical stress on electrical connections; no

**RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

wire or cable shall be supported by a connection point. Provide service loops where harness of different classes cross or where hinged panels are to be interconnected. Only Velcro style tywraps or cable ties shall be allowed for any cable dressing applications.

- 5.18 Each major component of equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place. NEMA code ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible.
- 5.19 Upon completion of the work, remove all refuse and rubbish from and about the premises, and leave the relevant areas and equipment clean and in an operational state.
- 5.20 During the installation, and up to the date of final acceptance, protect finished and unfinished work against damage and loss. In the event of such damage or loss, replace or repair such work at no cost to the owner.
- 5.21 Prior to final acceptance, provide minimum of three complete sets of drawings showing all cable numbers and construction details in accordance with the actual system installation. Revise the device layout drawings to represent actual installation locations and coordinate these with the electrical contractor. The operation manual shall contain all instructions necessary for the proper operation of the installed system and manufacturer's instructions. The maintenance manual shall contain all information required for the "proof of performance" as required and all manufacturers' maintenance information.

**Inspection and Test upon Completion**

- 5.22 Check out and final connections to the system shall be made by the Contractor of the products installed. Technicians shall demonstrate operation of the complete system and each major component to the Owner.
- 5.23 System field wiring diagrams shall be provided to the owner by the system Installer (Contractor) prior to completion of the installation.
- 5.24 Upon completion of the installation, four (4) copies of complete operational instructions shall be furnished, complete with record drawings. Instructions shall include part numbers and names, addresses, and telephone numbers of parts source. Final payment shall not be made until operational and maintenance manuals have been received.
- 5.25 The Contractor shall be responsible to provide service within 24 hours (or by mutual consent) after notification by the Owner or his representative, within the hours of 8:00 AM to 5:00 PM from Monday through Friday. Service request forms shall be supplied by the Contractor and the faxing or mailing of such a request form shall constitute notification by the Owner of a service request.
- 5.26 The Contractor shall provide two "preventative maintenance" service calls, spaced six months apart, for cleaning of all source devices and overall inspection of the system.

**PROJECT CLOSEOUT**

- 5.27 Prior to completion of project, compile a complete equipment maintenance manual for all equipment supplied under sections of this division, in accordance with these specifications and as described below.
- 5.28 Equipment Lists and Maintenance Manuals:

**RIO SECO ELEMENARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 5.28.1 Prior to completion of job, contractor shall compile a complete equipment list and maintenance manuals. The equipment list shall include the following items for every piece of material equipment supplied under this section of the specifications:
  - 5.28.1.1 Name, model, and manufacturer.
  - 5.28.1.2 Complete parts drawings and lists.
  - 5.28.1.3 Local supply for parts and replacement and telephone number.
  - 5.28.1.4 All tags, inspection slips, instruction packages, etc., removed from equipment as shipped from the factory, properly identified as to the piece of equipment it was taken from.
- 5.29 Maintenance manuals shall be furnished for each applicable section of the specifications and shall be suitably bound with hard covers and shall include all available manufacturers' operating and maintenance instructions, together with "as-built" drawings to properly operate and maintain the equipment. The equipment lists and maintenance manuals shall be submitted in duplicate to the Architect for approval not less than 10 days prior to the completion of the job. The maintenance manuals shall also include the name, address, and phone numbers of all subcontractors involved in any of the work specified herein. Four copies of the maintenance manuals bound in single volumes shall be provided.

**RECORD DRAWINGS**

- 5.30 The Contractor shall maintain record drawings as specified in accordance with these specifications, and as noted below.
- 5.31 Final As-Built Drawing Submittals – Provide (1) hard bound copy of "E-size" As-Built drawings and (3) copies on USB Flash Drive in AutoCad (2014 or newer version) format. A Hand marked-up copy of the original construction drawings will not be accepted as the final As-Built drawing submittal. Final As-Built drawings shall include copies of the floor plan drawings of each building showing projector locations, screens, detailed Audio-Visual System Diagrams showing all equipment and connections, quantities of input wallplates and speaker locations, identification of all final cable routes. In addition, the drawings shall include all outlet locations with cable identification numbers
- 5.32 Drawings shall show locations of all concealed and exposed conduit runs, giving the number and size of conduit wires. Underground ducts shall be shown with cross section elevations and shall be dimensioned in relation to permanent structures to indicate their exact location. Drawing changes shall not be identified only with referencing CORs and RFIs, the drawings shall reflect all the actual changes made.
- 5.33 One set of record drawings shall be delivered to the Engineer in accordance with these specifications.

**END OF SECTION**

**28 00 00**

**ELECTRONIC SAFETY & SECURITY**

**SANTEE SCHOOL DISTRICT**

**SECTION 28 01 00**

**ELECTRONIC SAFETY AND SECURITY GENERAL PROVISIONS**

**ARTICLE 1 - SUMMARY**

- 1.1 This Division of the specifications outlines the provisions of the contract work to be performed as a sub contract under the Division 26 scope of work. Reference the Division 26 Electrical General Provisions for scope of work and general requirements.
- 1.2 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under Division 1 requirements.

**END OF SECTION**

SECTION 28 30 01

FIRE ALARM VOICE EVACUATION SYSTEM

PART 1 – GENERAL

- 1.1 Work Included:
  - 1.1.1 Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating fire alarm system.
- 1.2 Related Work:
  - 1.2.1 Division 26 01 00: Electrical General Provisions
  - 1.2.2 Division 26 05 33: Conduit and Fittings
  - 1.2.3 Division 26 05 34: Outlet and Junction Boxes
- 1.3 The equipment and installation shall comply with the current applicable provisions of the following standards:
  - NFPA 72-2016. . . . . National Fire Alarm Code with California Amendments.
  - CBC - 2016. . . . . California Building Code (CBC), Part 2, Title 24, CCR.
  - CEC - 2016. . . . . California Electrical Code, (CEC), Part 3, Title 24, CCR.
  - CFC - 2016. . . . . California Fire Code (CFC), Part 9, Title 24, CCR.
- 1.4 The system and all components shall be listed by Underwriters Laboratories, Inc. for use in Fire Protective Signaling Systems under the following standards as applicable:
  - UL 38 . . . . . Manually Actuated Signaling Boxes.
  - UL 50 . . . . . Cabinets and Boxes.
  - UL 268 . . . . . Smoke Detectors for Fire Protective Signaling Systems.
  - UL 268A . . . . . Smoke Detectors for Duct Applications
  - UL 346 . . . . . Waterflow Indicators for Fire Protective Signaling Systems.
  - UL 464 . . . . . Audible Signaling Appliances.
  - UL 521. . . . . Heat Detectors for Fire Protective Signaling Systems.
  - UL 864 . . . . . Control Units for Fire Protective Signaling Systems.
  - UL 1481. . . . . Power supplies for Fire Protective Signaling Systems.
  - UL 1971. . . . . Visual Signaling Appliances.
- 1.5 Only Fire Alarm Control Panel Equipment and Peripheral Field Devices have been shown on the Contract Bid Single Line Block Diagram. Specific and complete wiring between Control Equipment and Peripheral Equipment has been deleted for clarity.
- 1.6 Submittal shall be made **in accordance with Division 26 01 00 – Shop Drawings and Submittals.** This submittal shall include the following:
  - 1.6.1 Complete bills of quantities, including all materials, components, devices, wiring and equipment required for this work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each item listed:
    - 1.6.1.1 Quantity of each type of equipment item.
    - 1.6.1.2 Quantities of 10% spare devices as per 1.16.
    - 1.6.1.3 Description of each item.

RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT

- 1.6.1.4 Manufacturer's Name and Model Number.
  - 1.6.1.5 Manufacturer's Specification Sheet.
  - 1.6.1.6 Back box type and dimensions per device type.
  - 1.6.1.7 California State Fire Marshall Listing Sheets for all components.
  - 1.6.1.8 Equipment items which have individual components, will require that all component parts be listed individually.
  - 1.6.1.9 Letter indicating the contractor's intent to comply with Phase II submittal drawings.
- 1.7 Phase II Submittal shall be provided within (20) working days after the approval of the Phase I submittals and prior to any fabrication or field conduit installations. All shop drawings shall be engineered and drawn on a CAD System. Each submission shall include 'D' or 'E' size print copies to match the contract drawings, and one (1) data disk copy with files in an AutoCAD 2000i or 2004 format. Building floor plan CAD files on disk, will be made available via express mail after the receipt of payment of \$50.00 per building floor plan, or \$300.00 minimum which ever is less. Contractor shall make the request for drawings in writing directly to Johnson Consulting Engineers, confirmation of the request and a release form will be forwarded to the contractor to include a signed copy with payment prior to release of files. Detail or riser diagram sheets or any other drawings other than floor or site plans, will not be made available to the contractor.
- 1.7.1 **Provide complete shop drawings to include the following:**
- 1.7.1.1 Complete floor plans, at scale of contract documents, showing the locations throughout the project of all devices, panels conduits, wireways, tray, pullboxes, junction boxes, number and type of conductors, and other devices.
  - 1.7.1.2 Point to point wiring diagrams showing wiring from panel terminals to each device.
  - 1.7.1.3 Riser diagram indicating all wiring and circuits.
  - 1.7.1.4 Current State Fire Marshal listing sheets for all components and devices.
  - 1.7.1.5 Provide battery power supply calculations, indicate point of power supply connection, means of disconnect, over-current protection, etc. for each panel.
  - 1.7.1.6 Provide detailed information on conductors to be used-manufacturer, type, size, insulation, etc.
  - 1.7.1.7 Provide voltage drop calculations for all conductor run is from each panel (i.e., main FACP, remotes, power extenders, etc.) for each panel.
  - 1.7.1.8 Provide written sequence of system operation matrix.
  - 1.7.1.9 Provide list of zones. (Every device that is addressable.)
  - 1.7.1.10 Provide detailed drawing for annunciator panel indicating all zones and initiating devices.

1.8 **Common submittal mistakes which will result in submittals being rejected:**



- 1.8.1 Not including the qualifications of the installing contractor.
- 1.8.2 Not including all items listed in the above itemized description.
- 1.8.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
- 1.8.4 Not including actual manufacturer's catalog information of proposed products.
- 1.8.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.
- 1.9 All equipment and material shall be new and unused, and listed by Underwriter's Laboratories for the specific intended purpose. All control panel components and field peripherals shall be designed for continuous duty without degradation of function or performance. All equipment covered by this specification or noted on Installation. Drawings shall be equipment suited for the application and shall be provided by a single manufacturer or be recognized and UL listed as compatible by both manufacturers.
- 1.10 It will be the responsibility of the Contractor to ensure proper specification adherence for system operation, final connection, test, turnover, warranty compliance, and after-market service. The distributor of the equipment specified must be factory-trained and certified.
- 1.11 Basic System Functional Operation, upon operation of any automatic, manual or other initiation device the following shall occur:
  - 1.11.1 The system alarm LED shall flash.
  - 1.11.2 A local piezo electric signal in the control panel shall sound.
  - 1.11.3 A backlit 80-character LCD display shall indicate all information associated with the fire alarm condition, including the alarm point and its location within the protected premises.
  - 1.11.4 History storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.
  - 1.11.5 All system output programs assigned via control by event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
  - 1.11.6 LED display and audible signaling at the remote annunciator indicating building, fire zone, and type of device. Annunciator shall also provide a separate audible signal for CO detection with a green flashing light, with classroom number indication.
  - 1.11.7 Automatic retransmission to a UL central station for fire department notification.
  - 1.11.8 Automatic shut down of air conditioning units shall be performed by control modules at each unit when required as part of a complete area coverage design scheme. Each building shall shut down all A/C units and dampers within that building as one zone.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 1.12 All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approval agency for use as part of a protective signaling system.
- 1.13 All equipment and components shall be installed in strict compliance with manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- 1.14 All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. Fasteners and supports shall be adequate to support the required load.
- 1.15 All wiring shall be installed in a conduit system.
- 1.16 The contractor shall provide as a part of this contract additional control modules, heat detectors, smoke detectors, CO detector, duct detectors, manual pull stations, strobes, speakers, speaker/strobes exterior speakers devices etc. along with all required programming, to equal 10% of the total quantity of devices shown on the drawings, or a minimum of three (3) for each type, whichever is greater. Installation of 50' of conduit, boxes and all wiring for each of the devices shall be included, and required locations coordinated with CSFM final approved shop drawings. Any devices not required to be included during construction shall be delivered to the District at the completion of the project. The quantities of these devices shall be listed as a part of the Phase I submittals.
- 1.17 The installing contractor shall provide a copy of current documentation, indicating that the contractor installing the fire alarm systems or devices and wiring, is certified by Underwriters Laboratories (UL) in its product directories under the listing category "PROTECTIVE SIGNALING SERVICES - LOCAL, AUXILIARY, REMOTE STATION, AND PROPRIETARY." The contractor shall be certified by the manufacturer to install and program the system. The contractor must also provide complete installation of all wiring and equipment, and software programming. Supervised installation of the wiring, devices and/or any software programming shall not be permitted.
  - 1.17.1 The installing contractor must also be an "authorized dealer" by the equipment manufacturer and must have completed all required training prior to the bid of this project.
  - 1.17.2 The fire alarm system installation shall be warranted by the manufacturer's representative.
  - 1.17.3 The Contractor shall have a current California C-10 or C-7 Contractor's License, and all individuals working on this project shall have passed the Department of Industrial Relations Division of Apprenticeship Standards – "Fire / Life Safety Certification Program."
  - 1.17.4 The installing contractor shall provide, at the time of submittal, a letter of intent to provide an extended service warranty. This warranty shall extend for a total of three (3) years, starting at the completion, testing, and training of this project. The service warranty shall cover all material and labor to keep operational all system devices installed under this project, and shall include two (2) complete U.L. system's tests and cleaning of all devices at year two (2) and year three (3) of the warranty. Routine cleaning of devices, other than at the two (2) specified U.L. system's testing periods, will not be included as a part of this warranty.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 1.17.5 The installing contractor shall provide, at the time of submittal, a letter indicating that the installation crew for this project meets the following NICET certifications:
  - 1.17.5.1 25% of the installing field personnel must have completed NICET Level 2 Certification.
  - 1.17.5.2 One of the installing field personnel and /or supervisor must have completed NICET Level 3 Certification.
  - 1.17.5.3 Contractor shop drawings shall be signed by an individual who has completed NICET Level 4 Certification.
- 1.18 All conduit and standard backboxes will be furnished and installed by the Division 26 Contractor. Specialty boxes will be furnished by the equipment supplier to be installed by the Division 26 Contractor.
- 1.19 Equipment and materials shall be the standard product of Simplex
- 1.20 Alternate equipment as manufactured by any other manufacturer not specifically listed above will not be approved for use on this project.
- 1.21 D.S.A approved drawings are included as a part of the drawing set.

**PART 2 - PRODUCTS**

- 2.1 Main Fire Alarm Control Panel:
  - 2.1.1 Fire alarm control panel is an existing Simplex 4100U with Voice Evacuation.
  - 2.1.2 The automatic fire alarm system should comply with (CBC/CFC 907.2.3).The system shall be controlled and supervised by a microprocessor based monitoring fire alarm control panel. The systems shall be addressable, field configurable, programmable and editable. The system shall continuously scan devices for change of status. Each device shall have its own unique address, but shall also be grouped by building as a separate zone for remote annunciation and alarm report purposes (CFC 907.6.6.3)
  - 2.1.3 The system shall be a fiber network and fiber cabling shall be single mode, with capabilities, software and modem to communicate with the District-wide diagnostic and annunciation network.
  - 2.1.4 The fire alarm control panel shall be housed in a lockable, code gauge steel cabinet with 80character LCD display, master controller operator's panel, indicating lamps, silence switch and reset switch mounted on cabinet front. The fire alarm control panel shall be physically and visually located in the general office for monitoring by staff and shall sound the "Voice Message" in all zones. Signal duration shall be field programmable and initially set at three minutes. Provide all control modules, synchronous modules, etc., to provide a complete working system per all codes that apply. With every new system, a documentation cabinet shall be installed at the system control unit or at another approved location at the protected premises (NFPA 72, 7.7.2.1)

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 2.1.5 The fire alarm control panel shall come with standardized software for on-site customization of the system. The unit shall be capable of providing a 600-event historical log with zone or point selectable alarm verification.
- 2.1.6 Provide a minimum 100 watts of amplification in each FACP with a minimum of 25% spare capacity.
- 2.1.7 The unit shall support a minimum of 3000 intelligent addressable points and one output point, SPST contact per zone. Provide the number of modules necessary to control and supervise fire alarm devices as shown on the Drawings, as well as to provide 25% spare capacity.
- 2.1.8 The unit shall also provide a minimum of (2) class B strobe circuits with additional circuits as indicated on the drawings.
- 2.1.9 The fire alarm control panel shall be capable of providing a walk test.
- 2.2 The power feed for the FACP shall be 3-wire, 120volt, AC, single phase (20A circuit) permanently labeled "FIRE ALARM CONTROL POWER", terminating at the master fire alarm control and supervisory panel. The label shall be red with 1/4" high white lettering. The source circuit breaker must be provided with a lock-on device.
- 2.3 In addition to the AC circuit, the panel shall be equipped with a DC battery to activate an audible alarm and pilot light in case of a power failure on the AC circuit.
- 2.4 The master fire alarm panel shall be equipped with a manual pull lever type, supervised report station.
- 2.5 With the exception of the manually operated report station required at the master fire alarm panel and large assembly areas, the remainder of the school facility shall be equipped with approved, electronically supervised, automatic fire detection devices, such that every room, space, including concealed spaces, such as the attic spaces above ceilings, etc., is provided with approved coverage.
- 2.6 TRANSPONDER PANELS shall provide voice evacuation/annunciation with a minimum 100 watts of audio amplification to support 70v speaker devices and a minimum of (2) Class B Strobe NAC circuits and be fiber networked to the system. Provide for 25% additional capacity for amplification in each Transponder panel.
- 2.7 REMOTE POWER SUPPLIES shall provide a minimum of (4) Class B NAC circuits.
- 2.8 MANUAL FIRE ALARM STATIONS shall be addressable test-reset lock in order that they may be tested, and so designed that after actual emergency operation, they cannot be restored to normal, except by use of a key. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet, front or side. Manual stations shall be constructed of die-formed, satin-finished aluminum, with operating directions provided on the cover in depressed red letters. The word FIRE shall appear on each side of the stations in depressed letters, 1/2-inch in size or larger. Stations shall be suitable for semi-flush mounting on a standard single-gang box or switch plate, and shall be provided with a terminal block for connection of fire alarm system wiring. Manual pull stations must comply with CBC sections 11B-309 and 11B-403.
- 2.9 SPEAKER / STROBE DEVICE shall be of the semi-flush type designed for mounting to a standard 4 11/16" deep electrical back box. Each device shall be provided with a semi-

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

flush accessory plate. Exterior speakers shall be weatherproof. The strobe unit shall have a meantime between failure (MTBF) of 1,000 hours or greater. The strobe section shall have a minimum flash rate of approximately one flash per second, with candela rating as per UL standard 1971. Housing shall be white.

- 2.9.1 In areas containing two or more audible devices, or three or more visual devices, these devices shall be synchronized, Per NFPA 72, Chapter 18.5.5.5.7 California Amendments (2016).
- 2.10 **SPEAKERS** shall operate at either 25 or 70 VRMS and provide tap setting from 1/8 to 2 watts and provide efficient design for high intelligibility at a minimum wattage across a frequency range of 300 to 8000 HZ and shall be white in color. Speakers shall be ADA, NFPA and ANSI compliant. The audible alarm notification appliances shall provide a sound pressure level of 15 decibels (dBA) above the average ambient sound level or 5 dBA above the maximum sound level having a duration of not less than 60 seconds, whichever is greater, in every occupiable space within the building (CFC 907.5.2.1.1). The maximum sound pressure level for audible alarm notification appliances shall be 110 dBA at the minimum hearing distance from the audible appliance. Where the average ambient noise is greater than 95 dBA, visible alarm notification appliances shall be provided in accordance with NFPA 72 and audible alarm notification appliances shall not be required.(CFC 907.5.2.1.2) To meet the requirements of Section 10.9, the alarm audible signal pattern used to notify building occupants of the need to evacuate (leave the building) or relocate (from one area to another) shall be the standard alarm evacuation signal consisting of a three-pulse temporal pattern (NFPA 72, 18.4.2).
  - 2.10.1 Speakers for typical classrooms shall be tapped at ¼ watt with exterior speakers tapped at 2 watts. Other areas such as Theaters, Auditoriums, Gymnasiums, Team Rooms, Cafeterias, Kitchens and all shop areas shall be tapped at ½ watt.
  - 2.10.2 Contractor shall also include (2) additional site visits within the first year to adjust speaker output on a space by space basis as requested by the owner.
- 2.11 **STROBES.** The strobe unit shall have a meantime between failure (MTBF) of 1,000 hours or greater. The strobe section shall have a minimum flash rate of approximately one flash per second, with candela rating as per UL standard 1971. Housing shall be white.
  - 2.11.1 In areas containing two or more audible devices, or three or more visual devices, these devices shall be synchronized, per NFPA 72, Chapter 18 California Amendments (2016).
  - 2.11.2 Maximum pulse duration to be 0.20 of a second with an ADAAG 4.28.3(3). Visual alarms maximum duty cycle of 40%.
  - 2.11.3 Capable of providing minimum candela. Intensity as shown on plans (effective strength measured at the source).
  - 2.11.4 The flash rate to be a minimum of 1 Hz and a maximum of 2 Hz per NFPA 18.5.3.1.
- 2.12 **HEAT DETECTOR DEVICES** shall be analog addressable, fixed temperature x rate of rise, fixed at 200°F and a 15°F/min rate of rise. In janitor rooms equipped with kilns, devices shall be fixed at 200°F.
- 2.13 **SMOKE DETECTOR DEVICES** shall be analog addressable, photo-electric.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 2.14 SMOKE DETECTOR/CO-CARBON MONOXIDE combination detectors shall be analog addressable, photo-electric type and provided in all Group E Classrooms with a sounder base to alarm individual classrooms with a 4-pulse temporal pattern as well as transmitting a signal to the staffed remote annunciator.

**PART 3- EXECUTION**

- 3.1 All wiring shall be (min) #18 AWG copper or as noted on drawings. All underground conductors shall be UL wet location rated for use in wet locations, West Penn "Aquaseal" or equal. There shall be no splices in underground handholes or vaults. A multi-conductor cable rated for use in wet locations will also be acceptable. It must be labeled "FIRE ALARM" in all pull boxes, using a water-tight labeling system.
- 3.2 Interior, dry location wiring for low voltage initiating circuits shall be #18 AWG copper, twisted shielded pair minimum, signaling circuits shall be No. 14 AWG minimum, and wiring for 120 volt circuits shall be No. 12 AWG minimum. All wiring shall be color coded, solid copper conductor. Use of power limited cable shall be restricted to controls listed for this purpose. Single conductors shall be type THHN/THWN-2 insulated copper.
- 3.3 Wire markers shall be provided for each wire connected to equipment. The marker shall be of the taped bank type, of permanent material, and shall be suitable and permanently stamped with the proper identification. The markers shall be attached in a manner that will not permit accidental detachment. Changing of wire colors within circuits shall be unacceptable.
- 3.4 A terminal cabinet shall be installed in the electric room for the fire alarm systems at each building. All fire alarm wiring shall terminate on UL approved strips in this terminal cabinet. All wiring shall be labeled at each termination strip. Wiring shall be configured such that all end-of-line resistors will be installed at the terminal cabinet.
- 3.5 Fire Sprinkler Activation detecting System(s) shall each be indicated on a separate zone in the fire alarm control panel.
- 3.6 Fire Alarm Control Panel and all other equipment shall be mounted with the center of all operable reset buttons, located a maximum of 48" front approach / 54" side approach above floor level.
- 3.7 Contractor shall provide complete wiring between all equipment.
- 3.8 The Fire Alarm/Life Safety Installation shall comply fully with all Local, State and National Codes, and the Local Authority Having Jurisdiction (AHJ) DSA.
- 3.9 The Fire Alarm Control Panel and power supply shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Panelboard as FIRE ALARM CIRCUIT.
- 3.10 The Control Panel Cabinet shall be grounded securely to a power system ground conductor. Provide a 1/2-inch conduit and 1#12 grounding conductor to the building electrical service ground bus.
- 3.11 Conduit shall enter into the Fire Alarm Control Panel back box only at those areas of the back box which have factory conduit knockouts.
- 3.12 All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in

the field wiring; an audible and visual trouble signal will be activated until the system and its associated field wiring are restored to normal condition.

- 3.13 All cables and wiring shall be listed for Fire Alarm/Life Safety use, and shall be of the type as required by and installed per CEC Article 760.
- 3.14 Final System Acceptance
  - 3.14.1 Provide an NFPA Certificate of Compliance to DSA and the engineer of record. Complete fire alarm system shall comply with Chapter 14 of NFPA for testing and inspection and be tested for intelligibility in all spaces requiring voice evacuation. This testing shall be performed in the presence of the project engineer and be verified by either qualitative means (human-based test methods) or quantitative measurement using commercially available test instrumentation (refer to NFPA-72, Annex D for recommendations). Adjust speaker taps or provide additional speakers as required to provide acceptable levels.
  - 3.14.2 Beam detectors shall be tested by two methods:
    - 3.14.2.1 Manual slow cover test to confirm reflector alignment is correct.
    - 3.14.2.2 Software fire test per UL268.5 to demonstrate when signal level is reduced simulating obstruction the detector will go into alarm.
  - 3.14.3 The system will be accepted only after a satisfactory test of the entire system has been accomplished by a Factory-Trained Distributor in the presence of a representative of the authority having jurisdiction and the Owner's representative. This contractor shall provide all personnel, ladders and testing equipment to assist the local authority in completing this test. Actuate each device and verify that the system performs as specified.
  - 3.14.4 The Contractor will present a complete set of "as-built" Fire Alarm/Life Safety system drawings, and the factory supplied Operator's Manuals as required by the General Provisions section of this specification.
  - 3.14.5 Once the system has been tested and the certificate of compliance completed, the contract shall not be considered complete until after owner training has been completed. The contractor shall notify in writing their intent to provide the training for the system. This notification shall be given to the Division 21 Contractor, Architect and the Project Engineer a minimum of 2 weeks prior to the scheduled training session. The Division 21 Contractor and/or the architect shall be responsible for notifying the owner to confirm that the appropriate District personnel will be made available for this training session. If the Division 21 Contractor does not receive confirmation that the training session can be performed on the proposed date, then another time shall be provided. The training shall consist of the following:
    - 3.14.5.1 Provide a minimum of one (1) four-to-six -hour training period located at the project site, to instruct District personnel in proper operation of all systems.
    - 3.14.5.2 Provide a minimum of three (3) complete owner operation manuals for the District records.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITION  
SANTEE SCHOOL DISTRICT**

- 3.14.5.3 Provide a minimum of two (2) complete as built sets of drawings for the District records.
- 3.14.5.4 Provide all spare parts as described in part 1 of these specifications
- 3.14.5.5 Provide written confirmation and proposed scheduled dates for follow up training and 1-year complete system test.

**3.15 Follow up Training**

- 3.15.1 Provide as a part of this contract, the follow up instructional training period within six (6) months after the final acceptance of the systems. This training shall include a minimum of one four-to-six-hour training period to instruct District personnel in proper operation of all systems and shall instruct the District technicians how to repair any non-operational parts of the system as required. All defective parts shall be replaced at no cost to the owner.

**END OF SECTION**



**32 00 00**

**EXTERIOR IMPROVEMENTS**

**SANTEE SCHOOL DISTRICT**

**SECTION 32 31 13**

**CHAIN LINK FENCING AND GATES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Chain link fencing, including gates, and hardware and as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Section 03 30 00 – Cast-in-Place Concrete.

**1.02 REFERENCE STANDARDS**

Work of the section shall conform to the following 2010 California Code of Regulations:

- A. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- B. ASTM A121 – Metallic-Coated Carbon Steel Barbed Wire.
- C. ASTM A123 – Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.
- D. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A392 – Zinc-Coated Steel Chain-Link Fence Fabric.
- F. ASTM A491 – Aluminum-Coated Steel Chain-Link Fence Fabric.
- G. ASTM A653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- H. ASTM A1011 – Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- I. ASTM B117 – Operating Salt Spray (Fog) Apparatus.
- J. ASTM C94 – Ready-Mixed Concrete.
- K. ASTM F567 – Installation of Chain-Link Fence.
- L. FS RR-F-191 - Fencing, Wire and Post, Metal.

**1.03 SUBMITTALS**

- A. Submit shop drawings showing application to project, including gates. Include plan layout, grid, spacing of components, accessories, fittings, hardware, anchorages, and schedule of components.
- B. Submit manufacturer's product data with printed specifications and installation instructions.
- C. Submit samples.
- D. Manufacturer's certifications of compliance for chain link fabric, posts and rail.

**RIO SECO ELEMENTARY SCHOOL  
CLASSROOM ADDITIONS  
SANTEE SCHOOL DISTRICT**

**1.04 DELIVERY, STORAGE AND HANDLING**

- A. Materials shall be delivered to the site in an undamaged condition. Carefully store material off the ground to provide proper protection against oxidation caused by ground moisture.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Materials shall be new and products of recognized, reputable manufacturers. Used, re-rolled or re-galvanized materials are unacceptable. Like products shall be supplied by a single source.

**2.02 MATERIALS**

- A. Fabric: Steel fabric shall be hot-dipped galvanized before weaving with 1.2 ounces of zinc per square foot of surface conforming to ASTM A392, Class I, or aluminum coated in accordance with ASTM A491. Wire shall be 9 gauge, 2 inch diamond mesh, with selvage edges knuckled. Provide 1-3/4 inch diamond mesh at tennis courts and athletic areas. Height as indicated on drawings.
- B. Tension Wire: 7 gauge galvanized spring steel with same galvanizing as fabric.
- C. Framework: Shall conform to FS RR-F-191/3E Class 1, Grade A or B, or Class 3, except as herein modified.
  - 1. Class 1, Grade A pipe shall conform to ASTM A53, except the hydrostatic test shall be waived. Galvanizing shall be in accordance with ASTM A123.
  - 2. Grade B pipe, shall be made from steel complying with ASTM A653 Grade D or ASTM A1011. The exterior surface shall have a hot dipped zinc coating of  $1.0 \pm .1 \text{ oz/ft}^2$  followed by 15 micrograms/in<sup>2</sup> min. chromate conversion coating and  $.5 \pm .2$  mils of clear acrylic. The interior surface shall be hot dipped zinc coated with a minimum of  $1.0 \pm .1 \text{ oz/ft}^2$ , or shall be a minimum of .5 mils of zinc rich organic coating with a minimum zinc loading of 91%.
  - 3. Class 2 Roll-Formed C-Sections shall be made from steel conforming to ASTM A1011, Grade 45 and shall be galvanized with 1.8 oz. hot dipped zinc in accordance with ASTM A123. The product of the yield strength and the section modulus of framework material shall not be less than that of pipe conforming to ASTM A53.
- D. Top Rail: Steel pipe, 1.660" O.D. weighing 2.27 lb/ft; pass through intermediate post tops and form a continuous compression member from terminal to terminal of each stretch of fence. The pipe shall be in approximately 20 foot lengths and shall be joined with couplings of the outside sleeve type at least seven inches long. Top rail shall be fastened to terminal posts by heavy pressed steel connections stretched along the fence bottom and secured to terminal posts.

**2.03 COMPONENTS**

- A. 6 Foot High Fence or Less:

1. Line Posts: 1.9" o.d. steel pipe, Class 1 Grade A or B; or 1.875" x 1.625" x 1.85 lbs/ft. Class 3.
2. Corner and Terminal Posts: 2.375" o.d. steel pipe, Class 1 Grade A or B.
3. Provide posts at 10'-0" maximum o.c. Provide top rail and bottom tension wire, as specified herein. Provide bottom rail at athletic areas.

## 2.04 ACCESSORIES

### A. Gates:

1. Gate Frame: 1.90" O.D. steel pipe Class 1, Grade A or B for welded fabrication. Welded or damaged areas shall be cleaned and coated with two coats of zinc rich paint. Provide same fabric as for fence. Install diagonal cross-bracing using 3/8" truss rods.
2. Gate Posts for Swing Gates shall be as follows:

<u>Gate Leaf Width</u>	<u>Gate Post Dimensions</u>
6' or less	2.875" O.D. - 4.64 lbs/ft
over 6' to 12'	4.000" O.D. - 6.56 lbs/ft
over 12' to 18'	6.625" O.D. - 18.02 lbs/ft
over 18' to 24'	8.625" O.D. - 27.12 lbs/ft

3. Gate Hardware: See Plans for special hardware requirements of Fire Access and Panic hardware per CBC Section 1008.2, 11B-206.5 and 11B-404.1.
  - a. In Path of Travel: Fork type latch lever hardware, locking hardware shall be at +30"-44" above finish floor mount height. Provide 10 inches minimum high, 16 gauge galvanized metal kickplate attached to the bottom of the gate. (No drop rods at gates accessible to disabled persons).
  - b. Gates in the path of travel must comply with exit door requirements (CBC Section 11B-206.5 and 11B-404.1). Specify lever hardware that does not require pinching, grasping, or twisting motion to operate (CBC Section 11B-404.2.7 and 11B-309.4). Provide solid kick plates 10" minimum high 3" maximum from the paving on both sides of the gate, 5 lbs maximum opening pressure and door maneuvering clearances.
4. Fittings and accessories shall be galvanized in accordance with ASTM A153, Table I.
5. Post Caps: Weathertight caps shall be supplied for each post. Shall be cast steel or malleable iron, galvanized. Caps shall have a loop to receive top rail.

- C. Provide 12" wide x 4" deep continuous flush concrete mow strips at all fencing locations.

## 2.05 FINISHES

- A. Hot Dipped Galvanized. ASTM A153-09 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

## PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567, follow the lines, grades, and details as indicated.
- B. Posts shall be set in concrete with the diameter to be four times the largest cross section of the post. The depth shall be a minimum of 24 inches plus an additional 3 inches for each 1 foot increase in fence height over 4 feet. Terminal posts shall be braced on fences 7 feet or above in height, and on fences without top rail, regardless of height.
  - 1. Provide concrete for setting posts. Refer to paragraph 2.01A. Specification Section 03 30 00, Cast-in-Place Concrete. Portland Cement shall be Type I, II, or V concrete per paragraph 2.01A. Specification Section 03 30 00, Cast-in-Place Concrete, and shall conform to ASTM C150. Concrete aggregates shall conform to ASTM C33. The maximum size aggregate shall be 1-1/2 inch. Mix shall be 1 part cement and 6 parts well-graded aggregate. Dig holes 3 inches deeper than bottom of post. Make slight crown at top of concrete, 2 inches minimum above finish grade, to shed water.
  - 2. Terminal posts must not have gates hung on them.
  - 3. Erect fencing straight and plumb, following the finish grade. Place no post in ditches, dips, or mounds.
- C. Remove all excess materials, debris, rocks, dirt, concrete, etc., and rake grade to within 2 inches of the bottom of the fabric. Dispose of all debris and other refuse off-site in a legal manner.

**END OF SECTION**