Project Manual

For

Nicolas Junior High School

ARC Building

1100 W. Olive Ave.
Fullerton, Ca 92833

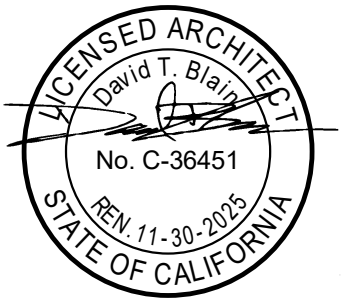
Bidding and Contract Requirements
And
Specifications

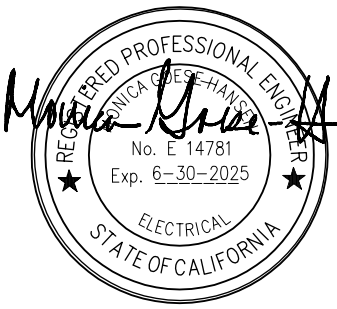
for the

Fullerton School District
1401 W. Valencia Dr.
Fullerton, Ca. 92833

Date: **10/04/24**

PBK Project No.: 230336





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PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Deep penetrating concrete sealer.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, application instructions, and recommendations. Include data substantiating product complies with requirements of the Contract Documents.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Building Code: Comply with applicable requirements for interior finishes in CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).

B. Accessibility Requirements:
   1. Comply with applicable requirements:
      a. Americans with Disabilities Act of 1990, as amended:
         1) ADA Title II Regulations and the 2010 ADA Standards for Accessible Design.
      b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
      c. CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

C. Manufacturer Qualifications: Provide products produced by a company specializing in production of concrete sealers for minimum of five (5) years.

PART 2 PRODUCTS

2.1 MATERIAL

A. Concrete Sealer: Ready to use multipurpose and permanent penetrating liquid sealer/hardener, specifically formulated to penetrate up to six inches and seal concrete for the prevention of water vapor migration and alkali efflorescence, protecting and preserving concrete and masonry against moisture causing problems.

B. Basis of Design:
   1. Product: Subject to compliance with requirements, provide **Moxie International Inc.; Moxie Shield 1500 Concrete Sealer**, P.O. Box 838 Loomis, CA 95650
      a. PROSOCO, Inc.
      b. W.R. Meadows.

C. Physical Properties:
1. Permeability: Maximum 0.093 ml/m^2/s.
2. Specific gravity: 1.08.
3. PH: 11.35.
4. Flash point: Noncombustible.
5. Chemical identity: Mixture containing silicates, bonding catalysts, and inert materials.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Requirements: Do not proceed with installation until areas to receive work are enclosed and temperature and relative humidity are stabilized and maintained for optimum quality control.

B. Environmental Limitations:
1. Comply with coating manufacturer's written instructions for substrate temperature, ambient temperature, humidity, ventilation, and conditions affecting floor treatment application. Do not apply coating until wet work in spaces is complete and dry; and overhead work, including installing mechanical systems, lighting, and athletic equipment, is complete:
a. Apply floor coatings when substrate temperature and surrounding air temperatures are between 50 degrees F and 95 degrees F (10 degrees C and 35 degrees C).
b. Do not apply floor coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.

3.2 EXAMINATION

A. Examine substrates for conditions affecting performance and conditions of floor treatment:
1. Verify compatibility with and suitability of substrates, including existing finishes or primers.
2. Verify plasticizers in existing concrete substrate will not impair bond.
3. Proceed with installation after correcting unsatisfactory conditions

3.3 PREPARATION

A. Clean substrate, removing projections and substances detrimental to the work; comply with recommendations of manufacturer of products to be installed for proper preparation procedures. Mask off or protect adjacent surfaces not scheduled to receive sealer.

3.4 APPLICATION

A. Spray apply sealer to comply with manufacturer's instructions except where Project conditions require extra precautions or provisions to ensure satisfactory performance of the Work:
1. Apply sealer to produce surface without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or surface imperfections. Produce sharp glass lines and color breaks.

3.5 CLEANING

A. After completing application, clean spattered surfaces. Remove spattered sealer by washing or other appropriate methods for coating. Do not scratch or damage adjacent finished surfaces.

B. Clean Up: Remove rubbish, empty cans, rags, and discarded materials from site daily. Rinse and recycle or legally dispose of sealer and coating containers.

3.6 PROTECTION

A. Institute protective procedures and install protective materials as required to ensure that work of this Section will be without damage or deterioration at substantial completion.

END OF SECTION

SECTION 04 05 00 MORTAR AND GROUT

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section is related to mortar and grout installation and includes:
   1. Provisions of all materials, labor, and accessories as required and specified for complete mortar and grout installation in masonry walls.

B. Reference Standards:
   1. ASTM C144 Aggregate for Masonry Mortar.
   2. ASTM C150 Portland Cement.
   3. ASTM C207 Hydrated Lime for Masonry Purposes.
   4. ASTM C270 Standard Specification for Mortar For Unit Masonry.
   5. ASTM C404 Aggregates for Grout.
   6. ASTM C476 Standard Specification for Grout for Masonry.
   7. ASTM C1019 Method of Sampling and Testing Grout.
   8. 2022 California Building (CBC), with State of California Amendments:
      a. 2022 California Building (CBC), Section 2103A.
   9. Masonry Standards Joint Committee (MSJC).

1.3 SUBMITTALS

A. Mix design for mortar and grout shall be submitted for review.

B. Supplier’s certificates indicating materials comply with the specifications below. They shall include, but are not necessarily limited to:
   1. Aggregates.
   2. Cement.
   3. Admixtures.

1.4 QUALITY ASSURANCE

A. Tests and Inspections:
   1. A testing program is required prior to start of construction. Testing program to be done in compliance with the 2022 CBC requirements and in collaboration with the testing laboratory, design team, Contractor, and Owner, and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
   2. All tests and inspections herein are to be performed by an independent testing laboratory approved by the building official.
   3. Mortar and grout tests:
      a. At the beginning of masonry work, at least one (1) test sample each of mortar and grout shall be taken on three (3) successive working days, then once per week with at least one sample taken for each 5,000 square feet of wall area, or fraction thereof:
         1) Test specimens shall be made in accordance with ASTM C1019 for grout and ASTM C780 for mortar.

2) Test specimens shall be continuously stored in moist air until tested.
3) Mortar shall show a compressive strength of not less than 1,800 psi at 28 days. Grout shall show a compressive strength of not less than 2,000 psi at 28 days.

4. A special inspector shall be employed per CBC Section 1705A.4 during the placement of all units, placement of all reinforcing steel, during all grouting operations, and during taking of all test specimens.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement: ASTM C150, Type I or II, low alkali; natural gray.

B. Hydrated Lime: ASTM C207, Type S.

C. Quicklime: ASTM C5.

D. Lime Putty:
1. Made from hydrated lime or quicklime:
   a. If made from quicklime, other than processed pulverized quicklime, slake lime and then screen through a No. 16 mesh sieve. Before using, store and protect slaked and screened lime putty for not less than ten (10) days.
   b. Processed pulverized quicklime shall be slaked for not less than 48 hours, and shall be cool when used.
   c. Lime putty prepared from hydrated lime may be used immediately after mixing.
   d. Lime putty prepared from quicklime or pulverized quicklime shall have a plasticity figure, after slaking and screening, of not less than 200, and shall weigh not less than 83 pounds per cubic foot. Lime putty prepared from hydrated lime shall conform to ASTM C207, Type S.

E. Aggregate:
1. For mortar: ASTM C144.
2. For grout: ASTM C404.

F. Admixture: **Sika Grout Aid by Sika Corporation U.S.**
1. Substitutions with Architect’s approval, pursuant to conditions of Divisions 00 and 01.

G. Water: Suitable for domestic consumption.

2.2 MORTAR

A. Mortar shall be Type S having a 28-day compressive strength of not less than 1,800 psi and shall conform to CBC Section 2103A.9.

B. Mortar shall be made with admixtures that are proportioned, added and mixed in strict accordance with manufacturer's directions.

C. Mortar mix shall be proportioned by volume; one-part portland cement, not less than 1/4-part nor more than 1/2-part lime putty, and sand totaling not less than 2-1/4 nor more than three (3) times sum of volumes of cement and lime used:
1. Total clay content shall not exceed two percent (2%) of sand content or six percent (6%) of cement content.

2.3 GROUT

A. Grout shall have a 28-day compressive strength of not less than 2,000 psi. Proportion by volume, and with sufficient water to produce consistency for pouring without segregation so that grout will flow into masonry joints. Grout shall conform to CBC Section 2103A.13.

B. Fine Grout:
   1. One-part portland cement, to which may be added not more than 1/10-part lime putty, and three-parts sand.
   2. Fine grout shall be used for all grout spaces less than three inches (3") wide.

C. Coarse Grout:
   1. One-part portland cement, to which may be added not more than 1/10-part lime putty, three-parts sand, and not less than one-part nor more than two-parts pea gravel (3/8-inch maximum aggregate size).
   2. Coarse grout shall be used in grout spaces three inches (3") wide or more.

D. Add Sika Grout Aid admixture to grout at the rate of one (1) pound per 100 pounds cementitious material.

PART 3 EXECUTION

3.1 MIXING MORTAR AND GROUT

A. Accurately measure materials in suitably calibrated devices; shovel measurements are not acceptable. Each 94-pound sack of portland cement will be considered as one (1) cubic foot.

B. Place sand, cement, and water in mixer, in that order, and mix for at least two (2) minutes. Add lime putty and continue mixing as long as necessary to secure a uniform mass, but in no case less than ten (10) minutes.

C. Use mixers of at least one (1) sack capacity; batches requiring fractional sacks will not be permitted unless cement is weighed for each batch.

3.2 GROUTING PROCEDURES

A. Specified under 04 22 00: Concrete Unit Masonry.

3.3 RETEMPERING

A. When necessary to retemper mortar, add water and remix; retempering by dashing water over mortar will not be permitted.

B. Any mortar that is unused within 30 minutes after initial mixing and any mortar that has begun to set shall not be used.

3.4 DEFECTIVE MORTAR OR GROUT

A. Should the strength of mortar or grout fall below that specified, remainder of Work shall be adjusted to reach required strength. Work in place representing inferior grout and mortar and indicating a strength less than the minimum specified shall be tested by taking and testing core samples. Number and location of cores shall be determined by the structural Engineer.

B. Should compression tests of cores fail to meet required strength, masonry shall be deemed to be defective and shall be removed and replaced at no cost to Owner.

C. Costs relative to taking and testing of core samples shall be paid by Owner and will be deducted from Contract amount. Cost of patching core holes shall be borne by Contractor.

END OF SECTION

SECTION 04 22 00 CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including, but not limited to:
1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcement.
4. Masonry insulation.
5. Accessories necessary for a complete installation.

B. Reference Standards:
1. ACI: American Concrete Institute.
2. ASTM: American Society of Testing Materials.
3. CMACN: Concrete Masonry Association of California and Nevada.
4. NCMA: National Concrete Masonry Association.
5. TEK Bulletins.
6. TMS: The Masonry Society.

1.3 DEFINITIONS

A. CMU: Concrete Masonry Unit.

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry and structural unit masonry that develops indicated net-area compressive strengths at 28 days:
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 402/602.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

1.5 SUBMITTALS

A. Product Data: Technical data including schedules and illustrations to indicate the performance, fabrication procedures, product variations, and accessories for each type of product.

B. Shop Drawings:
1. Masonry units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Show elevations of reinforced walls.
3. Fabricated flashing: Detail corner units, end dam units, and other special applications.

C. Samples:
   1. Submit each type and color of the following:
      a. Exposed or decorative CMU.

D. Material Certificates:
   1. Submit for each type and size:
      a. Masonry units: Include data on material properties and material test reports substantiating compliance with requirements.
      b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
      c. Cementitious materials: Include name of manufacturer, brand name, and type.
      d. Mortar admixtures.
      e. Preblended, dry mortar mixes: Include description of type and proportions of ingredients.
      f. Grout mixes: Include description of type and proportions of ingredients.
      g. Reinforcing bars.
      h. Joint reinforcement.
      i. Anchors, ties, and metal accessories.

E. Mix Designs:
   1. Submit for each type of mortar and grout with description of type and proportions of ingredients:
      a. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
      b. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

F. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 402/602.

G. Cold Weather and Hot Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

H. Statement of Understanding: Provide statement signed by Contractor and masonry subcontractors that for high-lift Grouting, the contractor has read, understood, and will follow all requirements of DSA Interpretation of Regulations (IR) 21-2.13. A copy of the IR shall be on site for review.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Building Code:
      a. Comply with applicable requirements of Chapter 21A of the 2022 California Building Code: (CBC).
         1) Masonry standard: Comply with TMS 402/602 unless modified by requirements in the Contract Documents.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality,

including color for exposed masonry, from single manufacturer for each cementitious component and from single source.

D. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

PART 2 PRODUCTS

2.1 UNIT MASONRY

A. Masonry Standard: Comply with TMS 402/602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed work or within 20 feet (6 m) vertically and horizontally of a walking surface.

C. Fire Resistance Ratings:
1. Comply with requirements for fire resistance rated assembly designs indicated:
    a. Where fire resistance rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes:
1. Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated:
    a. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMU:
1. ASTM C90, loadbearing and/or ASTM C129 non-load bearing:
    a. Unit compressive strength: Provide units with minimum average net-area compressive strength of 2,150 psi (14.8 MPa).
    b. Density classification: Lightweight unless otherwise indicated.
    c. Size (width): Manufactured to dimensions 3/8-inch (10 mm) less than nominal

dimensions.

d. Exposed faces: Provide color and texture matching the range represented by Architect's sample.
e. Faces to receive plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.3 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMU matching adjacent CMU in color, texture, and density classification with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

A. Comply with 2022 CBC Chapter 21A for masonry mortar and grout.

B. Portland Cement:
1. ASTM C150/C150M, Type I or II, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce mortar color indicated:
   a. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

C. Hydrated Lime: ASTM C207, Type S (loadbearing).

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Mortar Pigments:
1. Natural and synthetic iron oxides and chromium oxides compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar:
   a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      1) Davis Colors.
      2) Lanxess Corporation.
      3) Solomon Colors, Inc.

F. Colored Cement Products:
1. Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements and containing no other ingredients:
   a. Colored portland cement-lime mix:
      1) Manufacturers are subject to compliance with requirements; provide products by one of the following:
         a) Lehigh Hanson.
         b) LafargeHolcim.
   b. Formulate blend to produce color selected.
   c. Pigments shall not exceed ten percent (10%) of portland cement by weight.

G. Aggregate for Mortar: ASTM C144.

H. Aggregate for Grout: ASTM C404.

I. Cold Weather Admixture:

1. Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated:
   a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      1) BASF Corporation.
      2) Euclid Chemical.
      3) GCP Applied Technologies.

J. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).

B. Reinforcing Bar Positioners:
   1. Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Form units from 0.148-inch (3.77 mm) steel wire, hot dip galvanized after fabrication. Provide units designed for number of bars indicated:
      a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
         1) Heckmann Building Products, Inc.
         2) Hohmann & Barnard, Inc.
         3) Wire-Bond.

2.6 TIES AND ANCHORS

A. Ties and Anchors: Extend ties and anchors a minimum 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16 mm) cover on outside face.

B. Materials:
   1. Provide ties and anchors made from materials complying with the following unless otherwise indicated:
      a. Hot dip galvanized, carbon steel wire: ASTM A1064/A1064M, with ASTM A153/A153M, Class B-2 coating.
      b. Stainless steel wire: ASTM A580/A580M, Type 306.

C. Individual Wire Ties:
   1. W-shaped ties with ends bent 90 degrees to provide hooks not less than two inches (50 mm) long may be used for rock veneer.
   2. Wire: Fabricate from #9AWG corrosion resistant wire.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1, compressible up to 35 percent, of width and thickness indicated, formulated from urethane or PVC.

B. Preformed Control Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond Breaker Strips: Asphalt saturated felt complying with ASTM D226/D226M, Type I

(No. 15 asphalt felt).

2.8 MASONRY CLEANERS

A. Detergent Cleaner: Bucket and brush hand cleaning method, BIA Technical Notes 20.

B. Proprietary Acidic Cleaner:
   1. Cleaner designed for removing mortar/grout stains, efflorescence, and construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned:
      a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
         1) PROSOCO, Inc.
         2) Diedrich Technologies, Inc.

2.9 MORTAR AND GROUT MIXES

A. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated:
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar unless otherwise indicated.
   3. For exterior masonry, use portland cement-lime mortar.
   4. For reinforced masonry, use portland cement-lime mortar.
   5. Add cold weather admixture (if used) at same rate for mortar exposed to view, regardless of weather conditions to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Type S.

D. Grout for Unit Masonry - Comply with ASTM C476:
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that complies with TMS 402/602 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C476, for specified 28-day compressive strength not less than 2,000 psi (14 MPa).

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Protection of Masonry:
   1. During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress:
      a. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three (3) days after building masonry walls or columns.

C. Stain Prevention:

1. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry:
   a. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   b. Protect sills, ledges, and projections from mortar droppings.
   c. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   d. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold Weather Requirements:
   1. Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602:
      a. Cold weather cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F (4 degrees C) and higher and will remain so until masonry has dried, but not less than seven (7) days after completing cleaning.

E. Hot Weather Requirements: Comply with hot weather construction requirements contained in TMS 402/602.

3.2 COORDINATION

A. Build openings and chases for heating, plumbing, electrical ducts, pipes, and conduits into masonry walls as necessary. Install bolts, toggles, flashings, beams, anchors, hangers, nailing strips, wall plugs, and frames as necessary:
   1. Coordinate related work incorporating installation of work to prevent subsequent cutting and patching.
   2. Coordinate installation of steel reinforcement for reinforced masonry.
   3. Coordinate dampproofing, waterproofing, and air infiltration membrane activities with masonry construction.
   4. Coordinate placement of concrete in masonry beams, lintels, soffits, and pilasters.

3.3 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work:
   1. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the work.
   2. Verify foundations are within tolerances specified.
   3. Verify reinforcing dowels are properly placed.
   4. Verify substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation after correcting unsatisfactory conditions.

3.4 INSTALLATION

A. Thickness: Build single wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.5 TOLERANCES

A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in Plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in ten feet (6 mm in 3 m), or 1/2-inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in ten feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in ten feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in ten feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in ten feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in ten feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.6 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement type joints, returns, and offsets. Avoid using less than half size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond. Do not use units with less than nominal four-inch (100 mm) horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

G. Fill all cores in hollow CMU with grout.

3.7 MORTAR BEDDING AND JOINTING

A. Lay CMU:
1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

C. Cut joints flush for masonry walls to receive plaster or other direct applied finishes (other than paint) unless otherwise indicated.

3.8 CONTROL AND EXPANSION JOINTS

A. Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry:
1. Fit bond breaker strips into hollow contour in ends of CMU on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond breaker strips at joint.

Keep head joints free and clear of mortar or rake out joint for application of sealant.

4. Install temporary foam plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.9 LINTELS

A. Provide masonry lintels where shown and where openings of more than 24 inches (610 mm) for block size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of eight inches (200 mm) at each jamb unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores:
   1. Construct formwork and shores as needed to support reinforced masonry elements during construction:
      a. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
      b. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 402/602.

C. Grouting:
   1. Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure:
      a. Comply with requirements in TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections:
   1. Special inspections according to Level C in TMS 402/602:
      a. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
      b. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
      c. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One (1) set of tests.

D. Testing Frequency: One (1) set of tests for each 5,000 square feet (464 sq. m) of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, damaged, or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning:
   1. After mortar is thoroughly set and cured, clean exposed masonry:
      a. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
      b. Test cleaning methods on sample wall panel; leave 1/2 of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
      c. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
      d. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
      e. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
      f. Clean stone trim to comply with stone supplier's written instructions.

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from site.

B. Waste Disposal as Fill Material:
   1. Dispose of clean masonry waste, including excess or soil contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed:
      a. Crush masonry waste to less than four inches (100 mm) in each dimension.
      b. Mix masonry waste with at least two (2) parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31.
      c. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Masonry Waste Recycling: Return broken CMU not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove and legally dispose excess clean masonry waste that cannot be used as fill or otherwise recycled, and masonry waste.

END OF SECTION

SECTION 05 41 10 METAL STUD SYSTEM

REFER TO DRAWINGS

SECTION 05 52 00 METAL RAILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for, but is not limited to:
   1. Steel pipe railings.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data:
   1. Technical data for railings and the following:
      a. Manufacturer's product lines of mechanically connected railings.
      b. Railing brackets.
      c. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples:
   1. For each type of exposed finish required:
      a. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
      b. Fittings and brackets.
      c. Assembled sample of railing system, made from full size components, including top rail, post, handrail, and infill. Sample need not be full height:
         1) Show method of connection and finishing members at intersections.

D. Qualification Data: For testing agency.

E. Mill Certificates: Signed by manufacturers of stainless steel products certifying that products furnished comply with requirements.

F. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

G. Evaluation Reports: For post installed anchors, from ICC-ES.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Accessibility requirements - comply with applicable requirements:
      a. Americans with Disabilities Act of 1990, as amended:
         1) ADA Title II Regulations and the 2010 ADA Standards for Accessible Design.
      b. 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
         1) Chapter 10 – Means of Egress:
            a) Section 1014 Handrails.

b) Section 1015.3 Guards.
2) CBC Section 11B-505, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

2. Welding qualifications - qualify procedures and personnel according to the following:
   a. AWS D1.1/D1.1M Structural Welding Code – Steel.
   b. AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.
   c. AWS D1.6/D1.6M Structural Welding Code - Stainless Steel.

B. Accessibility Requirements:
   1. Railings and handrails - according to CBC Section 11B-504:
      a. Top of handrails shall be a consistent vertical height between 34 inches and 38 inches above walking and ramp surfaces, and stair nosing.
      b. A minimum clearance of 1-1/2 inches between handrail gripping and adjacent surfaces shall be maintained:
         1) Handrail may be in a recess if recess depth is a maximum of three inches (3”) and there is a minimum of 18 inches clearance above the top of the handrail.
      c. Handrail gripping shall be continuous and unobstructed. Bottoms of gripping surfaces shall not be obstructed for more than 20 percent of their length. Where provided, horizontal projections shall occur 1-1/2 inches minimum below the bottom of the handrail gripping surfaces:
         1) Outside diameter of handrail gripping surfaces with a circular cross section shall be between 1-1/4 inches and two inches (2”).
      d. Outside diameter of handrail gripping surfaces with a non-circular cross section shall be between four inches (4”) and 6-1/4 inches, with a maximum cross-sectional dimension of 2-1/4 inches.
      e. Handrail gripping and adjacent surfaces shall be free of sharp and abrasive elements and have rounded edges.
      f. Handrails shall be fixed and not able to rotate within their fittings.
      g. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs in accordance with CBC Section 11B-505.10. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.

C. Source Limitations: Obtain each type of railing from single source from single manufacturer.

1.5 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the State of California and experienced in the design of railings, including attachment to building construction.

B. Structural Performance:
   1. Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
      a. Handrails and top rails of guards:
         1) Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
         2) Concentrated load of 200 lbf (0.89 kN) applied in any direction.
         3) Uniform and concentrated loads need not be assumed to act concurrently.
         4) Design shall comply with the CBC Live Loads Section 1607A.9 CBC. Table 1607A.1 (16).
      b. Infill of guards:
         1) Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of one square foot (0.093 sq. m).
         2) Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements:
1. Allow for thermal movements from ambient and surface temperature changes:
a. Temperature change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C, material surfaces).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers are subject to compliance with requirements; provide products by the following:
1. Steel pipe and tube railings: Industrial Metal Supply Co. 1-818-729-3333.

B. Metal Surfaces: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

C. Brackets, Flanges, and Anchors:
1. Formed metal of same type of material and finish as supported rails unless otherwise indicated:
a. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch (38 mm) clearance from inside face of handrail to finished wall surface.

D. Steel and Iron:
1. Tubing: ASTM A500 (cold formed) or ASTM A513.
2. Pipe: ASTM A53/A53M, Type F or Type S, Grade B, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
3. Plates, shapes, and bars: ASTM A36/A36M.

E. Fasteners:
1. Provide the following:
b. Hot dip galvanized railings: Type 304 stainless steel or hot dip zinc coated steel fasteners complying with ASTM A153/A153M or ASTM F2329 for zinc coating.
c. Provide exposed fasteners with finish matching appearance, including color and texture of railings.
d. Fasteners for anchoring railings to other construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

F. Miscellaneous Materials:
1. Welding rods and bare electrodes: Select according to AWS specifications for metal alloy welded.
2. Etching cleaner for galvanized metal: Complying with MPI#25.
3. Galvanizing repair paint: High zinc dust content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
4. Galvanizing repair paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20. Provide Tneme-Zinc 90-97 by Tnemec Company.
5. Bituminous paint: Cold applied asphalt emulsion complying with SSPC-Paint 12, containing no asbestos fibers, or cold applied asphalt emulsion complying with ASTM D1187/D1187M.

6. Non-shrink, nonmetallic grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.2 FABRICATION

A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections.

H. Welded Connections:
   1. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings:
      a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
      b. Obtain fusion without undercut or overlap.
      c. Remove flux immediately.
      d. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form Changes in Direction:
   1. As detailed.

J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors:
   1. Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect

railing members to other work unless otherwise indicated:

2.3 FINISHES

A. Steel and Iron Finishes:
   1. Galvanized railings:
      a. Hot dip galvanize exterior steel railings, including hardware, after fabrication.
      b. Comply with ASTM A123/A123M for hot dip galvanized railings.
      c. Comply with ASTM A153/A153M for hot dip galvanized hardware.
      d. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
   2. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
   3. Do not apply primer to galvanized surfaces.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

3.2 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

B. Grade elevation review to actual conditions.

3.3 INSTALLATION

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation, measured from established lines and levels and free of rack:
   1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in three feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.4 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections whether welding is performed in the shop or in the field.

3.5 ANCHORING POSTS

A. Core drill holes 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

3.6 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled in expansion shields and hanger or lag bolts.
   2. For steel framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.7 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 07 21 00 BUILDING INSULATION

REFER TO DRAWINGS

SECTION 07 41 10 METAL ROOF DECK

REFER TO DRAWINGS

SECTION 07 41 20 METAL SOFFIT PANELS

REFER TO DRAWINGS

SECTION 07 43 42 COMPOSITE WALL PANELS

REFER TO DRAWINGS

SECTION 07 90 10 JOINT SEALERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Control and expansion joints on exposed interior and exterior surfaces.
   2. Perimeter joints between wall surfaces and frames of interior and exterior doors and openings.
   3. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   4. Joints indicated or as necessary.
   5. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data:
   1. Technical data for each joint sealant product. Data to indicate elasticity and durability of each joint sealant product. Submit written certification from manufacturers of sealants attesting products are suitable for use indicated, verified through in-house testing laboratory:
      a. Written certification from manufacturers of joint sealants attesting that products comply with specification requirements and suitable for use indicated verified through manufacturers testing laboratory within the past 36 months or since most recent reformulation, whichever is most recent:
         1) Complete instructions for handling, storage, mixing, priming, installation, curing, and protection of each type of sealant.
         2) Manufacturer's letter, clearly indicating proposed lot numbers of each sealant supplied and expiration date sequence.
   2. VOC data: Submit manufacturer’s product data for sealants. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
   3. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

B. Samples:
   1. Provide color samples from full manufacturer’s full range for each type of sealant specified for Architect’s review.

C. Certificates and Reports:
   1. Product Certificates: Manufacturer's product certificate for each kind of joint sealant and accessory.
   2. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
   3. Product test reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
   4. Preconstruction compatibility and adhesion test reports:
      a. From sealant manufacturer, indicating the following:
         1) Materials forming joint substrates and sealant backings have been tested for compatibility and adhesion with sealants.

2) Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

5. Preconstruction field adhesion test reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified.
6. Field adhesion test reports: For each sealant application tested.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Firm having minimum five (5) years' documented experience and specializes in the installation of sealants:
      a. Exposed sealant work (sealants used for air and weatherseals external at perimeter, metal panel to panel joints) shall be performed by a single (i.e. one) firm specializing in the installation of sealants who has successfully produced work comparable to Project.
      b. Concealed sealant work (sealants that are internal to skylights and providing an air seal) shall be the responsibility of the subcontractor providing erection of the respective system.

B. Source Limitations: Obtain each type of joint sealant from a single manufacturer.

C. Product Testing:
   1. Test joint sealants using a qualified testing agency:
      a. Testing agency qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
      b. Test according to SWRI Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion in peel, and indentation hardness.

D. Environmental Requirements:
   1. Toxicity/IEQ:
      a. Comply with applicable regulations regarding toxic and hazardous materials:
         1) VOC content of interior sealants - sealants and sealant primers complying with limits for VOC content for SCAQMD when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
            a) Sealants: 250 g/L.
            b) Sealant primers for nonporous substrates: 250 g/L.
            c) Sealant primers for porous substrates: 775 g/L.
      b. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.

1.5 WARRANTY

A. Written warranty, signed by installer agreeing to repair or replace elastomeric joint sealant work that has failed to provide a weathertight system within specified warranty period:
   1. Warranty period: Five (5) years from date of Substantial Completion.

B. Written warranties (weatherseal and stain resistance), signed by sealant manufacturer agreeing to furnish joint sealants to repair or replace those that fail to provide airtight and watertight joints, or fail in adhesion, cohesion, abrasion resistance, stain resistance, weather resistance, durability, or appear to deteriorate in manner not specified in the manufacturer's data as an inherent quality of the material within specified warranty period:
   1. Warranty period: Five (5) years from date of Substantial Completion.

C. Warranties specified exclude deterioration or failure of sealants from:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer’s written instructions to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

PART 2 PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, backings, and related materials compatible with one another and with joint substrates under conditions of service and application, as stated by sealant manufacturer’s published data, and as substantiated by the manufacturer for each application through testing.

B. Liquid Applied Sealants: Comply with ASTM C920 and requirements indicated for each liquid applied sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Stain Test Response Characteristics: For sealants in contact with porous substrates, provide nonstaining products that have undergone testing according to ASTM C1248 and do not stain porous joint substrates.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors: For fully concealed joints, provide standard color of sealant that has the best overall performance characteristics for the application shown. For exposed joints, submit color samples to Architect for approval, from manufacturer’s full line of standard colors.

F. Manufacturer’s Representative: Use sealant produced by manufacturer who agrees to send a qualified technical representative to site upon request for the purpose of rendering advice concerning the recommended installation of manufacturer’s materials.

G. Sealants: Self-leveling compounds for horizontal joints in pavements and non-sag compounds elsewhere except as shown or specified.

H. Silicone Sealant:
   1. Comply with ASTM C920, Type M, Grade NS, Class 25; use NT, M, A and O:
      a. Use: Typical joints between masonry, metals, glass, and plastics (two-part silicone sealants).
      b. Properties:

1) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates. The minimum pli value after seven (7) day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion and Peel.
2) Cure system and oil content: Neutral cure system specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.

c. Product and manufacturer: Dow Corning; 756 Silicone Building Sealant - HP with Additive.

I. Silicone Sealant:
1. ASTM C920, Type S, Grade NS, Class 50, for Use NT:
a. Use: Typical joints between masonry, metals, glass, and plastics (single component sealants).
b. Properties:
1) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates.
2) Cure system and oil content: Neutral cure system specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.
c. Product and manufacturer:
1) BASF Building Systems; Omniseal 50.
2) Dow Corning Corporation; 756 SMS, 791, 795, 995 as applicable.
3) GE Advanced Materials, Silicones; SilGlaze II SCS2800, SilPruf NB SCS9000, SilPruf SCS2000, or UltraPruf II SCS2900 as applicable.
4) Pecora Corporation, as applicable.
5) Sika Corporation, Construction Products Division; SikaSil-C995.
6) Tremco, as applicable.
7) Comparable product.

J. Polyurethane Sealants:
1. ASTM C920, Type M, Grade NS, Class 25; use NT, M, A and O:
a. Use: Typical Wall and floor joints (two-part polyurethane sealants). Use at concrete joints.
b. Properties:
1) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates.
c. Products and manufacturers:
1) BASF Building Systems; Sonolastic NP-2.
2) Pecora Corporation; Dynatred.
3) Sika Corporation, Construction Products Division; Sikaflex 2c NS or Sikaflex 2c NS TG as applicable.
4) Tremco, as applicable.
5) Comparable product.

K. Two-Part Polyurethane Sealants:
1. ASTM C920, Type M, Grade NS, Class 50; use NT, M, A and O:
a. Use: Typical Wall and floor joints (two-part polyurethane sealants).
b. Properties:
1) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates. The minimum pli value after seven (7) day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion in Peel.
c. Products and manufacturers:
1) BASF Construction Chemicals; NP 2.

2) Pecora Corporation, as applicable.
3) Schnee-Morehead, Inc.; Permathane SM 7200.
4) Sika Corporation, Inc.; Sikaflex - 2c NS TG.
5) Tremco, as applicable.
6) Comparable product.

L. Mildew Resistant Silicone Sealant:
1. ASTM C920, Type S, Grade NS, Class 25, Use NT, Substrate uses G, A, and O; and containing fungicide for mildew resistance; acid curing:
a. Use: One-part mildew-resistant silicone, formulated with fungicide for sealing interior joints of nonporous substrates around ceramic tile, plumbing fixtures, and showers.
b. Products - provide one of the following:
1) BASF Building Systems; Omniplus.
2) Dow Corning; 786 Mildew Resistant Silicone Sealant.
3) GE Silicones; Sanitary SCS 1700.
4) Pecora Corporation, as applicable.
5) Sika Corporation, Inc., as applicable.
6) Tremco, as applicable.
7) Comparable product.

M. Latex Sealant:
1. Non-elastomeric, one-part, non-sag, paintable latex sealant that is recommended for exposed applications on the interior. Complying with ASTM C834, Type OP (opaque sealants):
a. Products are subject to compliance with requirements; provide one of the following:
1) BASF; Sonolastic Sonolac.
2) Pecora Corporation; AC-20 + Silicone.
3) Sika Corporation, Inc., as applicable.
4) Tremco, as applicable.
5) Comparable product.

N. Acoustical Joint Sealant:
1. Non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90:
a. Products are subject to compliance with requirements; provide one of the following:
1) BASF, as applicable.
2) Pecora Corporation; AC-20 FTR or AIS-919.
3) Sika Corporation, Inc., as applicable.
4) Tremco, as applicable.
5) USG Corporation; SHEETROCK Acoustical Sealant.
6) Comparable product.

O. Sealant Backing:
1. Provide sealant backings that are non-staining, compatible with joint substrates, sealants, primers, and joint fillers, and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing:
a. Cylindrical sealant backings: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding backings of flexible plastic foam complying with ASTM C1330, and of type indicated below. Select shape and density of cylindrical sealant backings in consultation with the manufacturer for proper performance in specific condition of use in each case.
b. Type C - closed cell polyethylene foam material with surface skin, nonabsorbent to liquid water and gas, non-outgassing in unruptured state; provide one of the

following:
1) BASF, as applicable.
2) HBR Closed Cell Backer Rod; Nomaco, Inc.
3) Pecora Corporation, as applicable.
4) Sonolastic Closed-Cell Backer-Rod; BASF Construction Chemicals.
5) Tremco, as applicable.
6) Comparable product.

P. Miscellaneous Materials:
1. Primer: Material recommended, as verified through compatibility and adhesion testing, by joint sealant manufacturer for the substrates indicated to be sealed.
2. Cleaners for nonporous surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants with joint substrates.
3. Masking tape: Non-staining, non-absorbent material compatible with joint sealants and that will not stain nor mar the finish of surface adjacent to joints to which it is applied.
4. Cork joint filler: Resilient and non-extruding, ASTM D1752, Type II.
5. Bond breaker tape: Polyethylene, TFE fluorocarbon, or plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Limitations:
1. Do not proceed with installation of joint sealants under the following conditions:
a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 degrees F (4.4 degrees C).
b. When joint substrates are wet. Should joints or backing materials become wet, remove and replace backing material with new.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

3.2 EXAMINATION

A. Examine joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and conditions affecting sealant performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Surface Cleaning of Joints:
1. Clean out joints immediately before installing joint sealants to comply with the recommendations of joint sealant manufacturer and requirements:
a. Remove foreign material from joint substrates interfering with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), existing joint sealants, oil, grease, water, surface dirt, and frost.

b. Clean concrete, masonry, unglazed surfaces of tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.
c. Remove laitance and form-release agents from concrete.
d. Clean metal, glass, porcelain enamel, glazed surfaces of tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming (Elastomeric Sealants Only): Prime joint substrates where recommended in writing by joint sealant manufacturer, based on prior testing and experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.4 INSTALLATION

A. Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants applicable to materials, applications, and conditions indicated.

C. Sealant Backings:
1. Install sealant backings to support sealants during application and at position necessary to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability:
a. Do not leave gaps between ends of sealant backings. Trim for tight fit around obstructions or elements penetrating the joint.
b. Do not stretch, twist, puncture, or tear sealant backings.
c. Remove absorbent sealant backings that become wet before sealant application and replace with dry sealant backings.
d. Install bond breaker tape behind sealants where backings are not used between sealants and back of joints.

D. Weeps and Vents: Install weeps and vents into joints at the same time sealants are being installed. Locate weeps and vents spaced recommended by sealant manufacturer and the window and curtain wall fabricator and erector. Do not install weeps and vents at outside building corners. Do not install vents at horizontal joints immediately below shelf angles, sills, and through wall flashings.

E. Sealants:
1. Install sealants by proven techniques resulting in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at same time sealant backings are installed:
a. Apply sealants in depth in accordance with manufacturer's recommendations and recommended general proportions and limitations.
b. Apply elastomeric sealants, in joints not subject to traffic or abrasion, to a depth

equal to 50 percent of the joint width, but not less than 1/4 inch (6 mm) and not more than 1/2 inch (13 mm).

c. Apply non-elastomeric sealants to a depth approximately equal to the joint width.

F. Tooling of Non-Sag Sealants:

1. Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform, beads to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces. Tool exposed surfaces of sealants to the profile shown, or if none is shown, tool slightly concave:
   a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
   b. Provide a slight wash on horizontal joints where horizontal and vertical surfaces meet.
   c. Against rough surfaces or in joints of uneven widths avoid the appearance of excess sealant or compound by locating the compound or sealant well back into joint wherever possible.

G. Installation of Preformed Silicone Sealant System:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer written recommendations.

3.5 FIELD QUALITY CONTROL

A. Field Adhesion Testing:

1. Field test exterior wall joint sealant adhesion to joint substrates:
   a. Extent of testing - test completed and cured sealant joints:
      1) Perform ten (10) tests for the first 1,000 feet (300 m) of joint length for each kind of sealant and joint substrate.
      2) Perform one (1) test for each 1,000 feet (300 m) of joint length thereafter or one (1) test per each floor per elevation.
2. Test method: Test joint sealants according to Method A, Field Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat

procedure for opposite side.

3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer field adhesion hand pull test criteria.
4. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure original sealant surfaces are clean and new sealant contacts original sealant.

B. Evaluation of Field Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.6 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality: Provide temporary ventilation during work. Coordinate interior application of sealants with interior finishes schedule.

3.7 CLEANING AND PROTECTION

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

B. Protect joint sealants during and after curing from contact with contaminating substances and from damage so sealants are without deterioration or damage at time of Substantial Completion. If, despite protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 08 11 00 HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCULENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide items shown on the Drawings and specified, including, but not limited to the following:
   1. Standard and fire rated steel doors.
   2. Steel frames for doors, sidelites, transoms, and windows.
   3. Louvers and vision lites in steel doors, if shown or required.
   4. Sound rated steel doors.
   5. Thermally rated steel doors.

B. Reference Standards:
   1. ASTM International (ASTM)
      a. A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
      b. A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
      c. A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
      d. A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
      e. C1363 Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
      f. E283 Standard Test Method for Determining the rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
      g. E413 Standard Classification for Rating Sound Insulation.
   2. Hollow Metal Manufacturers Association (HMMA):
      a. HMMA 802 Manufacturing of Hollow Metal Doors and Frames.
      b. HMMA 810 Hollow Metal Doors.
      c. HMMA 830 Hardware Preparation and Locations for Hollow Metal Doors and Frames.
      d. HMMA 840 Installation and Storage of Hollow Metal Doors and Frames.
      e. HMMA 850 Fire Rated Hollow Metal Doors & Frames.
      f. HMMA 890 Technical Summary of Hollow Metal by HMMA.
   3. National Fire Protection Association (NFPA):
      a. 80 Fire Doors and Fire Windows.
      b. 252 Fire Tests of Door Assemblies.
   4. Steel Door Institute – Current Standards: Technical Data Series.
   5. Underwriters Laboratories Inc. (UL):
      a. Building Materials Directory.
      b. Listing and Labeling.
      c. 10B and 10C Fire Tests of Door Assemblies.
      d. 1784 Air Leakage Tests of Door Assemblies.
   6. Intertek Testing, Services (Warnock Hersey, Inc. (WHI): Listing and Labeling.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's standard details and catalog data demonstrating compliance with specifications and referenced standards.
   2. Manufacturer's installation instructions.

B. Shop Drawings:
   1. Indicate complete schedule in detail for each steel door and frame using the same reference number for details and openings as those on the contract Drawings. If any door is not by the steel door manufacturer, only the door opening number should be shown along with the type of door (wood, plastic laminate faced, etc.):
      a. Show details of construction, installation, connections, anchors, hardware reinforcement, hardware preparation, louvers, and floor and threshold clearances.

C. Samples are required from non-Steel Door Institute members:
   1. 12-inch by 12-inch sample of a fire-rated and non-rated door, cut from corner of door, showing door construction.
   2. 12-inch by 12-inch sample of each type of door louver specified or required, showing louver construction.
   3. Six-inch (6”) long sample of a fire-rated, non-rated frame, and each type of glass stop specified or required, showing corner and construction.

D. Certificates: Manufacturer’s certification that oversized openings are in compliance with specifications.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: If other than a manufacturer listed under Paragraph 2.1 is proposed for use on the Project, it shall be a company specializing in the manufacturer of steel doors and frames of the type specified for this Project with a minimum of five (5) years’ experience.

B. All steel doors and frames shall be by a single manufacturer, shop drawings to be submitted with manufacturer’s insignia, which is being supplied.

C. Furnish steel doors and frames to meet current ANSI/Steel Door Standards.

D. ANSI A250.13 Testing and Rating of Sever Windstorm Resistant Components for Swing Door Assemblies.

E. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

F. Comply with ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

G. Regulatory Requirements:
   1. Fire-Rated Assemblies:
      a. Fire-rated door, panel, frame, and fire window construction shall conform to NFPA 252, or UL 10B, as applicable, and acceptable to the code of authorities having jurisdiction.
      b. Fire-rated door construction:
         1) Notwithstanding any other requirements of this Section, provide gauge of

metal, method of construction, hardware preparation, reinforcement, and placement, glass opening size, and other specifics required to obtain the specified or required label. The label shall contain the fire resistance rating (20-minute, 45-minute, 1-hour, 1-1/2-hour, 3-hour, etc.) and the designation (A, B, C, D, or E); doors with B Label shall be 1-1/2 hour.

2) Fire-rated doors used in a stairway enclosure, shall be so constructed so that the maximum transmitted temperature shall not exceed 450 degrees F above ambient temperature at the end of 30 minutes of the Standard Fire Exposure Test and shall be so noted on the label.

c. Fire-rated openings:

1) Conform to NFPA 80 for fire-rated class shown or required by code of authorities having jurisdiction:

a) Units shall be identical to assemblies whose fire resistance characteristics have been determined in accordance with requirements specified above, and shall be labeled and listed by UL, WHI, or other inspection and testing agency acceptable to the code of authorities having jurisdiction.

b) Fire-rated steel doors, panels, frames, and fire windows shall bear permanent labels attesting to fire resistance. At stairway enclosures, provide units listed for 450 degree F maximum temperature rise rating for 30 minutes of exposure.

c) Oversized openings shall be constructed in accordance with all applicable requirements for labeled door construction.

d) Fire rated door assemblies with gaps in excess of 1/8 inch between door and frame will not comply with NFPA 80.

e) Locate label on hinge side of doors and frames so that when door is closed, label is not visible.

f) Caution shall be taken to ensure that labels are not removed, damaged, or painted over.

g) Glass panes shall not exceed sizes allowed whether indicated or not on the Drawings.

H. Wind Loads: Provide hollow metal and door hardware assemblies approved by DSA, including anchorage, capable of withstanding wind load design pressures that are calculated for this Project by a registered Architect or Engineer and is part of the construction documents per CBC.

I. Accessibility Requirements:

1. Comply with applicable requirements:
   a. Americans with Disability Act of 1990, as amended: 2010 ADA Standards.
   b. 2022 California Building Code (CBC). CCR Title 24, Part 2, as adopted and amended by DSA.

1.5 WARRANTY

A. Warrant the work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.

B. Defects shall include, but not be limited to:

1. Use of incorrect materials in opening.
2. Incorrect labeled components installed within opening.
3. Noisy, rough, or difficult operation.
4. Failure to meet specified quality assurance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in accordance with manufacturer's instructions, and as follows:
   1. In manufacturer's original, clearly labeled, undamaged containers or wrappers.
   2. Containers or wrappers shall list the name of the manufacturer and product.

B. Deliver materials to allow for minimum storage time at the Project site. Coordinate delivery with the scheduled time of installation.

C. Protect products from moisture, construction traffic, and damage:
   1. Store under cover in a clean, dry place, protected from weather and abuse.
   2. Store in a manner that will prevent rust or damage.
   3. Store doors in a vertical position, spaced with blocking to permit air circulation.
   4. Do not use non-vented plastic or canvas shelters.
   5. Should containers or wrappers become wet, remove immediately.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project.
   1. CECO Door Products, Brentwood, TN; (615) 661-5030.
   2. Curries Company, Mason City, IA; (515) 423-1334.
   3. Pioneer Industries, Inc., Kewanee, IL; (309) 856-6000.
   4. Republic Builders Products Company, McKenzie, TN; (800) 733-3667.
   5. Steelcraft Mfg. Co., Cincinnati, OH; (513) 745-6400.
   6. Stiles Co.
   7. Approved equal.

2.2 MATERIALS, GENERAL

A. Steel requirements, all frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM A1008 general requirements. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM A1011. Exterior frames and interior frames where shown on approved Drawings or required in damp, moist, humid, and wet areas, i.e., toilets, locker rooms, showers, etc., to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel and galvannealed to A-60 minimum coating weight standard per ASTM A653 and A924, with coating weight of not less than 0.60 ounce per square foot (0.30 ounce per square foot per side).

2.3 FRAME FABRICATION

A. Minimum Gauges:
   1. Interior openings:
      a. Less than four feet (4') width: 16 gauge.
      b. Four feet (4') in width and greater: 14 gauge.
   2. Exterior openings: 14 gauge

B. Design and Construction:
   1. Frames shall be custom made, welded units with integral trim of sizes and shapes shown on approved shop drawings. Hinge jambs that butt adjacent 100-degree walls shall have at least four-inch (4") wide frame face to assure the door trim will not strike the wall prior to the door opening at least 100 degrees. Frame profile shall match wall thickness where practical, i.e., 4-3/4-inch at four-inch (4") CMU, 6-3/4-inch at six-inch (6") CMU, and 8-3/4-inch at eight-inch (8") CMU. At masonry wall openings, fabricate

frames to suite masonry opening with two-inch (2") head member.

2. Frames shall be strong and rigid, neat in appearance, square, true, and free of defects, warp, and buckle. Molded members shall be clean cut, straight, and of uniform profile throughout their length.
3. Jamb depths, trim, profile, and backbends shall be as shown on approved shop drawings.
4. Corner joints, including face and inside corners, shall have contact edges closed tight, with trim faces mitered and continuously welded, and stops butted. The use of gussets shall not be permitted. Face of frame shall be ground smooth. Knockdown (KD) frames are not permitted.
5. Minimum depth of stops shall be 5/8 inch, except at fire windows where minimum depth of stops shall be 3/4 inch.
6. Frames for multiple openings shall have mullion and rail members that are closed tubular shapes having no visible seams or joints. Joints between faces of abutting members shall be securely welded and finished smooth. Mullions shall be key locked removable type. Keys shall be master keyed to Owner's Best system.
7. High frequency hinge reinforcement: Provide high frequency hinge reinforcements at door openings 48-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
8. Continuous hinge reinforcement: Provide welded continuous 12-gage strap for continuous hinges specified in hardware sets in Division 08 Openings.
9. Provide countersunk flat or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.
10. Provide A60 galvannealed coating at frames in restrooms and locker rooms with showers/Jacuzzi, clean areas such as kitchen rooms.
11. Hardware reinforcements:
    a. Frames shall be mortised, reinforced, drilled, and tapped at factory for fully template mortised hardware in accordance with approved hardware schedule and templates provided by Section 08 71 00: Door Hardware. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only.
    b. Minimum thickness of hardware reinforcing plates shall be as follows:
        1) Hinge and pivot reinforcements (1-1/4-inch x 10-inch minimum size): Seven (7) gauge.
        2) Strike reinforcements: 12-gauge stiffeners.
        3) Flush bolt reinforcements: 12-gauge.
        4) Closer reinforcements: 12-gauge.
        5) Reinforcements for surface-mounted hardware, hold-open arms, and surface panic devices: 12-gauge.
12. Floor anchors: Minimum 14-gauge, securely welded inside each jamb, with holes for floor anchorage.
13. Jamb anchors:
    c. Frames for installation in wood or metal stud partitions shall be provided with steel anchors of suitable approved design, not less than 16-gauge thickness, securely welded inside each jamb as follows:
        1) Frames up to seven feet six inches (7'-6") in height: Four (4) anchors.
        2) Frames seven feet six inches (7'-6") to eight feet (8') in height: Five (5) anchors.
        3) Frames over eight feet (8') in height: Four (4) anchors plus one (1) additional for each two feet (2') or fraction thereof over eight feet (8').
    d. Frames to be anchored to previously placed concrete, masonry, or structural steel shall be provided with anchors of suitable design as shown on approved shop drawings.
14. Dust cover boxes: Shall be of not less than 26-gauge steel and shall be provided at all mortised hardware items.
15. Steel spreader: Shall be provided on all frames, temporarily attached to bottoms of both

jambs for bracing during shipping and handling.

16. Loose glazing stops: Shall be of cold rolled steel, not less than 20 gauge, butted at corner joints and secured to the frame with countersunk cadmium or zinc-plated screws. Loose stops at exterior frames shall be placed on the interior side of the frames.
17. Unless otherwise noted on Drawings, ALL doors coat inside of frame profile with corrosion resistant coating to minimum thickness of 1/16 inch.

C. Frame Color: Field painted under Section 09 90 10: Painting and Coating to match face of door unless otherwise indicated on drawings.

2.4 DOOR FABRICATION

A. Minimum Gauges
   1. Interior doors: 0.047 inch or 18 gauge (16 gauge for high frequency doors).Exterior doors: 0.059 inch or 16 gauge (14 gauge for windstorm rated doors).Design and Construction:
   2. Types: Doors shall be custom fabricated, of types and sizes shown on approved shop drawings, and shall be seamless face construction with no visible seams or joints on vertical edges with fully welded seams free from blemishes and defects. Thickness shall be 1-3/4 inch, unless specifically noted or shown otherwise. Exterior doors: Provide doors with 22-gage steel z-channels placed at six inches (6”) apart with foamed in place polyurethane core, with a thermal insulation calculated R factor of 11.01 per ASTM C518 Standards.
   3. Fabrication:
      a. Doors shall be strong, rigid, and neat in appearance, free from warpage and buckle.
      b. Corner bends shall be true and straight and of minimum radius for gage of metal used.
      c. Provide stiffeners with polystyrene core spaced maximum six inches (6”) on center and extending full height of door.
      d. Fill interior with noncombustible fiberglass insulation. Use mineral board filler as required for labeled doors.
      e. Faces shall be joined at vertical edges of door by a continuous weld extending full height of door. Welds shall be ground, filled, and dressed smooth to provide a smooth flush surface.
      f. Top and bottom edges of doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending full width of door and spot weld to both faces. Exterior doors shall have an additional flush closing channel at top and bottom edges. Openings shall be provided in the bottom closure channel at top and bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
      g. Continuous hinge reinforcement: Provide welded continuous 12-gage strap for continuous hinges specified in hardware sets in Division 08: Openings.
      h. Doors in wet or humid areas shall have a top cap and solid foam interior core to prevent internal moisture accumulation and galvannealed.
      i. Edge profile shall be provided on both vertical edges of door as follows:
         1) Single-acting swing doors: Beveled 1/8 inch in two inches (2”).
      j. Hardware reinforcements:
         1) Doors shall be mortised, reinforced, drilled, and tapped at factory for fully template hardware, in accordance with the approved hardware schedule and templates provided by Section 08 71 00: Door Hardware. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only.
         2) Minimum gauges for hardware reinforcing plates shall be as follows:
            a) Hinge and pivot reinforcements: Seven (7) gauge.

b) Reinforcements for lock face, flush bolts, concealed holders, concealed or surface-mounted closers: 12 gauge.

4. Glass moldings and stops: Loose stops shall be not less than 20-gauge steel, with butt corner joints, secured to frame opening by countersunk screws. Snap-on attachments will not be acceptable.
5. Louvers: Shall be inverted "V" blade, sight-proof type, unless noted otherwise.
6. Edge clearances:
   a. Between door and frame at head and jambs: 1/8 inch.
   b. At doorsills with no threshold: 5/8-inch to 3/4-inch above finished floor.
   c. At doorsills with threshold: As required to suit threshold.
   d. Between meeting edges of double doors: 1/8 inch.

B. Finish:
1. Shop paint steel (whether galvanized or ungalvanized) stops and accessories as follows:
   a. Clean surfaces free of mill scale, rust, oil, grease, dirt, and other foreign matter.
   b. Chemically treat surfaces and apply one (1) coat of an approved baked-on rust-inhibitive primer paint to provide a minimum 0.5 mil dry film thickness.

2. Field painted under Section 09 90 10: Painting and Coating.

2.5 LABELED DOORS AND FRAMES

A. Labeled doors and frames shall be provided for openings requiring fire protection ratings as scheduled and to comply with NFPA 80. Such doors and frames shall be constructed as tested and approved by UL, WHI, or other nationally recognized testing agency having a factory inspection service and approved by code authorities having jurisdiction and shall bear the appropriate permanent label.

B. If any door or frame scheduled to be fire-rated cannot qualify for appropriate labeling because of its size, design, hardware, or other reason, the Architect shall be so advised before fabrication work on that item is started. Indicate and highlight on shop drawing.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate the work of this Section.

B. Coordinate hardware installation with opening construction. Finish hardware is specified in Section 08 71 00: Door Hardware.

C. Coordinate doors, frames, and windows with glazing specified in Section 08 80 00: Glazing.

D. Coordinate doors and frames with painting specified in Section 09 90 10: Painting and Coating.

3.2 INSTALLATION

A. Separate dissimilar metals. Protect against galvanic action.

B. Frames:
1. Anchorage and connections: Secure to adjacent construction. Where practical, interior door frames shall be flush with the pull side wall to minimize or eliminate the reveal and allow full 180-degree door swing.

2. Install frames in accordance with manufacturer’s instructions and install labeled frames in accordance with NFPA 80.
3. Frame spreader bars: Leave intact until frames are set perfectly square and plumb and anchors are securely attached.
4. Remove hardware, with the exception of prime-coated items, tag box, and reinstall after finish paint work is completed. Do not remove or paint over labels on labeled frames.

C. Doors:
1. Install hardware in accordance with hardware manufacturer's templates and instructions.
2. Install doors in accordance with manufacturer’s instructions and install labeled doors in accordance with NFPA 80.
3. Adjust operable parts for correct function.
4. Remove hardware, with the exception of prime-coated items, tag, box, and reinstall after finish paint Work is completed. Do not remove or paint over labels on labeled doors.

3.3 ADJUST AND CLEAN

A. Adjust doors for proper operation, free from binding or other defects.

B. Clean and restore soiled surfaces.

C. Remove scraps and debris, and leave site in clean condition.

END OF SECTION

SECTION 08 31 13 ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes access doors in gypsum board, and plaster/stucco soffits, where shown or required.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's literature, including schedules, charts, installation instructions, and illustrations to indicate the performance, fabrication, procedures, product variations, and accessories.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years' experience manufacturing access doors meeting or exceeding the specifications and comply with Division 01 requirements regarding substitutions in order to be considered:
   1. J. L. Industries, Commerce, CA (basis of design for rated floors).
   2. Karp Associates, Inc., Melville, NY (basis of design).
   3. The Bilco Company, New Haven, CT.
   4. Babcock-Davis, San Lorenzo, CA.
   5. Larsen's Manufacturing Co., Minneapolis, MN.
   6. Milcor, Grand Rapids, MI.
   7. Approved equal.

2.2 PRODUCTS

A. Standard type flush steel access door for wall and ceiling construction:
   1. Size: As shown on the Drawings.
   2. Hinges: Concealed continuous piano type hinges.
   3. Finish: Phosphate dipped and prime coated for field painting, unless noted otherwise. Type 304, #4 satin Stainless Steel where installed at ceramic tile or exposed masonry.
   4. Frames: 16 gauge.
   5. Doors: 14 gauge steel where installed at plaster; 16 gauge at gypsum board.
   6. Lock: Flush screwdriver operated cam.
   7. Basis of Design: Models "BNP" & "BNW" by Babcock-Davis.

B. Fire Rated, Flush steel door for wallboard construction:
   1. Listing: UL listed "B" for 1-1/2 hours.
   2. Size: As shown on the Drawings.
   3. Hinges: Flush continuous piano type hinges.
   4. Finish: Phosphate dipped and prime coated for field painting, unless noted otherwise.

Type 304, #4 satin stainless steel where installed at ceramic tile or exposed masonry.

5. Frames: 16 gauge steel.
6. Doors: 20 gauge steel.
7. Lock: Knurled knob.
8. Insulation: Two-inch (2”) thick fire rated mineral fiber

PART 3 EXECUTION

3.1 INSTALLATION

A. Locate and provide access doors in walls (and floors) to construct the wall as indicated on Drawings and provide access doors and panels to fit the wall condition. Maintain designated wall types as indicated on Drawings.

3.2 LOCATIONS

A. Provide where required by code and where needed to service and maintain equipment.

B. If not shown on the Drawings, consult the Architect before locating in finished spaces.

END OF SECTION

SECTION 08 33 23 OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Motor operated galvanized steel door with trim and accessories.
   2. Electric wiring from disconnect(s) to motor operator.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors:
   1. Capable of withstanding the design wind loads:
      a. Design wind load: As indicated on Drawings.
      b. Testing: According to ASTM E330.
      c. Deflection limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE 7.

1.4 SUBMITTALS

A. Product Data:
   1. Manufacturer’s specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer’s installation instructions.
   3. Manufacturer's operation and maintenance data.

B. Shop Drawings: Indicating opening sizes, details of slat curtain, track and hardware, attachments, related and adjacent work, materials, and finishes.

C. Samples: 12-inch by 12-inch sample of slats with specified finish for each type door.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing coiling doors with minimum five (5) years’ experience and approved by manufacturer.

B. Contractor shall have the sole responsibility for entire coiling door assembly and associated work shown or required for complete system.

C. Pre-installation conference is to be conducted onsite.

1.6 WARRANTY

A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from both defective or nonconforming

materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations:
   1. Obtain overhead coiling doors from single source from single manufacturer: Obtain operators and controls from overhead coiling door manufacturer.

2.2 DOOR ASSEMBLY AND SIZE (AS INDICATED ON DRAWINGS)

A. Insulated Service Door:
   1. Overhead coiling door formed with curtain of interlocking metal slats:
      a. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following (substitution form required for manufacturers other than listed as basis of design):
         1) Cookson Company (basis of design).
         2) ACME Rolling Doors.
         3) Clopay Building Products.
         4) Cornell Iron Works, Inc.
         5) McKeon Rolling Steel Door Company, Inc.
         6) Overhead Door Corporation.
         7) Raynor.
         8) Approved equal.

B. Basis of Design: **ESD30**, by Cookson Company

C. Operation Cycles:
   1. Door components and operators capable of operating for not less than 50,000 cycles:
      a. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position:
         1) Include tamperproof cycle counter.

D. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E283 or ANSI/DASMA 105.

E. STC Rating: 26.

F. Curtain R-Value: 4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W.

G. Door Curtain Material: Galvanized steel.
   1. Door Curtain Slats: Flat profile.

H. Door Curtain Finish: SpectraShield Power Coating.

I. Color: Custom color to match adjacent exterior walls.

J. Bottom Bar: Two angles, each not less than 1-1/2 inch by 1-1/2 inch by 1/8 inch (38 mm x 38 mm x 3 mm); fabricated from aluminum extrusions and finished to match door.

K. Curtain Jamb Guides: Steel with exposed finish matching curtain slats.

L. Hood:
   1. Finish: Powder Coated steel to match curtain.

2. Shape: Square.
3. Mounting: As shown on Drawings.

M. Locking Devices:
1. Equip door with locking device assembly and chain lock keeper:
a. Locking device assembly: Cremone type, both jamb sides locking bars, operable from inside and outside with cylinders.

N. Electric Door Operator:
1. Usage classification: Light duty, up to ten (10) cycles per hour.
2. Operator location: Front of hood.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at eight feet (2.44 m) or lower.
4. Motor exposure: Interior.
5. Emergency manual operation: Crank type.
6. Obstruction-detection device: Automatic photoelectric sensor.
7. Sensor edge bulb color: As selected by Architect from manufacturer's full range.
8. Control station(s): Interior mounted.

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains:
1. Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
a. Steel door curtain slats: ASTM B209 sheet or ASTM B221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch (1.27 mm); and as required.
b. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.

B. Curtain Jamb Guides:
1. Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks:

2.5 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

2.6 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors:
   1. Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated:
      a. At door head, use 1/8-inch (3 mm) thick, replaceable, continuous-sheet baffle secured to inside of hood or field installed on the header.
      b. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch (3 mm) thick seals of flexible vinyl, rubber, or neoprene nylon brushes.

2.8 ELECTRIC DOOR OPERATORS

A. General:
   1. Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation cycles requirement specified, with electric motor and factory prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation:
      a. Basis of design product: Chamberlain/The Chamberlain Group, Inc.
      b. Alternate complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s) - Indicated for Each Door:
   1. Top-of-hood mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.

D. Motors:
   1. Reversible-type motor with controller disconnect switch for motor exposure indicated.
      a. Electrical characteristics:
         1) Phase: Polyphase.
         2) Hertz: 60.
      b. Motor size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than eight inches per second (203 mm/s) and not more than 12 inches per second (305 mm/s), without exceeding nameplate ratings or service factor.
      c. Operating controls, controllers, disconnect switches, wiring devices, and wiring: Manufacturer's standard unless otherwise indicated. Field coordinate prior to install.
      d. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Devices:
   1. External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel:
      a. Photoelectric sensor:
         1) Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction:
            a) Self-monitoring type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.

G. Control Station:
   1. Three (3) button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained or constant-pressure push-button control labeled "Close":
      a. Interior-mounted units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
      b. Emergency manual operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N) 30 lbf (133 N).

H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate areas and conditions, with installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install according to UL 325.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service:
   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
   3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door closing mechanism after successful test.

B. Adjusting:
   1. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion:
      a. Adjust exterior doors and components to be weather-resistant.
   2. Lubricate bearings and sliding parts as recommended by manufacturer.
   3. Adjust seals to provide tight fit around entire perimeter.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service:
   1. Beginning at Substantial Completion, maintenance service shall include six (6) months' full maintenance by skilled employees of coiling-door installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies:
      a. Perform maintenance, including emergency callback service, during normal working hours.
      b. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

SECTION 08 51 13 ALUMINUM WINDOWS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Aluminum windows for exterior locations.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data: Technical data for each type of product, including construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: Submit plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified, two inches by four inches (50 by 100 mm) in size.

D. Samples:
   1. For aluminum windows and components required, showing full range of color variations for finishes, and prepared on samples of size indicated below:
      a. Exposed finishes: Two inches by four inches (50 by 100 mm).
      b. Exposed hardware: Full size units.

E. Product Schedule: Use same designations indicated on Drawings.

F. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

G. Field quality control reports.

1.4 PERFORMANCE REQUIREMENTS

A. Performance Class and Grade AAMA/WDMA/CSA 101/I.S.2/A440:
   1. Minimum performance class: AW or as indicated on Drawings.
   2. Minimum performance grade: 40.

B. Solar Heat Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.27.

C. Condensation Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.

D. Thermal Movements:
   1. Provide aluminum windows, including anchorage, that allow for thermal movements

resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss:
a. Temperature change: 120 degrees F (67 degrees C) ambient; 180 degrees F (100 degrees C) material surfaces.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Energy code: Provide window units compliant with the IECC with California amendments.
2. Product standard - Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated:
a. Window certification: AAMA certified with label attached to each window.
3. Accessibility requirements - comply with applicable requirements:
a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).
b. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.
c. State of California T-24, Part I, CBC Section 11B (Accessible).

B. Manufacturer Qualifications: Manufacturer having minimum five (5) years' documented experience who is capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting the performance by test reports and calculations.

C. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

D. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

1.6 WARRANTY

A. Manufacturer's written warranty, signed by manufacturer, in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period:
1. Failures include, but are not limited to, the following:
a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
c. Deterioration of materials and finishes beyond normal weathering.
d. Failure of insulating glass.
2. Warranty period:
a. Window: Ten (10) years from date of Substantial Completion.
b. Glazing units: Ten (10) years from date of Substantial Completion.
c. Aluminum finish: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers are subject to compliance with requirements; provide impact resistant window products by one of the following:

1. Arcadia, Inc.
2. Kawneer North America; an Alcoa company.
3. Peerless Products, Inc.
4. Wausau Window and Wall Systems; Apogee Wausau Group.
5. Winco Manufacturing Co.
6. EFCO Corporation.

B. Basis of Design: **T200 Series 2" Heavy Commercial** aluminum window by Arcadia, Inc.

2.2 OPERATING TYPES

A. Provide the following operating types in locations indicated on Drawings:
1. Fixed.

2.3 GLASS

A. Glazing System per Section 08 81 00 – Glazing:
1. Factory dual glazing system that produces weathertight seal:

B. Fasteners:
1. Noncorrosive and compatible with window members, trim, hardware, anchors, and other components:
a. Exposed fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.5 FINISH REQUIREMENTS

A. Comply with NAAMM Metal Finishes Manual for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (mechanical finish: non-specular as fabricated; chemical finish: etched, medium matte; anodic coating: architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation after correcting unsatisfactory conditions.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances:
   1. Keep protective films and coverings in place until final cleaning.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 08 62 23 TUBULAR DAYLIGHTING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes tubular daylighting devices and accessories.

B. Reference Standards – Refer to current edition of all references:
1. AAMA/WDMA/CSA 101/I.S.2/A440 Standard/Specification for Windows, Doors, and Unit Skylights.
2. ASTM References:
   a. ASTM A463/A463M Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process.
   b. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc Coated (Galvanized), by the Hot Dip Process.
   c. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
   d. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   e. ASTM D635 Test Method for Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position.
   f. ASTM D1929 Test Method for Ignition Properties of Plastics.
   g. ASTM D2843 Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
   h. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   i. ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings.
   j. ASTM E283 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
   k. ASTM E308 Standard Practice for Computing the Colors of Objects by Using the CIE System.
   l. ASTM E330 Structural Performance of Exterior Windows, Curtain Walls and Doors.
   m. ASTM E547 Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain walls by Cyclic Air Pressure Difference.
   n. ASTM E1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
   o. ASTM E1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricane.
   p. ASTM F1642 Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading.
   q. ASTM F2912 Standard Specification for Glazing and Glazing Systems Subject to Airblast Loading.
3. California State OSHA Fall Protection Code of Regulations, Title 8, Section 3212 (e)(1).
4. FM Standard 4431 The Approval Standard for Skylights.
5. ICC-ES AC16 Acceptance Criteria for Plastic Skylights.

6. OSHA 29 CFR - 1910.23 (e)(8) (Guarding Requirements for Skylights); 1926 Subpart M (Fall Protection); 1926.501(b)(4)(i); 1926.501(i)(2); 1926.501(b)(4)(ii).
7. UL 2108 Low Voltage Lighting Systems.
8. Unified Facilities Criteria (UFC) 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's data sheets on each product to be used, including:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.
      c. Data sheets showing roof dome assembly, flashing base, reflective tubes, diffuser assembly, and accessories.
      d. Installation requirements.

B. Shop Drawings. Submit shop drawings showing layout, profiles, and product components, including rough opening and framing dimensions, anchorage, roof flashings, and accessories.

C. Electrical wiring diagrams and recommendations for power and control wiring.

D. Verification Samples: As requested by Architect.

E. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

1.4 PERFORMANCE REQUIREMENTS

A. Fire Testing:
   1. Fire rated roof assemblies: When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code for Class A, B, and C roof assemblies.
   2. When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code.
   3. Self-ignition temperature - greater than 650 degrees F per ASTM D1929.
   4. Smoke density: Rating no greater than 450 per ASTM E84 in way intended for use. Classification C.
   5. Rate of burn and/or extent:
      a. Maximum burning rate: 2.5 inches/min (62 mm/min). Classification CC-2 per ASTM D635.
   6. Rate of burn and/or extent:
      a. Maximum burn extent: One inch (25 mm). Classification CC-1 per ASTM D635.
   7. Fall protection performance:
      a. Passes fall protection test: No penetration of dome or curb cap when subject to 400 pounds (160 Kg) / 42-inch (1066 mm) impact drop test when tested in accordance with OSHA 29 CFR 1926.506(c) Safety Net Systems.
      b. Passes fall protection test: California State OSHA Fall Protection Code of Regulations, Title 8, Section 3212 (e)(1) Skylight Screens.
   8. Blast resistance - ASTM F1642, ASTM F2912, and UFC 4-010-01:
      a. Airblast loading ASTM hazard rating: Passes - no hazard rating.
      b. Airblast loading UFC level of protection: Passes medium level of protection.
      c. Dynamic overpressure loading ASTM hazard rating: Passes - no hazard rating.
      d. Dynamic overpressure loading UFC level of protection: Passes medium level of protection.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engaged in manufacture of tubular daylighting devices for minimum 20 years.

1.6 WARRANTY

A. Daylighting Device: Manufacturer's standard warranty for ten (10) years.

B. Electrical Parts: Manufacturer's standard warranty for five (5) years, unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, and with seals and labels intact.

B. Store products in manufacturer's unopened packaging until ready for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: SolaMaster 750 DS by Solatube International, Inc., Oak Ridge Way; Vista, CA 92081-8341

B. Or equal in accordance with requirements for substitutions.

2.2 TUBULAR DAYLIGHTING DEVICES

A. Tubular Daylighting Devices, General: Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICC AC16.

B. SolaMaster Series - Solatube Model 750 DS, 21-inch (530 mm) Daylighting System:
   1. Model: Solatube Model 750 DS Open Ceiling. AAMA Type TDDCC.
   2. Capture zone:
      a. Roof dome assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
         1) Outer dome glazing: Type DA, 0.125-inch (3.2 mm) minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend:
            a) Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.
         2) Acrylic dome plus inner dome glazing: Type DAI, inner dome is 0.115-inch (3 mm) minimum thickness acrylic classified as CC2 material.
      b. Tube ring:
         1) 0.090-inch (2.3 mm) nominal thickness injection molded high impact PVC. Prevents thermal bridging between base flashing and tubing and channel condensed moisture. Attached to base of dome ring with butyl glazing rope 0.24-inch (6 mm) diameter; to minimize air infiltration.
      c. Dome seal: Adhesive backed weather strip, 0.63-inch (16 mm) tall by 0.28-inch (7 mm) wide.
   3. Flashings:

a. One-piece: One-piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A653/A653M or ASTM A463/A463M or ASTM A792/A792M, 0.028 inch (0.7 mm) plus or minus .006-inch (.015 mm) thick.
b. Base style: Type FC, curb cap, with inside dimensions of 27 inches by 27 inches (685 mm by 685 mm) to cover curb.

4. Transfer zone:
   a. Reflective Tubes - aluminum sheet, thickness 0.018 inch (0.5 mm) conforming to ASTM B209.
      1) Reflective tubes:
         a) Reflective extension tube, Type EXX and Type EL with total length of run as indicated on the Drawings.
         b) Interior finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high visible light reflectance with ultra-low infrared (IR) reflectance.
      2) Tube options:
         a) Top tube angle adapter: Type TA Reflective 45-degree adjustable top tube angle adapter, 16 inches (406 mm) long.
         b) Wire suspension kit: Type E. Use the wire suspension kit when additional bracing to the structure is required.
5. Delivery zone:
   a. Diffuser assemblies for tubes not penetrating ceilings (Open Ceiling):
      1) Solatube Model 750 DS, 21 inch (530 mm) diameter diffuser attached directly to bottom of tube.
         a) Lens: Type L2 Prismatic lens designed to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E283. Visible light transmission shall be greater than 90 percent at 0.100-inch (2.5 mm) thick. Classified as CC2.
   b. Delivery zone options:
      1) Local dimmer control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use; provided with dimmer switch and cable:
         a) Daylight dimmer: Type D, electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02. Provided with dimmer switch and cable. Cable circuited, 4 conductor, size 22 AWG when total aggregate circuit runs are under 200 feet (60.96 m) or size 18 AWG when total aggregate circuit runs are under 500 feet (152.4 m); providing daylight output between two percent (2%) and 100 percent.
6. Accessories
   a. Switch: Basis of Design **Lutron DVTV 0-10V Controller**; Type SW, manufacturer-specific low voltage DC DP/DT switch (white) required to operate daylight dimmer. Note: only one switch is required per set of synchronously controlled dimmers. For use with daylight dimmer, Type D, only. Pre-wired with 30 feet (9.14 m) of 22 AWG, 4 conductor, low-voltage cable.
   b. Cable: Type CA, optional two conductor, size 22 AWG, low voltage cable (500 foot) for multiple unit DC connection. For use with daylight dimmer, Type D, only, and when aggregate circuit runs do not exceed 200 feet (60.96 m).

C. Performance Requirements:
   1. Daylight reflective tubes: Spectralight Infinity with INFRAREDuction Technology combines ultra-high visible light reflectance with ultra-low infrared (IR) reflectance. Patented spectrally-selective optical surface yields an average total and specular-reflectance greater than 99.5 percent for the visible light spectrum (400 nm to 700 nm)

providing maximized visible light transmission and less than 25 percent reflectance for infrared (IR) heat wavelengths (750 nm to 2500 nm) for minimized heat transmission, resulting in a spectrally-selective total solar spectrum (250 nm to 2500 nm) reflectance less than 37 percent, as measured using a Perkin Elmer Lambda 1050 spectrophotometer with a Universal Reflectance Accessory. Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus two (2) or be less than minus two (2) as determined in accordance to ASTM E308.

2. SOLAMASTER 750 DS (Open Ceiling):
   a. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG70, size tested 21-inch (533 mm) diameter, Type TDDOC and Type TDDCC:
      1) Air infiltration test:
         a) Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E283.
      2) Water resistance test: Passes water resistance; no uncontrolled water leakage with a pressure differential of 10.7 psf (512 Pa) or 15 percent of the design load (whichever is greater) and a water spray rate of five (5) gallons/hour/sf for 24 minutes when tested in accordance with ASTM E547 and ASTM E331.
      3) Uniform load test:
         a) All units tested with a safety factor of three (3) for positive pressure and two (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E330.
         b) No breakage, permanent damage to fasteners, hardware parts, or damage to make daylighting system inoperable or cause excessive permanent deflection of any section when tested at a positive load of 150 psf (7.18 kPa) or negative load of 70 psf (3.35 kPa).

2.3 ACCESSORIES

A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.

B. Suspension Wire: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.

C. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

D. Class 2 Transformer for 0-10V Daylight Dimmers: Provide min. (4) four 96 VA, 120V-24VAC, UL Listed Class 2 transformers, Part # TR96.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

3.2 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions.

C. If substrate and rough opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.3 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Coordinate requirements for power supply, conduit, and wiring.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the Project conditions.

3.4 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Coordinate installation with substrates, air and vapor retarders, roof insulation, roofing membrane, and flashing to ensure that each element of the work performs properly, and that finished installation is weather tight:
   1. Install flashing to produce weatherproof seal with curb and overlap with roofing system termination at top of curb.
   2. Provide thermal isolation when components penetrate or disrupt building insulation. Pack fibrous insulation in rough opening to maintain continuity of thermal barriers.
   3. Coordinate attachment and seal of perimeter air and vapor barrier material.

C. Where metal surfaces of tubular unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, provide permanent separation as recommended by manufacturer

D. Align device free of warp or twist, maintain dimensional tolerances.

E. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.

F. Inspect installation to verify secure and proper mounting. Test each fixture to verify operation, control functions, and performance. Correct deficiencies.

3.5 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

3.6 PROTECTION

A. Protect installed products until completion of Project.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 7100 DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Door hardware.
2. Gate hardware, including padlocks.

B. Related Divisions:

1. Division 01 – General Requirements
    a. Section 01 1100 - Summary of Work: Prequalification requirements.
2. Division 07 – sealant at exterior thresholds
3. Division 08 – metal doors and frames.

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Access doors and panels, except cylinders where detailed.
8. Corner Guards.

1.02 REFERENCES:

A. Use date of standard in effect as of Bid date.

1. American National Standards Institute
    a. ANSI 156.18 – Materials and Finishes.
2. BHMA – Builders Hardware Manufacturers Association
3. 2022 California Building Code
    a. Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing
4. DHI – Door and Hardware Institute
5. UL – Underwriters Laboratories
    a. UL 305 – Panic Hardware
6. WHI – Warnock Hersey Incorporated State of California Building Code
7. Local applicable codes
8. SDI – Steel Door Institute
9. NAAMM – National Association of Architectural Metal Manufacturers

1.03 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Division 1. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information:

1. Type, style, function, size, quantity and finish of hardware items.
2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Location of hardware set coordinated with floor plans and door schedule.
6. Explanation of abbreviations, symbols, and codes contained in the schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, materials and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.

B. Bid and submit manufacturer’s updated/improved item if the scheduled item is discontinued.

C. Deviations: Highlight, encircle or otherwise identify deviations from “Schedule of Finish Hardware” on submittal with notations clearly designating those portions as deviating from this section.

D. If a discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per Division 1. Include product data and indicate a benefit to the Project. Furnish operating samples on request.

F. Items listed with no substitute manufacturers have been requested by the Owner to meet existing standard.

G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, manufacturers’ installation, adjustment and maintenance information, and supplier’s final inspection report.

1.04 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during the course of work for project hardware consultation to Owner, Architect, and Contractor.
    a. Responsible for detailing, scheduling, and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes, and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges, and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

F. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to the commencement of related work.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Delivery: coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores: secured delivery direct to the Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.06 PROJECT CONDITIONS AND COORDINATION:

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practicable the same operation and quality as type specified, subject to Architect's approval.

B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:

1. Location of embedded and attached items to concrete.

2. Location of wall-mounted hardware, including wall stops.

3. Location of finish floor materials and floor-mounted hardware.

4. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.

5. Coordinate: low-voltage power supply locations.

6. Coordinate: back-up power for doors with automatic operators.

7. Coordinate: flush top rails of doors at out swinging exteriors, and throughout where adhesive-mounted seals occur.

8. Manufacturers' templates to the door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

D. Environmental considerations: segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

1.07 WARRANTY:

A. Part of the respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.

B. Include factory order numbers with close-out documents to validate warranty information, required for Owner in making future warranty claims:

C. Minimum warranties:

Locksets:	Three years
Exit Devices:	Three years mechanical
Closers:	Thirty years mechanical
Hinges:	Two years
Other Hardware	Two years

1.08 COMMISSIONING:

A. Conduct these tests prior to the request for the certificate of substantial completion:

1. With installer present, test door hardware operation with climate control system both at rest and while in full operation.

1.09 REGULATORY REQUIREMENTS:

A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2022 California Building Code, Section 11B-404.2.7.

1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.

B. Handles, pull, latches, locks, other operable parts on accessible doors shall comply with 2022 C.B.C. Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.

C. The force for pushing or pulling open a door shall be as follows per 2022 C.B.C. Section 11B-404.2.9:

1. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds (22.2 N) maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds (66.7 N). These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.

2. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2 N) maximum to comply with 2022 C.B.C. Section 11B-309.4.

D. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per 2022 California Building Code Section 11B-404.2.8.

E. Smooth surfaces at bottom minimum10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2022 California Building Code Section 11B-404.2.10.

1. Applied kickplates and armor plates: bevel all four edges; free of sharp or abrasive edges.

F. Door opening clear width no less than 32 inches, measured from the face of frame stop, or edge of the inactive leaf of pair of doors, to door face with the door opened to 90 degrees. Hardware projection, not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2022 California Building Code Section 11B-404.2.3.

1. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2022 California Building Code 11B-307.4.

G. Thresholds: floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2022 California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches: beveled to a slope no greater than 1:2 (50 percent slope). 2022 California Building Code Section 11B-303.2 & ~.3.

H. Floor stops: Do not locate in the path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access). Position stop no closer than one-half the door width to the hinging point.

I. Door and door hardware encroachment: when the door is swung fully-open into the means-of-egress path, the doo may not encroach/project more than 7 inches into the required exit width, with the exception of door release hardware such as lockset levers or panic hardware. These hardware items must be located no less than 34-inches and no more than 48-inches above the floor/ground. 2022 California Building Code, Section 1005.7.1.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Listed acceptable manufacturers: these will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE:
Hinges	(PBB) PBB Hinges	McKinney, Stanley
Continuous Hinges	(SEL) Select	Submit for approval
Key System	(TBD) to be determined	District Standard
Mechanical Locks	(SCH) Schlage	District Standard
Exit Devices	(VON) Von Duprin	District Standard
Closers	(LCN) LCN	District Standard
Kickplates	(TRI) Trimco	Rockwood, Don-Jo
Stops & Holders	(TRI) Trimco	Rockwood, Don-Jo
Thresholds	(NGP) National Guard Products	Reese, Pemko, Zero

Seals & Bottoms	(NGP) National Guard Products	Reese, Pemko, Zero

2.02 HINGING METHODS:

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow the door to stand parallel to the wall for the true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight, and frequency, and to hinge selection as scheduled. Where the manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices; notify Architect of deviation from scheduled hardware.

C. Conventional Hinges: Steel or stainless steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.

2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. Continuous Hinges:

a. Geared aluminum type, 25,000,000 million cycles tested, bearings in contact with anodized surfaces, hinges leafs mated/machined as a pair, dry-lubricated at factory.

2.03 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Mortise Locksets and Latchsets: Schlage L series as scheduled.

2.04 EXIT DEVICES / PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.

2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.

3. Deadlocking latch bolts, 0.75 inch projection.

4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.

5. No exposed screws to show through glass doors.

6. Weep holes at gates to drain condensation.

7. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.

8. Accessibility: Require not more than 5 lb to retract the latch bolt, per CBC 2022 11B-404.2.7 and 11B-309.4.

a. Mechanical method: Von Duprin "AX-" feature, where touchpad directly retracts the latch bolt with 5 lb or less of force. Provide testing lab

certification confirming that the mechanical device is independent third-party tested to meet this 5 lb requirement.

B. Specific features:

1. Lever Trim: breakaway type, forged brass or bronze escutcheon min. 0.130-inch thickness, compression spring drive, match lockset lever design.

2. Accepted substitutions: None

2.06 CLOSERS

A. Surface Closers: LCN 404XP Series.

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.
4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2019 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers**:** tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors**:** seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
11. Non-flaming fluid, will not fuel door or floor covering fires.
12. Pressure Relief Valves (PRV) not permitted.

2.07 OTHER HARDWARE

A. Overhead Stops: Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

B. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

C. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide the overhead type.

2. Locate overhead stops for a maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg dead stop. Note the degree of opening in the submittal.

D. Thresholds: As scheduled and per details. Comply with CBC 2022 11B-404.2.5. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.

1. Saddle thresholds: 0.125 inches minimum thickness.

2. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25-inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. Zero International's #226, National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".

3. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.

4. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high-security areas. Flathead sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

2.08 FINISH:

A. Generally: BHMA 626 Satin Chromium.

1. Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

B. Aluminum items: Provide closest anodized finish to match other hardware, unless otherwise noted.

C. Door closers: factory powder coated to match other hardware, unless otherwise noted.

2.09 KEYING REQUIREMENTS:

A. Key System**:** After meeting with District's representative to determine system hard-key system requirements, furnish District's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Contractor will install permanent cylinders/cores unless determined differently in conference. Provide a copy of the signed agreement to Architect; Architect is otherwise not required to attend this conference.

B. Keys -- for bidding purposes, use these criteria:

1. Existing factory registered master key system.
2. Construction keying**:** furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
3. Furnish 12 construction keys.

C. Furnish 3 construction control keys. Permanent keys**:** use secured shipment direct from point of origination to Owner.

1. For estimate**:** 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
2. For estimate**:** VKC stamping plus "DO NOT DUPLICATE".
3. Bitting List**:** use secured shipment direct from point of origination to Owner upon completion.
4. Permanent keys**:** use secured shipment direct from point of origination to Owner.

D. Key Cylinders**:** furnish utility patented, 6-pin solid brass construction.

E. Cylinder cores**:** furnish keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS:

A. Can read and understand manufacturers' templates, suppliers' hardware schedule, and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss the installation of hardware.

3.02 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of code conflicts before ordering material.
2. Locate latching hardware between 34 inches to 44 inches above the finished floor, per
3. Locate panic hardware between 36 inches to 44 inches above the finished floor.
4. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops: before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.03 INSTALLATION

A. Install hardware per the manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
2. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
3. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more than 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, the door should be well clear of the point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where the situation is questionable or difficult, contact Architect for direction.

C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

D. Locate overhead stops for minimum 90 degrees at rest and for the maximum allowable degree of swing.

3.04 ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner's satisfaction.

2. Adjust doors to fully latch with no more than 1 pound of pressure.

a. Door closer valves: turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.

3. Adjust delayed-action closers on fire-rated doors to fully close from the fully-opened position in no more than 10 seconds.

4. Adjust door closers per 1.9 this section.

B. Fire-rated doors:

1. Wood doors: adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.

2. Steel doors: adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.

3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above the threshold or finish floor material under the door.

C. Final inspection: Installer to provide a letter to Owner that upon completion installer has visited the Project and has accomplished the following:

1. Has re-adjusted hardware.

2. Has evaluated maintenance procedures and recommend changes or additions, and instructed the Owner's personnel.

3. Has identified items that have deteriorated or failed.

4. Has submitted a written report identifying problems.

3.05 DEMONSTRATION:

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.06 PROTECTION/CLEANING:

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame, and door surfaces soiled from installation/reinstallation **process.**

3.07 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.

C. Manufacturers and their abbreviations used in this schedule:

Abbr	Name
C-R	CORBIN RUSSWIN
GRI	GEORGE RISK INDUSTRIES
IVE	H.B. IVES
LCN	LCN COMMERCIAL DIVISION
LCX	LOCINOX
NGP	NATIONAL GUARD PRODUCTS INC
PBB	PBB, INC
SAR	SARGENT MANUFACTURING CO
SCH	SCHLAGE LOCK COMPANY
SEL	SELECT HINGES
TRI	TRIMCO
VON	VON DUPRIN

D. **HARDWARE SETS**

HW SET: N-01 EXTERIOR, HMD W/ FULL-LITE, PANIC HDW

2	EA	WIDE-THROW CONT.HNG	CH51-WIDETHROW	630	PBB
1	EA	KEY-RMVBL MULLION	KR4954	689	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	PANIC HARDWARE	98EO CD-CI AX-PA	626	VON
1	EA	PANIC HARDWARE	98NL-OP CD-CI AX-PA	626	VON
2	EA	MORT. CYL (DOGGING)	CAMPUS STANDARD	626	
1	EA	MORT. CYL (MULLION)	CAMPUS STANDARD	626	
1	EA	RIM CYLINDER	CAMPUS STANDARD	626	
2	EA	ANTI-VANDAL PULL	1097HA SERIES	630	TRI
1	EA	MULLION SEAL	5100S	GRY	NGP
2	EA	SURFACE CLOSER	4040XPM DEL EDA	689	LCN
2	EA	KICKPLATE	KO.050 10"X1.5"LDW CTSNK B4E	630	TRI
2	EA	FLR STOP/HLDR	126_ (HT AS REQ'D)	626	TRI
1	SET	SCREW-ON PERIMETER SEAL	700U HEAD & JAMBS	628	NGP
2	EA	SWEEP: BRUSH+MEMBRANE	C697 / C698	628	NGP
1	EA	6"W SADDLE THRSHLD	613 COMBO, OR	719	NGP
1	EA	1/4" OFFSET THRSHLD	653 COMBO	719	NGP
2	EA	DR POSITION SWTCH	180 / 184 / 8080-T SERIES (COORD DIV 28)	WHT	GRI

INSTALL HEAD & JAMB SEAL FIRST, FASTEN DOOR CLOSER BRACKETS AND MULLION TOP BRACKET OVER AND THROUGH THE SEAL -- DO NOT CUT THE SEAL HOUSING.

HW SET: N-02 INTERIOR MULTI-OCC STU RR, CLASSROOM DEADLOCK

3	EA	HVY-WT HNG	4C81 4.5 X 4.0 NRP	652	PBB
1	EA	MAINTENANCE DEADLK	DL4122 M34	626	C-R
2	EA	MORT. CYLINDER	CAMPUS STANDARD	626	
1	EA	PUSH/PULL PLATE SET	1894-4B 'HEALTHY HARDWARE' CFC	710CU	TRI
1	EA	SURFACE CLOSER	4040XP DEL HEDA	689	LCN
1	EA	MOP PLATE	KM.050 4"X1"LDW CTSNK B4E	630	TRI
1	EA	KICKPLATE	KO.050 12"X1.5"LDW CTSNK B4E	630	TRI
1	EA	FLR STOP	1214CK	626	TRI
1	SET	SCREW-ON PERIMETER SEAL	700U HEAD & JAMBS	628	NGP
1	EA	THRSHLD	513 COMBO	719	NGP

INSTALL HEAD & JAMB SEAL FIRST, FASTEN DOOR CLOSER BRACKETS OVER AND THROUGH THE SEAL -- DO NOT CUT THE SEAL HOUSING.

HW SET: N-03 INTERIOR STORAGE ROOM @ PLATFORM

6	EA	STD-WT HINGE	CB81 4.5 X 4.0	652	PBB
1	EA	SELF-LATCH AUTOBOLT	3825L X 3815L	626	TRI
1	EA	DUSTPROOF STK	3910(N)	630	TRI
1	EA	CLASSROOM LOCK	L9070L 06N	626	SCH
1	EA	MORT. CYLINDER	CAMPUS STANDARD	626	
1	EA	STEEL ASTRAGAL	139SP SNB + 5050C-ANTI.LIG	600	NGP
2	EA	DOOR HOLDER	PAH60	695	LCN
2	EA	WALL STOP	1270WX	630	TRI
1	EA	ADHSV GASKET	5050C ANTI-LIGATURE	BLK	NGP

HW SET: N-04 EXTERIOR TO STORAGE RM @ PLATFORM AND @ FIRE RISER

1	EA	CONTINUOUS HINGE	SL24HD	628	SEL
1	EA	STORERM LK	L9080L LLL/06A	630	SCH
1	EA	SS ARMOR COLLAR	1SB-X	630	SAR
1	EA	MORT. CYLINDER	CAMPUS STANDARD	626	
1	EA	ANTI-VANDAL PULL	1097HA SERIES	630	TRI
1	EA	SURFACE CLOSER	4040XP DEL EDA	689	LCN
1	EA	KICKPLATE	KO.050 12"X1.5"LDW CTSNK B4E	630	TRI
1	EA	FLR STOP/HLDR	126_ (HT AS REQ'D)	626	TRI
1	SET	SCREW-ON PERIMETER SEAL	700U HEAD & JAMBS	628	NGP
1	EA	SWEEP: BRUSH+MEMBRANE	C697 / C698	628	NGP
1	EA	6"W SADDLE THRSHLD	613 COMBO, OR	719	NGP
1	EA	1/4" OFFSET THRSHLD	653 COMBO	719	NGP
1	EA	DR POSITION SWTCH	180 / 184 / 8080-T SERIES (COORD DIV 28)	WHT	GRI

HW SET: N-05 EXTERIOR ROLLUP @ PLATFORM

1	EA	CYLINDER OR PADLOCK	CAMPUS STANDARD	626	
1	EA	O.H.DOOR SWITCH	200 SERIES (COORD DIV 28)	719	GRI

HW SET: N-06 INTERIOR DRESSING/WORK ROOM

3	EA	STD-WT HINGE	CB81 4.5 X 4.0	652	PBB
1	EA	ESCAPE DEADBOLT	L9460L LLL/06A L583-363 XL11-886 OS-LOC+IS-LOC	630	SCH
1	EA	MORT. CYLINDER	CAMPUS STANDARD	626	
1	EA	ROLLER LATCH	RL30-A	626	IVE
1	EA	PUSH PLATE	1820	630	TRI

1	EA	SURFACE CLOSER	4040XP DEL HEDA	689	LCN
1	EA	MOP PLATE	KM.050 4"X1"LDW CTSNK B4E	630	TRI
1	EA	KICKPLATE	KO.050 12"X1.5"LDW CTSNK B4E	630	TRI
1	EA	FLR STOP	1214CK	626	TRI
1	EA	ADHSV GASKET	5050C ANTI-LIGATURE	BLK	NGP
1	EA	DOOR SWEEP	200S	628	NGP
1	EA	THRSHLD	513 COMBO	719	NGP

HW SET: N-07 EXTERIOR TO DRESSING/WORK ROOM

1	EA	CONTINUOUS HINGE	SL24HD	628	SEL
1	EA	SECURITY CLSSRM LK	L9071L L283-711 LLL/06A	630	SCH
1	EA	SS ARMOR COLLAR	1SB-X	630	SAR
2	EA	MORT. CYLINDER	CAMPUS STANDARD	626	
1	EA	ANTI-VANDAL PULL	1097HA SERIES	630	TRI
1	EA	SURFACE CLOSER	4040XP DEL EDA	689	LCN
1	EA	KICKPLATE	KO.050 12"X1.5"LDW CTSNK B4E	630	TRI
1	EA	FLR STOP/HLDR	126_ (HT AS REQ'D)	626	TRI
1	SET	SCREW-ON PERIMETER SEAL	700U HEAD & JAMBS	628	NGP
1	EA	SWEEP: BRUSH+MEMBRANE	C697 / C698	628	NGP
1	EA	6"W SADDLE THRSHLD	613 COMBO, OR	719	NGP
1	EA	1/4" OFFSET THRSHLD	653 COMBO	719	NGP
1	EA	DR POSITION SWTCH	180 / 184 / 8080-T SERIES (COORD DIV 28)	WHT	GRI

HW SET: N-08 INTERIOR MECH / UTILITY SPACE

3	EA	STD-WT HINGE	CB81 4.5 X 4.0	652	PBB
1	EA	STORERM LK	L9080L LLL/06A	630	SCH
1	EA	MORT. CYLINDER	CAMPUS STANDARD	626	
1	EA	DOOR HOLDER	PAH60	695	LCN
1	EA	MOP PLATE	KM.050 4"X1"LDW CTSNK B4E	630	TRI
1	EA	WALL STOP	1270WX	630	TRI
1	EA	ADHSV GASKET	5050C ANTI-LIGATURE (AUX SEAL)	BLK	NGP
1	SET	SCREW-ON PERIMETER SEAL	700N HEAD & JAMBS	628	NGP
1	EA	DOOR SWEEP	200S	628	NGP
2	EA	CORNER PAD	54CP	BLK	NGP
1	EA	THRSHLD	513 COMBO	719	NGP

INSTALL HEAD & JAMB SEAL FIRST, FASTEN DOOR HOLDER BRACKETS OVER AND THROUGH THE SEAL -- DO NOT CUT THE SEAL HOUSING.

SET THRESHOLD IN FULL BED OF SEALANT FOR ACOUSTIC ISOLATION.

HW SET: N-09 INTERIOR A/V ROOM

3	EA	STD-WT HINGE	CB81 4.5 X 4.0	652	PBB
1	EA	CLASSROOM LOCK	L9070L 06N	626	SCH
1	EA	MORT. CYLINDER	CAMPUS STANDARD	626	
1	EA	SURFACE CLOSER	4040XP-H DEL	689	LCN
1	EA	MOP PLATE	KM.050 4"X1"LDW CTSNK B4E	630	TRI
1	EA	KICKPLATE	KO.050 12"X1.5"LDW CTSNK B4E	630	TRI
1	EA	FLOOR OR WALL STOP	1211 OR 1270WX (PER CONDITIONS)	626	TRI
1	EA	ADHSV GASKET	5050C ANTI-LIGATURE (AUX SEAL)	BLK	NGP
1	SET	SCREW-ON PERIMETER SEAL	700N HEAD & JAMBS	628	NGP
1	EA	DOOR SWEEP	200S	628	NGP
2	EA	CORNER PAD	54CP	BLK	NGP
1	EA	THRSHLD	513 COMBO	719	NGP

INSTALL HEAD & JAMB SEAL FIRST, FASTEN DOOR HOLDER BRACKETS OVER AND THROUGH THE SEAL -- DO NOT CUT THE SEAL HOUSING.

SET THRESHOLD IN FULL BED OF SEALANT FOR ACOUSTIC ISOLATION.

HW SET: N-10 INTERIOR UNDER-STAGE STORAGE

2	EA	SAFETY-TOP CONT.HNG	SL24-HT	628	SEL
1	EA	SURFACE BOLT	3922	652	TRI
1	EA	STORERM LK	L9080L LLL/06A	630	SCH
1	EA	SS ARMOR COLLAR	1SB-X	630	SAR
1	EA	MORT. CYLINDER	CAMPUS STANDARD	626	
1	EA	FLUSH PULL	1113	626	TRI
1	EA	STEEL ASTRAGAL	139SP SNB + 5050C-ANTI.LIG	600	NGP
2	EA	MOP PLATE	KM.050 4"X1"LDW CTSNK B4E	630	TRI
1	EA	ADHSV GASKET	5050C ANTI-LIGATURE	BLK	NGP
1	EA	SADDLE THRSHLD	413 10MSES	719	NGP

THRESHOLD: SEAL PERIMETER TO EXCLUDE SPILLS AND FLOOR-CLEANING CHEMICALS.

HW SET: N-G01 EXTERIOR SGL-LEAF CHAINLINK PEDESTRIAN GATE, PANIC HDW

1	SET	GATE HINGE+CLSR SYS	MAMMOTH-180 + CHAINLINK ADAPTERS	689	LCX
1	EA	PANIC HARDWARE	98NL-OP CD-CI AX-PA WEP	626	VON
1	EA	SS ARMOR COLLAR	1SB-X	630	SAR
1	EA	MORT. CYL (DOGGING)	CAMPUS STANDARD	626	
1	EA	RIM CYLINDER	CAMPUS STANDARD	626	
1	EA	ANTI-VANDAL PULL	1097HA SERIES	630	TRI
1	EA	POST-MT STOP+HOLDER	1260WP (COORD: PIPE)	626	TRI

HW SET: N-G02 EXTERIOR PAIRED-LEAF TUBE-STEEL PEDESTRIAN GATE, PANIC HDW

2	SET	GATE HINGE+CLSR SYS	MAMMOTH-180	BLK	LCX
1	EA	PANIC HARDWARE	98EO CD-CI AX-PA WEP	626	VON
1	EA	PANIC HARDWARE	98NL-OP CD-CI AX-PA WEP	626	VON
1	EA	SS ARMOR COLLAR	1SB-X	630	SAR
2	EA	MORT. CYL (DOGGING)	CAMPUS STANDARD	626	
1	EA	RIM CYLINDER	CAMPUS STANDARD	626	
2	EA	ANTI-VANDAL PULL	1097HA SERIES	630	TRI
2	EA	POST-MT STOP+HOLDER	1260WP (COORD: PIPE)	626	TRI

GATE OPENING HAS A FIXED SHARED MULLION INTERPOSED BETWEEN THE GATE LEAFS, AS OPPOSED TO THE BUILDERS HARDWARE TYPE USED AT GYM ENTRY PAIRED OPENINGS.

HW SET: N-G03 EXTERIOR SGL-LEAF TUBE-STEEL PEDESTRIAN GATE, PANIC HDW

1	SET	GATE HINGE+CLSR SYS	MAMMOTH-180	BLK	LCX
1	EA	PANIC HARDWARE	98NL-OP CD-CI AX-PA WEP	626	VON
1	EA	SS ARMOR COLLAR	1SB-X	630	SAR
1	EA	MORT. CYL (DOGGING)	CAMPUS STANDARD	626	
1	EA	RIM CYLINDER	CAMPUS STANDARD	626	
1	EA	ANTI-VANDAL PULL	1097HA SERIES	630	TRI
1	EA	POST-MT STOP+HOLDER	1260WP (COORD: PIPE)	626	TRI

GATE OPENING HAS A FIXED SHARED MULLION INTERPOSED BETWEEN THE GATE LEAFS, AS OPPOSED TO THE BUILDERS HARDWARE TYPE USED AT GYM ENTRY PAIRED OPENINGS.

HW SET: N-G04 EXTERIOR ROLLING GATE

1	EA	CYLINDER OR PADLOCK	CAMPUS STANDARD	626

REMAINING GATE HARDWARE PART OF GATE FABRICATION PKG.

HW SET: N-G05 EXTERIOR UTILITY/MECH'L ENCLOSURE

1	EA	CYLINDER OR PADLOCK	CAMPUS STANDARD	626

REMAINING GATE HARDWARE PART OF GATE FABRICATION PKG.

END OF SECTION

SECTION 08 81 00 GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Float glass.
   2. Tempered glass.
   3. Insulated glass.
   4. Glazing sealants.
   5. Accessories necessary for a complete installation.

1.3 DEFINITIONS

A. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C1036.

B. Interspace: Space between lites of an insulating glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. Installed Glazing: Design glazing systems to withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance:
   1. Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the CBC and ASTM E1300:
      a. Design Wind Pressures: Indicated on Structural Drawings.
      b. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE 7, based on heights above grade indicated on Drawings:
         1) Wind Design Data: As indicated on Drawings.
         2) Basic Wind Speed: 102 mph.
         3) Importance Factor: 1.0.
   2. Exposure Category: C.
   3. Maximum Lateral Deflection: For glass supported on all four edges, limit center of glass deflection at design wind pressure to not more than 1/50 times the short side length or 1 inch (25 mm), whichever is less.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties:
   1. Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
      a. For monolithic glass lites, properties are based on units with lites 6 mm thick.
      b. For insulating glass units, properties are based on units of thickness indicated for

overall unit and for each lite.

c. U-Factors: Center of glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
d. Solar Heat Gain Coefficient and Visible Transmittance: Center of glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
e. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

1.5 SUBMITTALS

A. Product Data: Technical data for each type of product including recommended installation and cleaning procedures.

B. Glass Samples: For each type of glass required. Prepare samples from same material to be used for Work. Size: 12 inch x 12 inch.

C. Glazing Schedule: List glass types and thickness for each size opening and location. Use same designations indicated on Drawings.

D. Product Certificates:
1. Submit glass product certificates required by Code:
a. Glass Manufacturer Certificate: The glass manufacturer shall submit a letter certifying it has reviewed the glazing details proposed for the project, including the use of gaskets and sealants, and that each product furnished is recommended for the application shown and compliance with the Code.

E. Product Test Reports:
1. Submit test reports for insulating glass and glazing sealants, for tests performed by a qualified testing agency:
a. Glazing Sealants: Provide test reports based on testing current sealant formulations within previous 36 month period.
b. Glazing Sealants: Preconstruction adhesion and compatibility test report.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with applicable requirements of the CBC for glazing.
2. Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies:
a. As a minimum provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission *Safety Standard for Architectural Glazing Materials*, published in the Code of Federal Regulations) and ANSI Z97.1.
b. Permanently mark safety glass with certification label of Safety Glazing Certification Council.
3. Insulating Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
4. Comply with published recommendations of glass product organizations:
a. GANA: Glazing Manual.
b. IGMA: SIGMA TM-3000 Vertical Glazing Guidelines.
c. GANA: Laminated Glazing Reference Manual.
d. AAMA: AAMA GDSG-1 Glass Design for Sloped Glazing.
e. AAMA: TIR A7 Sloped Glazing Guidelines.
f. IGMA for Sloped Glazing: IGMA TB-3001 Guidelines for Sloped Glazing.
g. IGMA for Insulating Glass: SIGMA TM-3000 North American Glazing Guidelines for

Sealed Insulating Glass Units for Commercial and Residential Use.

5. Fire Rated Door Assemblies: Assemblies complying with NFPA 80 listed and labeled by UL for fire ratings indicated, based on testing according to NFPA 252.
6. Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated:
   a. Minimum Glass Thickness for Exterior Lites: 1/4 inch (6 mm).
   b. Thickness of Tinted Glass: Provide same thickness for each tint color indicated.
7. Where annealed float glass is indicated, provide annealed float glass, heat strengthened float glass, or fully tempered float glass necessary to comply with performance requirements:
   a. Where heat strengthened float glass is indicated, provide heat strengthened float glass or fully tempered float glass necessary to comply with performance requirements.
   b. Where fully tempered float glass is indicated, provide fully tempered float glass.

B. Manufacturer Qualifications for Insulating Glass Units with Sputter Coated, Low E Coatings: Insulating glass manufacturer who is approved and certified by coated glass manufacturer.

C. Installer Qualifications, Glazer: Experience entity having minimum 5 years documented experience and who employs glass installers certified under the National Glass Association's Certified Glass Installer Program.

D. Installer Qualifications, Decorative Film: Experience entity having minimum 5 years documented experience in the installation of glass films.

E. Source Limitations for Glass and Glass Accessories: Obtain each type of glass and glass accessories from a single source.

F. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

G. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

H. Preconstruction Adhesion and Compatibility Testing:
1. Test each glass product, tape sealant, gasket, glazing accessory, and glass framing member for adhesion to and compatibility with elastomeric glazing sealants:
   a. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   b. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   c. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   d. Schedule enough time for testing and analyzing results to prevent delaying the Work.
   e. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

I. Pre-installation Conference: Conduct conference at site.

1.7 WARRANTY

A. Written warrant, executed by glass manufacturer agreeing to repair or replace **glass** units

that fail in materials and workmanship or deteriorate within warranty period. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to decorative glass manufacturer's published instructions:
1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Written warranty signed by manufacturer in which glass manufacturer agrees to replace **coated glass** units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating:
1. Warranty Period: Ten (10) years from date of Substantial Completion.

C. Written warranty signed by manufacturer in which manufacturer agrees to replace **insulating glass** units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass:
1. Warranty Period: Ten (10) years from date of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by manufacturer.

D. Exercise exceptional care to prevent edge damage to glass, and damage/deterioration to coating on glass.

E. Comply with insulating glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
1. Glass:
   a. Vitro Architectural Glass (Basis of Design).
   b. AGC Glass Company North America, Inc.
   c. Cardinal Glass Industries.
   d. Guardian Industries Corp.;
   e. Pilkington North America.
   f. Viracon.

B. Ultraclear Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3.

C. Fully Tempered Float Glass:
   1. ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) as indicated, Quality-Q3:
      a. Fabrication Process: By horizontal (roller hearth) process with roll wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.2 INSULATING GLASS

A. Factory assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190.

B. Performance Properties:
   1. Basis of Design Product: Vitro Architectural Glass:
   2. Overall Unit Thickness: 1 inch (25 mm).
   3. Minimum Thickness of Each Glass Lite: 1/4 inch (6 mm).
   4. Outdoor Lite: Fully tempered float glass.
   5. Interspace Content: Air.
   6. Indoor Lite: Fully tempered float glass.
   7. Safety glazing required.

C. Sealing System:
   1. Dual seal, with polyisobutylene and silicone primary and secondary sealants:
      a. Spacer: Aluminum with black, color anodic finish. Thermally broken aluminum.
      b. Manufacturers: Subject to compliance with requirements, provide products by Technoform Glass Insulation NA, Inc.
      c. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.3 GLAZING ACCESSORIES

A. Compatibility: Provide glazing sealants compatible with one another and with other materials in contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of service and application, demonstrated by sealant manufacturer based on testing and field experience.

B. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

C. Colors of Exposed Glazing Sealants: Selected by Architect.

D. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Dow Corning Corporation.
      b. GE Construction Sealants; Momentive Performance Materials Inc.
      c. May National Associates, Inc.; a subsidiary of Sika Corporation.
      d. Pecora Corporation.
      e. Sika Corporation.

E. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. BASF Corporation; Construction Systems.

b. Dow Corning Corporation.
c. GE Construction Sealants; Momentive Performance Materials Inc.
d. May National Associates, Inc.; a subsidiary of Sika Corporation.
e. Pecora Corporation.
f. Polymeric Systems, Inc.
g. Sika Corporation.

F. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
a. Bostik, Inc.
b. Dow Corning Corporation.
c. GE Construction Sealants; Momentive Performance Materials Inc.
d. May National Associates, Inc.; a subsidiary of Sika Corporation.
e. Polymeric Systems, Inc.
f. Schnee-Morehead, Inc., an ITW company.
g. Sika Corporation.

G. Glazing Sealant - Acid curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
a. BASF Corporation; Construction Systems.
b. Bostik, Inc.
c. Dow Corning Corporation.
d. GE Construction Sealants; Momentive Performance Materials Inc.
e. May National Associates, Inc.; a subsidiary of Sika Corporation.
f. Pecora Corporation.
g. Polymeric Systems, Inc.
h. Schnee-Morehead, Inc., an ITW company.
i. Sika Corporation.

H. Glazing Sealants for Fire rated Glazing Products - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
a. Dow Corning Corporation.
b. GE Construction Sealants; Momentive Performance Materials Inc.
2. Colors of Exposed Glazing Sealants: Selected by Architect.

I. Back Bedding Mastic Glazing Tapes:
1. Preformed, butyl based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
a. Tape, where indicated.
b. Tape, for glazing applications in which tape is subject to continuous pressure.
c. Tape, for glazing applications in which tape is not subject to continuous pressure.

J. Expanded Cellular Glazing Tapes:
1. Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
a. Type 1, for glazing applications in which tape acts as the primary sealant.

b. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

K. Miscellaneous Glazing Accessories:
1. Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with proven record of compatibility with surfaces contacted in installation:
a. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
b. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
c. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
d. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
e. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
f. Perimeter Insulation for Fire Resistive Glazing: Product approved by testing agency listed and labeled fire resistant glazing product with which it is used for application and fire protection rating indicated.

2.4 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements:
1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components:
a. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F, material surfaces.
2. Edge and Surface Conditions: Comply with the recommendations of AAMA *Structural Properties of Glass* for clean cut edges, except comply with manufacturer's recommendations.
3. Exposed Glass Edges and Surface Condition: Finish edges flat with an arrissed edge profile (small bevel of uniform width not exceeding 1.5 mm at an angle of approximately 45 degrees to the surface of the glass) with polished (surface is reflective in appearance similar to the major surface of the glass) surface.

B. Cutting: Wheel cut or sawed edges and seamed at manufacturer's option. For site cut glass, provide glass 2 inches larger than required in both dimensions to facilitate cutting of clean cut edges without the necessity of seaming or nipping. Do not cut, seam, nip or abrade heat treated glass.

C. Butt Glazing: Clean cut or flat grind vertical edges of butt glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

D. Edges: Grind smooth and polish exposed glass edges and corners.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Environmental Limitations:
   1. Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes:
      a. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 degrees F.

B. Field Measurements: Verify actual dimensions of openings and construction contiguous with decorative glass by field measurements before fabrication.

3.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

3.3 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation after correcting unsatisfactory conditions.

3.4 PREPARATION

A. Clean glazing channels and framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates:
   1. Comply with manufacturer instructions for wiping of surfaces immediately before application of primers.
   2. Wipe metal surfaces with IPA (isopropyl alcohol) unless otherwise required by compatibility and adhesion testing results.

B. Inspect each piece of glass immediately before installation. Do not install pieces improperly sized or with damaged edges, scratches, abrasion, or evidence damage. Remove labels from glass immediately after installation.

C. Examine glazing units to locate exterior and interior surfaces. Label or mark units so exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

D. Seal vent (breather or capillary) tubes in insulating glass units in accordance with insulating glass manufacturer written recommendations.

3.5 GLAZING

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with

edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm):
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8 inch (3 mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement:
   1. Square cut wedge shaped gaskets at corners and install gaskets as recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

K. Tape Glazing:
   1. Position tapes on fixed stops so that, when compressed by glass, the exposed edges are flush with or protrude slightly above sightline of stops:
      a. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make tapes fit opening.
      b. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
      c. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
      d. Do not remove release paper from tape until right before each glazing unit is installed.
      e. Apply heel bead of elastomeric sealant.
      f. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
      g. Apply cap bead of elastomeric sealant over exposed edge of tape.

L. Gasket Glazing (Dry):
1. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation:
   a. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
   b. Installation with Drive in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
   c. Installation with Pressure Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
   d. Install gaskets to protrude past face of glazing stops.

M. Sealant Glazing (Wet):
1. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance:
   a. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
   b. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

N. Erection Tolerances:
1. Maximum Deviation from Vertical: 1/8 inch in any story and 1/4 inch in any 45 foot run.
2. Maximum Deviation from Horizontal: 1/8 inch in any 30 foot run.
3. Maximum Deviation from True Alignment: 1/32 inch for any two (2) abutting units. Allow no edge projections.
4. Maximum Joint Gap: 1/32 inch.

O. Insulating-Glass Unit(s): **CTG1** (transparent)
1. Double Glazed Tinted Solar Control Insulating Glass Unit; 6mm Solarban® 70 (2) | Air 1/2" (12.7mm) | 6mm Clear:
   a. Conformance: ASTM E2190.
   b. Outdoor Lite: Tempered Float Glass as manufactured by Vitro Architectural Glass:
      1) Conformance: ASTM C1036, Type 1, Class 2, Quality q3.
      2) Glass Thickness: 6mm (1/4")
      3) Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C1376.
      4) Coating: Solarban® 70 on Surface # 2
   c. Interspace Content: Air 1/2" (12.7mm)
   d. Indoor Lite: Clear tempered float glass as manufactured by Vitro Architectural Glass:
      1) Conformance: ASTM C1036, Type 1, Class 1, Quality q3.
      2) Glass Thickness: 6mm (1/4")
   e. Performance Requirements:
      1) Visible Light Transmittance: 64 percent minimum.
      2) Winter Nighttime U-Factor: 0.28 (Btu/hr*ft2*°F) maximum.
      3) Shading Coefficient: 0.31 maximum.

4) Solar Heat Gain Coefficient: 0.27 maximum.
5) Outdoor Visible Light Reflectance: 13 percent maximum.

3.6 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains:
   1. If contaminating substances come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 09 29 00 GYPSUM BOARD

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes requirements including but not limited to:
   1. Paper faced gypsum board.
   2. Mold, mildew, moisture resistant paper faced gypsum board.
   3. Fiberglass mat faced gypsum board.
   4. Accessories.
   5. Trim.
   6. Joint tape.
   7. Joint compounds.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A108 Interior Installation of Cementitious Backer Units.

B. ASTM International (ASTM):
   1. ASTM C475/C475M Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
   2. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board.
   3. ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications.
   4. ASTM C1002 Standard Specifications for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
   5. ASTM C1178/C1178M Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
   6. ASTM C1325 Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units.
   7. ASTM C1396/C1396M Standard Specification for Gypsum Board.
   8. ASTM C1629/C1629M Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
   9. ASTM C1658/C1658M Standard Specification for Glass Mat Gypsum Panels.
   10. ASTM C1766 Standard Specification for Factory-Laminated Gypsum Panel.
   11. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
   12. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
   13. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. Gypsum Association (GA):
   1. GA-214 Recommended Levels of Gypsum Board Finish.
   2. GA-216 Application and Finishing of Gypsum Panel Products.

1.4 SUBMITTALS

A. Product Data: Submit for each type of drywall including calculations for loadings and stresses of exterior walls and specially fabricated framing based on manufacturer's load tables.
   1. Gypsum Board.
   2. Trim accessories.

B. Shop Drawings: Indicate locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

C. Samples:
   1. Trim Accessories: Full size Sample in 12 inch (300 mm) long length for each trim accessory indicated.
   2. Textured Finishes: 12 inches by 12 inches (300 mm by 300 mm) for each textured finish indicated and on same backing indicated for Work.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. 2022 California Building Code (CBC) (CCR Title 24, Part 2, as adopted and amended by DSA):
      a. CBC-7 – Chapter 7, Fire Resistant Materials and Construction
      b. CBC-19A – Chapter 19A, Concrete
      c. CBC – Chapter 25, Gypsum Board and Plaster.
   2. Division of the State Architect, Interpretation of Regulations (DSA-IR):
      a. DSA-IR 25-3, Drywall Ceiling Suspension Conventional Construction-One Layer.
      b. DSA-IR 25-2.13, Metal Suspension Systems for Lay in Panel Ceilings.
   3. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. Single Source Responsibility:
   1. Framing Members: Obtain steel framing members from single manufacturer.
   2. Panel Products: Obtain each type of gypsum board and other panel products from single manufacturer.
   3. Finishing Materials: To the extent possible, obtain finishing materials from same manufacturer supplying gypsum board products. When not possible, obtain materials from manufacturer acceptable to gypsum board manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

PART 2 PRODUCTS

2.1 MATERIALS

A. Basis of Design: Products from **National Gypsum Company**, 2001 Rexford road, Charlotte, North Carolina 2811. 704-365-7300 ng@nationalgypsum.com.
   1. All other manufacturers are subject to compliance with requirements to match or

exceed products listed here-in.

2.2 PAPER FACED GYPSUM BOARD

A. Gypsum Board, Regular Core, ASTM C1396/C1396M:
   1. Gold Bond® Gypsum Board.
   2. Gold Bond® High Strength LITE® Gypsum Board.
   3. Gold Bond® High Flex® Gypsum Board.
      a. Thickness: 1/2 inch.
      b. Core: Regular.
      c. Edges: Tapered.

B. Gypsum Board, Fire-Resistant Core: ASTM C1396/C1396M.
   1. Gold Bond® Fire-Shield C™ 5/8" Gypsum Board.
      a. Thickness: 5/8 inch.
      b. Core: Type X.
      c. Edges: Tapered.

2.3 MOLD, MILDEW, MOISTURE RESISTANT PAPER FACED GYPSUM BOARD

A. Gypsum Board, Regular Core, Mold, Mildew, Moisture Resistant: ASTM C1396/C1396M.
   1. Gold Bond® XP® Gypsum Board.
      a. Thickness: 1/2 inch.
      b. Core: Regular.
      c. Edges: Tapered.
      d. Mold/Mildew Resistance: ASTM D3273; Score of 10.
      e. Mold/Mildew Resistance: ASTM G21, Score of 0.

B. Gypsum Board, Fire Resistant Core, Mold, Mildew Moisture Resistant: ASTM C1396/C1396M.
   1. Gold Bond® XP® Fire-Shield C™ 5/8" Gypsum Board.

2.4 ACCESSORIES

A. Acoustical Sealant: ASTM C919.
   1. Manufacturers and Products:
      f. Grabber Construction Products; Acoustical Sound and Smoke Sealant GSCSF.
      a. Specified Technologies Inc.; SpecSeal SNS Smoke N Sound Acoustical Sealant.
      b. BOSS Products; BOSS 826 Acoustical Acrylic Sound Sealant.

B. Firestopping: ASTM E814.
   1. Manufacturers and Products:
      a. Specified Technologies Inc.; SpecSeal SSP Putty & Putty Pads.
      b. BOSS Products; BOSS 818 Fire Rated Putty Pads.

C. Fasteners for 5/8 inch thick panels:
   1. Metal Framing: 1-1/4 inch minimum corrosion resistant sharp point or drill point bugle head screw, or min required by fire-rated assembly.

2.5 JOINT TAPE

A. Paper Tape: 2-1/16 inch wide, cross-fibered paper, ASTM C475/C475M.
   1. ProForm™ Paper Joint Tape.

B. Fiberglass Mesh Tape: Polymer-coated (alkali-resistant) fiberglass mesh.

1. PermaBASE™ Cement Board Tape, 4 inch.

2.6 JOINT COMPOUNDS

A. Setting Type Compound
   1. Field mixed quick setting and hardening: ASTM C475/C475M.
      a. ProForm® Quick Set™ Setting Compound.
   2. Field mixed quick setting and hardening; fire resistant: ASTM E814.
      a. ProForm® Quick Set™ Fire and Smoke Stop 90 Setting Compound.

B. Drying Type Compound:
   1. Ready mix, vinyl base: ASTM C475/C475M.
      a. ProForm® Multi-Use Joint Compound.
      b. ProForm® All Purpose Joint Compound.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Limitations:
   1. Comply with ASTM C840 for gypsum board manufacturer's written instructions, whichever are more stringent:
      c. Do not install paper faced gypsum panels until installation areas are enclosed and conditioned.

B. Room Temperatures: Maintain minimum 40 degrees F (4 degrees C). For adhesive attachment and finishing of gypsum board, maintain minimum 50 degrees F (10 degrees C) for 48 hours before application and continuously after until dry. Do not exceed 95 degrees F (35 degrees C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

D. Do not install panels that are wet, moisture damaged, and mold damaged:
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.2 EXAMINATION

A. Examine areas and substrates including welded hollow metal frames, cast in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.4 INSTALLATION

A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated. Install in accordance with:
   1. Manufacturer recommendations.
   2. ANSI A108.
   3. GA-214.
   4. GA-216.

B. Gypsum Board Assemblies: Comply with requirements in ASTM C840 applicable to framing installation.

C. Gypsum Board:
   1. Install interior gypsum board where indicated on drawings.
      a. Single Layer Application:
         1) On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
         2) On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints. Stagger abutting end joints not less than one framing member in alternate courses of panels.
         3) Fastening Methods: Apply gypsum panels to supports with steel drill screws.
      b. Multilayer Application:
         1) On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
         2) On Z shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
         3) Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Exterior Gypsum Board Soffits:
   1. Apply panels perpendicular to supports, with end joints staggered and located over supports:
      a. Install with 1/4 inch open space where panels abut other construction or structural penetrations.
      b. Fasten with corrosion-resistant screws.

E. Trim Accessories:
   1. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Attach trim according to manufacturer's written instructions:
      a. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
      b. Exterior Trim:
         1) Install in the following locations:
            a) Cornerbead: Use at outside corners.
            b) LC Bead: Use at exposed panel edges.
      c. Interior Trim - Install in the following locations:
         1) Cornerbead: Use at outside corners, unless otherwise indicated.
         2) Bullnose Bead: Use at outside corners.
         3) LC Bead: Use at exposed panel edges.
         4) L Bead: Use where indicated or necessary.
         5) U Bead: Use at exposed panel edges.

F. Gypsum Board Finishing:
   1. Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces:
      a. Prefill open joints, rounded or beveled edges, and damaged surface areas.
      b. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
      c. Gypsum Board Finish Levels - Finish panels to levels indicated below and according to ASTM C840:
         1) Level 1: Ceiling plenum areas, concealed areas, and where indicated.
         2) Level 2: Panels that are substrate for tile.
         3) Level 3: Surfaces be coated with drywall primer prior to final finishes. Heavy or medium texture finishes before final painting, or where heavy-grade wall coverings are to be applied as the final decoration. This level of finish is not recommended where smooth painted surfaces, or light to medium weight wall coverings as specified.
         4) Level 4: For surfaces receiving wall covering and flat paints.
         5) Level 5: For surfaces receiving gloss or semigloss paint and surfaces subjected to severe lighting. To be used in Kitchen areas and food service areas only.

3.5 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged:
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 00 TILING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Ceramic mosaic tile.
   2. Accessories required for indicated installation.

B. Reference Standards:
   1. American National Standards Institute (ANSI).
   2. Tile Council of North America (TCNA):
      a. Reference TCNA method numbers for tile assemblies.
   3. Comply with Health Department requirements for tile in food service facilities

1.3 SUBMITTALS

A. Product Data: Technical data including data sheets, installation recommendation, and recommended joint widths.

B. Shop Drawings - Show locations of each type of tile and tile pattern:
   1. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples - Submit samples showing full range of color and texture variations expected:
   1. Full size units of each type and composition of tile and for each color and finish required.
   2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required; minimum 12 inches (300 mm) square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed work.
   3. Waterproof membrane in 6 x 6-inch sample.

D. Test Reports: Submit test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile products with requirements for slip resistance.

E. Maintenance Instructions: Submit maintenance instructions for each type of product specified.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Building Code: Comply with applicable requirements for the CBC for interior finishes.
   2. Surface Burning Characteristics - ASTM E84; identify products with appropriate markings of applicable testing agency:
      a. Flame Spread Index: 25 or less.
      b. Smoke Developed Index: 450 or less.

3. Accessibility Requirements - Comply with applicable requirements:
   a. Americans with Disabilities Act of 1990, as amended:
      1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design
   b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
      1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

B. Source Limitations for Tile: Obtain tile of same type and color or finish from one source or producer. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products:
   1. Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
      c. Waterproofing.
      d. Joint sealants.
      e. Metal edge strips.

E. Mockups:
   1. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
      a. Build mockup of each type of wall tile installation.
      b. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 WARRANTY

A. Warrant the work specified, including backer boards but not limited to, for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided. Store liquid materials in unopened containers and protected from freezing.

C. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

PART 2 PRODUCTS

2.1 MATERIALS

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types,

compositions, and other characteristics indicated. Provide tile complying with Standard grade requirements.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting - For factory mounted tile, provide back or edge mounted tile assemblies as standard with manufacturer unless otherwise indicated:
   1. Where tile is indicated for installation on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.2 TILE PRODUCTS

A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   1. Ceramic Tile:
      a. Daltile.
      b. Or approved equal.

B. Ceramic Wall Tile (CT-1): Field Color… 90%
   1. Basis of Design Product/Manufacturer: **Daltile**
   2. Composition: Glazed Ceramic
   3. Collection: Color Wheel Classic
   4. Color: To be selected by Architect
   5. Module Size: 3 inches x 6 inches
   6. Thickness: 5/16 inch (8 mm).
   7. Finish: Semi-Gloss
   8. Pattern/layout: See drawings
   9. Grout Color: Selected by Architect unless noted otherwise.
   10. Trim Units - Coordinated with sizes and coursing of adjoining flat tile where applicable matching characteristics of adjoining flat tile. Provide shapes selected from standard shapes:
      a. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inch by 1 inch (50.8 mm by 25.4 mm) or 2 inch by 2 inches (50.8 mm by 50.8 mm).
      b. External Corners for Thinset Mortar Installations: Surface bullnose, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inch by 1 inch (50.8 mm by 25.4 mm) or 2 inch by 2 inches (50.8 mm by 50.8 mm).
      c. Internal Corners: Field-butted square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.

C. Ceramic Wall Tile (CT-2): Accent Color… 10%
   1. Basis of Design Product/Manufacturer: **Daltile**
   2. Composition: Glazed Ceramic
   3. Collection: Color Wheel Classic
   4. Colors: To be selected by Architect
   5. Module Size: 3 inches x 6 inches
   6. Thickness: 5/16 inch (8 mm).
   7. Finish: Semi-Gloss

8. Pattern/layout: See drawings
9. Base: 3 inch high by 6 inch wide ceramic tile cove base to match wall tile.
10. Grout Color: Selected by Architect unless noted otherwise.
11. Trim Units - Coordinated with sizes and coursing of adjoining flat tile where applicable matching characteristics of adjoining flat tile. Provide shapes selected from standard shapes:
    d. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inch by 1 inch (50.8 mm by 25.4 mm) or 2 inch by 2 inches (50.8 mm by 50.8 mm).
    e. External Corners for Thinset Mortar Installations: Surface bullnose, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inch by 1 inch (50.8 mm by 25.4 mm) or 2 inch by 2 inches (50.8 mm by 50.8 mm).
    f. Internal Corners: Field-butted square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.

2.3 WATERPROOF MEMBRANE

A. Waterproof membrane recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid Applied Membrane - Liquid latex rubber or elastomeric polymer:
   1. Basis of Design - **Laticrete 9235 Waterproofing Membrane**:
      a. Subject to compliance with requirements, provide basis if design or comparable product by one of the following:
         1) Laticrete International, Inc.
         2) MAPEI Corporation.
         3) TEC; H.B. Fuller Construction Products Inc.

C. Fabric Reinforced, Fluid Applied Membrane:
   1. System consisting of liquid latex rubber or elastomeric polymer and continuous fabric reinforcement.
      a. Basis of Design - **Laticrete 9235 Waterproofing Membrane** and reinforcing Fabric. Subject to compliance with requirements, provide basis if design or comparable product by one of the following:
         1) Laticrete International, Inc.
         2) MAPEI Corporation.
         3) Merkrete by Parex USA, Inc.

D. Latex Portland Cement Waterproof Mortar:
   1. Flexible, waterproof mortar consisting of cement based mix and latex additive:
      a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
         1) C-Cure.
         2) MAPEI Corporation.
         3) TEC; H.B. Fuller Construction Products Inc.

E. Liquid Latex Waterproofing/Crack Isolation Membrane:
   1. Single Component, self-curing, load bearing liquid rubber polymer that forms a flexible seamless combined waterproofing membrane and crack isolation membrane:
      a. Basis of Design - **Hydroban by Laticrete International**. Subject to compliance with requirements, provide basis of design or comparable product by one of the following:
         1) Laticrete International, Inc.
         2) MAPEI Corporation.
         3) TEC; H.B. Fuller Construction Products Inc.

2.4 CRACK ISOLATION MEMBRANE

A. Crack isolation membrane for standard performance and recommended by manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric Reinforced, Modified Bituminous Sheet – Self-adhering, modified bituminous sheet with fabric reinforcement facing; 0.040-inch (1 mm) nominal thickness:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Custom Building Products.
      b. MAPEI Corporation.

C. Fluid Applied Membrane - Liquid latex rubber or elastomeric polymer:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Custom Building Products.
      b. Laticrete International, Inc.
      c. MAPEI Corporation.
      d. Merkrete by Parex USA, Inc.
      e. TEC; H.B. Fuller Construction Products Inc.

D. Fabric Reinforced, Fluid Applied Membrane - System consisting of liquid latex rubber or elastomeric polymer and fabric reinforcement:
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Bonsal American, an Oldcastle company.
      b. Bostik, Inc.
      c. Custom Building Products.
      d. Laticrete International, Inc.
      e. MAPEI Corporation.
      f. Merkrete by Parex USA, Inc.

2.5 SETTING MATERIALS

A. Dry Set Mortar (Thinset):
   1. Mortar Bed - Proportions of 1 part Portland Cement to 5 parts sand:
      a. Portland Cement: ASTM C150, Type 1.
      b. Sand: ASTM C144.
      c. Water: Potable.
   2. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Custom Building Products.
      b. Laticrete International, Inc.
      c. MAPEI Corporation.
   3. Wall Applications: Provide mortar complying with requirements for non-sagging mortar.

B. Improved Modified Dry Set Mortar (Thinset):
   1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
      a. Laticrete International, Inc.
      b. MAPEI Corporation.
      c. TEC; H.B. Fuller Construction Products Inc.
   2. Provide prepackaged, dry mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at Project site.

3. For wall applications, provide mortar complying with requirements for non-sagging mortar.

C. Tile Setting Epoxy - Water cleanable; 100 percent solids epoxy grout:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   a. Polyblend Tile Grout with 100% Solids Epoxy; Custom Building Products.
   b. SpectraLOCK PRO Stainless Grout; Laticrete International, Inc.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F and 212 degrees F (60 degrees C and 100 degrees C), respectively, and certified by manufacturer for intended use.
3. Color: Selected by Architect.

2.6 GROUT MATERIALS

A. Water Cleanable Epoxy Grout:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   a. Polyblend Tile Grout with 100% Solids Epoxy; Custom Building Products.
   b. SpectraLOCK PRO Stainless Grout; Laticrete International, Inc.
   c. MAPEI Corp., Kerapoxy or Kerapoxy CQ Epoxy Grout.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F and 212 degrees F (60 degrees and 100 degrees C), respectively, and certified by manufacturer for intended use.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex modified, Portland cement-based formulation provided or approved by manufacturer of tile setting materials for installations indicated.

B. Vapor Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Tile and Grout Sealer - Sealer for sealing grout joints and that does not change color or appearance of grout:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   a. Custom Building Products.
   b. Summitville Tiles, Inc.
   c. TEC; H.B. Fuller Construction Products Inc.

E. Sealant - Silicone sealant; refer to Section 07 92 00:
1. Top of Wainscot: Bullnose

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

B. Contractor is required to achieve the specified concrete moisture content prior to installation of all flooring materials or use a flooring manufacture approved moisture barrier prior to installation of all flooring products.

C. Maintain temperatures at 50 degrees F or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

3.2 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents:
   1. Tile and Trim Units: Furnish quantity of full size units equal to 2 percent of field tile and 5 percent of amount installed trims, accent tiles, and shapes, composition, color, pattern, and size indicated.
   2. Grout: Furnish quantity of grout equal to 2 percent of amount installed for each type, composition, and color indicated.

3.3 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of the work:
   1. Verify substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108 for installations indicated.
   2. Verify concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108 for installations indicated:
      a. Verify surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify protrusions, bumps, and ridges have been removed by sanding or grinding.
   3. Verify installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
   4. Verify joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation after correcting unsatisfactory conditions.

3.4 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically

recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108 and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at site before installing.

3.5 INSTALLATION

A. Comply with TCNA *Handbook for Ceramic, Glass, and Stone Tile Installation* for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series *Specifications for Installation of Ceramic Tile* that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used:

B. Grout:
1. Walls: Non-sanded grout.
2. Grout to be sealed 28 days after installation.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Provide trim shapes where necessary to eliminate exposed tile edges.

F. Where accent tile differs in thickness from field tile, vary setting bed thickness so tiles are flush.

G. Jointing Pattern:
1. Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated:
   a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   c. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

H. Joint Widths - Unless otherwise indicated, install tile with the following joint widths:
1. Ceramic Mosaic Tile: 1/8 inch (3.2 mm).
2. Porcelain Tile: 1/4 inch (6.4 mm), or per manufacturer for sheet mosaics

I. Lay out tile wainscots to dimensions indicated.

J. Expansion Joints:
   1. Provide expansion joints and sealant filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installing tiles:
      a. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile and no threshold is indicated.

L. Waterproofing:
   1. Install waterproofing to manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate:
      a. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

M. Crack Isolation Membrane:
   1. Install crack isolation membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate:
      a. Allow crack isolation membrane to cure before installing tile or setting materials over it.

N. Wall Tile Installation:
   1. Install types of tile designated for wall installations to comply with requirements, including those referencing TCNA installation methods and ANSI setting bed standards:
      a. Back Buttering - For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
         1) Tile wall installations in wet areas, including showers.
         2) Tile installed with chemical resistant mortars and grouts.

3.6 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning - On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter:
   1. Remove grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION

SECTION 09 65 13 RESILIENT BASE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Rubber base.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data: Technical data for each type of product including manufacturer's installation instructions.

B. Samples: Sample of Base Selected or Color Chart if none selected.

C. Maintenance Data: Submit for inclusion in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Entity having minimum 5 years documented experience who employs workers competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store base and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F (10 degrees C) or more than 85 degrees F (29 degrees C). Store floor tiles on flat surfaces.

PART 2 PRODUCTS

2.1 MATERIALS

A. Basis of Design Product:
   1. Manufacturers and tile series, pattern, and color selections are indicated in the Finish Schedule and are a basis of design. Subject to compliance with requirements, provide product indicated in Finish Schedule or comparable product by one of the following:
      a. Johnsite, a division of Tarkett Group.
      b. Burke, a division of Mannington Commercial.
      c. The R.C. Musson Rubber Co.

B. Rubber Base - ASTM F1861:
   1. Material: Rubber, vulcanized, Type TS, Group I, Styles A and B.
   2. Manufacturing Method: Group I (solid, homogeneous).
   3. Style: Topset cove; minimum 100 foot coil, cut to length required.
   4. Minimum Thickness: 0.125 inch (3.2 mm).

5. Color: Selected by Architect.
6. Height: 4 inches, unless otherwise indicated on drawings.
7. Outside Corners: Job formed.
8. Inside Corners: Job formed.

C. Adhesives: Water resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F (21 degrees C) or more than 85 degrees F (29 degrees C), in spaces to receive floor tile during the following time periods:
1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees F (13 degrees C) or more than 95 degrees F (35 degrees C).

C. Close spaces to traffic for 48 hours after installation.

3.2 EXAMINATION

A. Examine substrates for compliance with requirements for maximum moisture content and other conditions affecting performance of the work:
1. Verify that finishes of substrates comply with tolerances and other requirements specified for other work and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation after correcting unsatisfactory conditions. Installation of resilient flooring and accessories indicates acceptance of surfaces and conditions.

3.3 PREPARATION

A. Immediately before installation, sweep clean substrates to be covered by resilient base.

3.4 INSTALLATION

A. Comply with manufacturer's written instructions for installing flooring. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Extend flooring into toe spaces, door reveals, closets, and similar openings.

B. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.

C. Resilient Base:
1. Comply with manufacturer's written instructions for installing resilient base. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required:

a. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
b. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
c. Do not stretch resilient base during installation.
d. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
e. Preformed Corners: Install preformed corners before installing straight pieces.
f. Job Formed Corners:
    1) Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
    2) Form without producing discoloration (whitening) at bends.
    3) Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length:
        a) Miter or cope corners to minimize open joints.

END OF SECTION

SECTION 09 65 23 LUXURY VINYL TILE FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes requirements limited to:
   1. Luxury vinyl floor tile.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data: Technical data for each type of product including manufacturer's installation instructions.

B. Shop Drawings - For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built in furniture, cabinets, and cutouts:
   1. Show details of special patterns.

C. Samples - Full size units of each color and pattern of floor tile required:
   1. Luxury Vinyl Tile (LVT) flooring: 18 inch by 18 inch (460 mm by 460 mm) tile in each color selected and 12 inch long piece of base material in each color selected for approval.

D. Product Schedule: Submit for floor tile using same designations indicated on Drawings.

E. Maintenance Data: Submit for inclusion in maintenance manuals.

F. Reports: Certified Moisture Testing Results.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Fire Test Response Characteristics - For resilient tile flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency:
      a. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
      b. Smoke Density: Maximum specific optical density of 450 per ASTM E662.
   2. Accessibility Requirements - Comply with applicable requirements:
      a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).
      b. 2022 CBC Section 11B-302.1.

B. Installer Qualifications: Entity having minimum 5 years documented experience who employs workers competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

C. Contractor is required to achieve the specified concrete moisture content prior to installation of all flooring materials or use a flooring manufacture approved moisture barrier prior to installation of all flooring products. Contractor shall provide certified moisture testing results

per ASTM F2170 (*Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes*) to Architect and Owner prior to floor installation. Acceptable moisture content of concrete sub floor shall be within approved manufacture limits or lower prior to installation.

D. Source Limitations:
1. Tile: Obtain floor products of same type and color or finish from one source or producer. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
2. Setting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

1.5 WARRANTY

A. Warrant the Work specified herein for ten (10) years against becoming unserviceable or causing an objectionable appearance resulting from either defective, or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to, the following:
1. Damaged tile, including broken or chipped edges.
2. Loose or missing tile.
3. Noticeable deterioration or discoloring of tile or grout.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F (10 degrees C) or more than 85 degrees F (29 degrees C). Store floor tiles on flat surfaces.

PART 2 PRODUCTS

2.1 MATERIALS

A. Basis of Design Product:
1. Manufacturers and tile series, pattern, and color selections are indicated in the Finish Schedule and are a basis of design. Subject to compliance with requirements, provide product indicated in Finish Schedule or comparable product by one of the following:
a. Luxury Vinyl Tile (LVT):
1) Basis of Design: **Armstrong World Industries - LVT**
2) Alternates include:
a) Tarkett
b) Or approved equal

B. Luxury Solid Vinyl Tile (LVT-1) - ASTM F1700:
1. Collection: To be selected by Architect.
2. Color: To be selected by Architect.
3. Thickness: 0.125 inch (3.2 mm).
4. Size: 18” x 36”
5. Design: Mystix
6. Shape: Plank

C. Trowelable Leveling and Patching Compounds: Latex modified, portland cement based formulation provided or approved by floor tile manufacturer for applications indicated.

D. Adhesives: Water resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

E. Floor Polish: Provide protective, liquid floor polish products recommended by floor tile manufacturer.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F (21 degrees C) or more than 85 degrees F (29 degrees C), in spaces to receive floor tile during the following time periods:
1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees F (13 degrees C) or more than 95 degrees F (35 degrees C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Where demountable partitions, cabinets, and similar items are indicated for installation on top of resilient tile flooring, install tile before these items are installed.

F. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

G. Install flooring after other finishing operations, including painting, have been completed.

3.2 EXTRA STOCK

A. Furnish extra materials matching products installed and packaged with protective covering for storage and identified with labels describing contents:
1. LVT Flooring: 1 percent of quality installed or 2 full unopened containers, whichever is greater.

3.3 EXAMINATION

A. Examine substrates for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work:
1. Verify that finishes of substrates comply with tolerances and other requirements specified for other Work and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation after correcting unsatisfactory conditions. Installation of resilient flooring and accessories indicates acceptance of surfaces and conditions.

3.4 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure

adhesion of resilient products.

B. Concrete Substrates - Prepare according to ASTM F710:
   1. Verify substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing - Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
      a. Perform anhydrous calcium chloride test according to ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Perform relative humidity test using in situ probes according to ASTM F2170. Proceed with installation only after substrates have a maximum **95** percent relative humidity level.
   5. Bond Test: Bond 3' x 3' panels spaced 50 feet apart throughout subfloor area. After moisture test proves floor acceptably dry, install panels using adhesive. If panels are securely bonded after 72 hours, subfloor is sufficiently clean of foreign materials for satisfactory installation of resilient flooring.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed:
   1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.5 INSTALLATION

A. Comply with manufacturer's written instructions for installing flooring. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Extend flooring into toe spaces, door reveals, closets, and similar openings.

B. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.

C. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one/half tile at perimeter:
   1. Lay tiles square with room axis.

D. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles:

1. Lay tiles with grain running in one direction.

E. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built in furniture, cabinets, pipes, outlets, and door frames.

F. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

H. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

I. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

J. Floor Tile - Comply with manufacturer's written instructions for installing floor tile:
1. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one/half tile at perimeter:
   a. Lay tiles square with room axis unless pattern indicated for an area.
2. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles. Lay tiles with grain running in one direction.

K. Resilient Accessories - Comply with manufacturer's written instructions for installing resilient accessories:
1. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:
1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish. Apply two coat(s).

E. Sealers and Finish Coats:
1. Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products:
   a. Sealer: Apply two base coats of liquid sealer.

b. Finish: Apply two coats of liquid floor finish.

F. Cover floor tile until Substantial Completion.

G. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations:
1. Before cleaning, strip protective floor polish.
2. Reapply polish to floor surfaces to restore protective floor finish according to flooring manufacturer's written recommendations.

END OF SECTION

SECTION 09 65 66 RESILIENT AHTLETIC FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Resilient Athletic Flooring
2. Product Materials
3. Accessories required for a complete installation
4. Moisture Vapor Control System
5. Maintenance

1.2 REFERENCES

A. ASTM International (ASTM)
1. ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
2. ASTM D2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine.
3. ASTM D2240: Standard Test Method for Rubber Property (Durometer Hardness).
4. ASTM D3389: Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader).
5. ASTM E492: Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine.ASTM E648: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
6. ASTM E1643: Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
7. ASTM E1745: Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
8. ASTM F386: Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces.
9. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
10. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.
11. ASTM F970: Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading.
12. ASTM F1514: Standard Test method for Measuring Heat Stability of Resilient Flooring by Color Change.
13. ASTM F1515: Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.
14. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
15. ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

B. State of California (CA)
1. CA Section 01350. Standard Method for the Testing and Evaluation of Volatile Organic Compound Emissions from Indoor Sources Using Environmental Chambers.

C. GREENGUARD Environmental Institute (GEI)
1. GREENGUARD Certification. Compliant with stringent emission levels for over 360

VOCs, plus a limit on the total of all chemical emissions combined (TVOC).
2. GREENGUARD Gold. Compliant with safety factors to account for sensitive individuals (such as children and the elderly) and ensures that a product is acceptable for use in environments such as schools and healthcare facilities.

1.3 SUBMITTALS

A. Product Data
1. Provide Manufacturer's current printed substrate surface preparation guidelines.
2. Provide Manufacturer's current printed installation guidelines for Products Supplied.
3. Provide a copy of Original Equipment Manufacturer (OEM)'s ISO 9001 certificate.
4. Provide current printed data sheets for all Products Supplied.
5. Provide samples (6 inches x 6 inches), for verification of such characteristics as color and surface texture, for each Manufactured Product specified.
6. If line painting has been specified, provide samples of available paint colors for selection and approval. As necessary, provide shop drawings prepared for the project that illustrate layouts, details, dimensions and other pertinent data.

B. Closeout Submittals
1. Provide Manufacturer's current printed maintenance guidelines for Manufactured Product.
2. Provide Manufacturer's current printed standard warranty for Manufactured Product.

C. Maintenance Material Submittals
1. Provide extra stock materials from original dye lots, for use in facility operations and maintenance
2. Two-Percent (2%) of the total floor surface for each color, surface texture and format of Manufactured Product specified.

D. Mock-ups:
1. A mock-up installation is highly recommended; always follow the same procedures and use the same materials that have been specified for the actual project. The Owner or Architect will be responsible for deeming the mock-up acceptable.
2. Mock-up size: Ten foot square, unless otherwise indicated by Architect.

1.4 QUALITY ASSURANCE

A. Manufacturer must be certified ISO 9001.

B. Manufacturer must have a minimum of fifteen (15) years of experience in the manufacturing of prefabricated resilient rubber flooring.

C. Manufactured Product must have undergone a vulcanization process; factory lamination should not be accepted as equivalent.

D. Surfacing Contractor to be recognized and approved by the Manufacturer.

E. Surfacing Contractor shall be fully acquainted with the existing facility and utilities and shall fully understand the difficulties and restrictions attending the execution of the work under contract. Surfacing Contractor to advise the Owner of any restrictions or anticipated difficulty, in writing and before submitting bids.

F. Installer must be approved by the Surfacing Contractor and must have performed installations of the same scale in the last three (3) years.

G. Line marking:
   1. Line Marker shall be approved by the Surfacing Contractor. Painting must be done by professionals with proper experience and qualifications to effectively perform the work; Line Marker to have painted a minimum of ten (10) rubber surfaces in North America.

1.5 DELIVERY, STORAGE AND HANDLING

A. Products Supplied must be delivered in Manufacturer's original, unopened and undamaged packaging with identification labels intact. Products Supplied must be protected from exposure to harmful weather conditions and must be safely stored on a clean, dry, flat surface. Store rolls of resilient athletic flooring upright.

B. Climate controlled storage is recommended. Storage temperature must not be below 40^{O}F (4^{O}C) and must not exceed 100^{O}F (38^{O}C). Materials must be delivered to site a minimum of 24 hours before work is scheduled to begin so that they may acclimate.

C. Avoid storing Manufactured Product for extended periods of time or additional material trimming may be required.

D. Products Supplied need not suffer damage during delivery, storage and handling (i.e. dents/scratches, excessive compression or warping, chipped edges, etc.).

1.6 WARRANTY

A. The resilient athletic flooring is warranted to be free from manufacturing defects for a period of one (1) year from the date that is 30 days from shipment from the Manufacturer, per the terms and conditions of the Manufacturer's written Limited Warranty.

B. For standard applications, the resilient athletic flooring is warranted against excessive wear under normal usage for a period of ten (10) years from the date that is 30 days from shipment from the Manufacturer, per the terms and conditions of the Manufacturer's written Limited Warranty.

C. Refer to current copy of Manufacturer's written Limited Warranty for all terms and conditions, which shall be obtained directly from Manufacturer. In no event shall any warranties provided by any third parties (including distributors, insurance and/or private label providers) be considered a valid.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Mondo Luxembourg S.A.: Z.I. Foetz - Rue de l'Industrie, L-3895 Foetz, Luxembourg.
   1. Or Approved Equal

B. Product Description:
   1. Advance Vulcanized is prefabricated resilient athletic flooring, calendered and vulcanized, with a base of natural and synthetic rubbers, stabilizing agents and pigmentation, as manufactured by Mondo Luxembourg S.A. or approved equal.
   2. Triple durometer construction, vulcanized into a single prefabricated sheet for optimal performance and durability. The Shore hardness of the top layer (wear layer) will be greater than that of the other layers; Shore hardness of layers to be recommended by the Manufacturer and to respect limits specified.

3. Health-Conscious Production: Advance Vulcanized is free from red listed ingredients (LBC Red List) and is manufactured without bisphenol A (BPA), formaldehyde, halogens, heavy metals, isocyanates, phthalates and polyvinyl chloride (PVC).
4. Thickness: 0.394'' (10 mm).
5. Colors: To be selected from manufacturers full line of available colors.
6. Surface Texture: Smooth, matte.
7. Format:
   a. Available in sheets that are 6'1" (1.86 m) wide and 42'7" (13 m) long [min. 19'8" (6 m)/max. 49'2" (15 m)].

C. Performance
1. Performance of the Manufactured Product to conform to the following criteria:

Performance Criterion	Test Method	Requirement	Result*
Elongation at Break	ASTM D412	≥100%	≥100%
Tensile Strength	ASTM D412	≥300 psi	≥350 psi
Static Coefficient of Friction (leather heel)	ASTM D2047	≥0.50 (dry)	≥0.80 (dry)
Hardness of Top Layer (Shore A)	ASTM D2240	78 ± 5	82
Hardness of Bottom Layer (Shore A)	ASTM D2240	50 ± 8	53
Abrasion Resistance (H18 wheel, 1000 g, 1000 cycles)	ASTM D3389	≤1.0 g	≤0.4 g
Impact Insulation Class	ASTM E492	-	≈60 dB (IIC)
Critical Radiant Flux	ASTM E648	≥0.22 W/cm^2 (Class 2)	≥0.45 W/cm^2 (Class 1)
Thickness	ASTM F386	10 mm (±0.2 mm) 0.394" (±0.008")	Compliant
Resistance to Chemicals	ASTM F925	≤Slight Change	Compliant **
Static Loading (tested at 250psi)	ASTM F970	≤0.009 in	0.006 in
Heat Resistance	ASTM F1514	ΔE ≤8.0	Compliant
Light Resistance	ASTM F1515	ΔE ≤8.0	Compliant
Indoor Air Quality (IAQ) Certifications			
CA Section 01350	CA: V1.1-2010	-	Compliant
Greenguard Gold	Greenguard	-	Compliant
Greenguard Certification	Greenguard	-	Compliant

*Results obtained from manufacturing controls can vary between production contact time, please communicate with Mondo's Technical Department.

2.2 MATERIALS

A. Provide Advance Vulcanized rubber flooring manufactured by Mondo Luxembourg S.A. or approved equal.

B. Provide Manufactured Product as specified in section 2.1.2 Description.

2.3 ACCESSORIES

A. Provide adhesive certified by Manufacturer: Mondo PU 105 (polyurethane) adhesive is recommended for installations over concrete and wood.

B. If line painting has been specified, line paint to be supplied or recommended/approved by

Manufacturer.

C. Moisture Vapor Control System:
   1. Approved Manufacturer: Koster American Corporation, or equal.
   2. Product: Koster VAP - 2000 Zero VOC
   3. Surface Preparation: Mechanically shot-blasting to an ICRI Concrete Surface Profile (CSP 3)
   4. Product shall conform to ASTM F3010-13

PART 3 EXECUTION

3.1 SITE CONDITIONS

A. The General Contractor shall be responsible for ensuring all site conditions meet the requirements of the Manufacturer, as referenced herein at sections 3.2 and 3.3. Refer to current version of ASTM F710 for additional information.

B. Concrete slabs, on or below grade, must be installed over a permanent effective vapor retarder, respecting current versions of the standard practice ASTM E1643 and the standard specification ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mil (0.010 in).

C. No sealers or curing compounds are applied to or mixed into the concrete (refer to Section 03 30 00 – Cast-In-Place Concrete).

D. Installation of the resilient athletic flooring to be carried out no sooner than the specified curing time of the concrete (normal density concrete curing time is approximately 28 days for development of design strength, having a minimum 3500 psi or 25 MPa in compressive strength).

E. Substrate surface must be free of all contaminants that can inhibit bond (paint, wax, dust, oil or grease, sealer, curing compound, solvent, asphalt, old adhesive residues, etc.). All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.

F. Concrete must have a smooth finish, proper density and be highly compacted with a tolerance of $1/8^{th}$ of an inch in a 10-foot radius (3.2 mm in 3.05 m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

G. Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with the current version of ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with the current version of ASTM F1869 (anhydrous calcium chloride).

H. Maintain stable room and substrate temperatures prior to moisture testing and flooring installation, during the flooring installation, as well as a minimum of 48 hours after the flooring has been completely installed. Recommended ambient temperature range is between 65^{o}F and 86^{o}F (18^{o}C and 30^{o}C) and recommended ambient humidity range is

between 35% and 55%.

I. If installing over wood substrates, ensure exterior grade plywood with at least one good side, such as: APA (Engineered Wood Association) Exterior grade plywood (A-A Exterior, A-B Exterior or A-C Exterior) and CANPLY (Canadian Plywood Association) Exterior certified plywood (Canada: Grade G2S A-A or G1S A-C. USA: G2S A-A, A-B, B-B, or G1S A-C, B-C). There must be proper underfloor ventilation, plywood must be dry and should have a moisture content ranging between 6 and 12%, when measured with a quality wood moisture meter (electronic hygrometer).

J. Installation of resilient athletic flooring will not commence until the building is enclosed and all other trades have completed their work. It is the General Contractor or Construction Manager's responsibility to maintain a secure and clean working area before, during and after the installation of the resilient athletic flooring.

3.2 INSTALLERS

A. Refer to section 1.4 of this document for information on installers.

3.3 EXAMINATION

A. Prior to resilient athletic flooring installation, ensure substrate is ready to receive resilient flooring and has been prepared according to Manufacturer's current substrate surface preparation guidelines. Refer to current version of ASTM F710 for additional information.

B. Ensure that concrete slabs, on or below grade, are installed over a permanent effective vapor retarder, respecting current versions of the standard practice ASTM E1643 and the standard specification ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mil (0.010 in).

C. Ensure that no concrete sealers or curing compounds have been applied to or mixed into the concrete (refer to Section 03 30 00 – Cast-In-Place Concrete).

D. Installation of the resilient athletic flooring to be carried out no sooner than the specified curing time of the concrete (normal density concrete curing time is approximately 28 days for development of design strength, having a minimum 3500 psi or 25 MPa in compressive strength).

E. Ensure that concrete surface is free of any contaminant that could inhibit bond (paint, wax, dust, oil or grease, sealer, curing compound, solvent, asphalt, old adhesive residues, etc.). All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.

F. Confirm concrete has a smooth finish, proper density and is highly compacted with a tolerance of $1/8^{th}$ of an inch in a 10-foot radius (3.2 mm in a 3.05 m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

G. Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with the current version of ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab must not exceed the

tolerance of the adhesive specified, in accordance with the current version of ASTM F1869 (anhydrous calcium chloride).

H. Ensure room and substrate temperatures are maintained prior to moisture testing and flooring installation, during the flooring installation, as well as a minimum of 48 hours after the flooring has been completely installed. Recommended ambient temperature range is between 65^{O}F and 86^{O}F (18^{O}C and 30^{O}C) and recommended ambient humidity range is between 35% and 55%.

I. If installing over wood substrates, ensure exterior grade plywood with at least one good side, such as: APA (Engineered Wood Association) Exterior grade plywood (A-A Exterior, A-B Exterior or A-C Exterior) and CANPLY (Canadian Plywood Association) Exterior certified plywood (Canada: Grade G2S A-A or G1S A-C. USA: G2S A-A, A-B, B-B, or G1S A-C, B-C). There must be proper underfloor ventilation, plywood must be dry and should have a moisture content ranging between 6 and 12%, when measured with a quality wood moisture meter (electronic hygrometer).

J. Installation of resilient athletic flooring will not commence until the building is enclosed and all other trades have completed their work. It is the General Contractor or Construction Manager's responsibility to ensure that a secure and clean working area is maintained before, during and after the installation of the resilient athletic flooring.

3.4 PREPARATION

A. Prepare substrate surface in accordance with Manufacturer's current printed guidelines.

3.5 INSTALLATION

A. Install sheets of resilient athletic flooring following Manufacturer's current printed guidelines.

B. Install all accessories following Manufacturer's current printed guidelines.

C. Line Marker to paint all lines following Manufacturer's current printed guidelines, respecting the drawing(s) and the Master Specification.

3.6 REPAIR

A. Repair material must come from the same original dye lot as the Manufactured Product initially installed, NOT from the 2% extra stock specified.

B. Repairs are to be performed by Surfacing Contractor's qualified installers/technicians only.

3.7 CLEANING

A. Always wait at least a minimum of 72 hours after the resilient athletic flooring has been completely installed before performing initial maintenance. Always maintain the resilient athletic flooring following Manufacturer's current printed guidelines.

B. For surfaces having received newly painted lines, wait a minimum of 30 days after the application of the paint to ensure its proper curing before going over the surface with a scrubber/scrubbing the lines.

3.8 PROTECTION

A. As needed, protect resilient athletic flooring with 1/8" Masonite during and after the

installation, prior to its acceptance by the Owner.

B. Preserve the integrity of the installation and protect against direct sunlight/UV exposure; always ensure that windows and glass doors have inherent UV protection and/or are fitted with blinds/UV film.

END OF SECTION

SECTION 09 67 00 EPOXY FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Epoxy floor system.
   2. Accessories necessary for a complete installation.

1.3 DEFINITIONS

A. Comparable Product: Product demonstrated and approved through submittal process, or where indicated as a produce substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

1.4 SUBMITTALS

A. Product Data: Technical data for each type of product indicated include manufacturer's technical data, application instructions, and recommendations for each flooring component required.

B. Samples - Submit flooring system required, 6 inches (150 mm) square, applied to a rigid backing:
   1. Two samples indicating range of slip resistant textures.
   2. Two samples of actual color and texture selected by the Architect.

C. Reports and Certificates:
   1. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

D. Maintenance Data: Submit data for flooring system to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Building Code: Comply with applicable requirements of the CBC for interior floors.
   2. Fire Test Response Characteristics: Determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
   3. Accessibility Requirements - Comply with applicable requirements:
      a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).
      b. 2010 ADA regulations.
      c. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.
   4. Flammability: Self-extinguishing according to ASTM D635.

B. Installer Qualifications: Installer having minimum 5 years documented experience in the installation of epoxy floors and who is a manufacturer authorized representative trained and

approved for installation of flooring systems required. Engage installer certified in writing by floor manufacturer as qualified to apply flooring systems indicated.

C. Source Limitations: Obtain primary flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Pre-installation Conference: Conduct conference at site.

1.6 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full year from date of installation or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

PART 2 PRODUCTS

2.1 MATERIALS

A. Basis of Design - **Stonshield HRI as manufactured by Stonhard**; subject to compliance with requirements, provide products by one of the following:
1. BASF Corporation; Construction Systems.
2. Crossfield Products Corp.
3. Sherwin-Williams Company, General Polymers.
4. Sika Corporation; Flooring.

B. Flooring System: 3/16th inch epoxy mortar base with decorative quartz broadcast.

C. Primer Formulation Description Basis of Design: Stonhard Standard Epoxy Primer two component 100% solid squeegee applied and back rolled.

D. Formulation Description - Body Coat HRI Base:
1. Resin: 100% solid 3-part Epoxy Mortar troweled at 3/16th inch.
2. Formulation Description: Comprised of a three-component mortar, consisting of pigmented epoxy resin, curing agent, and pigmented blended aggregates.
3. Application Method - Troweled Mortar and added quarts broadcast:
   a. Mortar: Uniformly Trowel 3/16th inch mortar over substrate; Add Stonshield undercoat then broadcast decorative quartz into undercoat until refusal and seal with CE4 Epoxy sealer.

E. System Physical Properties - Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Static load Limit: 0.004in/0.1mm.
2. Resistance to Heat: Delta E>8 per ASTM F970.
3. Hardness: 85 Min. per ASTM D2240/Shore A Durometer.

4. Residual Indentation: 1% thickness per ASTM F- 1914.
5. Noise Reduction Coefficient: 0.05 per ASTM C-423.
6. Abrasion Resistance: 0.01gm per ASTM D-3389, H-18 500g, 1000 cycles.
7. Fire Resistance: Class 1, Per ASTM E-648.

F. System Characteristics:
1. Color and Pattern: To be determined by Architect.
2. Wearing Surface: ½ texture 2.
3. Integral Cove Base: 6 inches high with zinc termination strip.
4. Overall System Thickness: 3/16 inch (4.7625 mm).

G. Antimicrobial Additive: Antimicrobial chemical additive to control growth of most bacteria, fungi, algae and actinomycetes.

H. Primer/Waterproofing Membrane: Type recommended by flooring manufacturer for substrate and flooring system indicated.

I. Patching and Fill Material: Resinous product approved by flooring manufacturer and recommended by manufacturer for application indicated.

J. Undercoat:
1. Resin: Stonshield Undercoat.
2. Formulation Description: Epoxy.
3. Type: Clear.
4. Finish: Gloss.
5. Number of Coats: two.

K. Topcoats:
1. Resin: Epoxy.
2. Type: Two-component 100% solids.
3. Type: Clear.
4. Finish: Gloss.
5. Number of Coats: two.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Environmental Limitations: Comply with flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during flooring application and for 24 hours after application unless manufacturer recommends a longer period.

3.2 PREPARATION

A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates - Provide sound concrete surfaces free of laitance, glaze,

efflorescence, curing compounds, form release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring:

1. Remove existing floor covering, adhesives, and contaminates. Ensure existing concrete floor is ready to receive epoxy floor covering.
2. Roughen concrete by Shot Blasting (mechanical preparation only) substrates according to manufacturer's written instructions.
3. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
4. Verify that concrete substrates are dry and moisture vapor emissions are within acceptable levels according to manufacturer's written instructions:
   a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.
   b. Plastic Sheet Test: ASTM D4263. Proceed with application after testing indicates absence of moisture in substrates.
   c. Relative Humidity Test: Use in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
5. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Patching and Filling - Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions:
   1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

D. Epoxy Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.3 APPLICATION

A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated:
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Primer/Waterproofing Membrane - Apply primer or waterproofing membrane over entire substrate surface in manufacturer's recommended thickness:
   1. Apply to integral cove base substrates.

C. Integral Cove Base:
   1. Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Do not broadcast into cove. Mix quartz aggregates and add thixotropic and hand trowel. Round internal and external corners:
      a. Integral Cove Base: 6 inches (100 mm) high.

D. Trowel HRI Base to 3/16th inch then apply Stonshield undercoat.

E. Quartz Granules: Broadcast Quartz into Undercoat. Scrape off and vacuum up excess aggregate.

F. Topcoats: Trowel or squeegee apply clear epoxy resin coat topcoats indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

3.4 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION

SECTION 09 84 13 FIXED SOUND-ABSORPTIVE PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section relates to the installation of fixed sound-absorptive panels.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer’s specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer’s installation instructions.

B. Shop Drawings: Show panel joints, detail references, dimensions and methods of attachment.

C. Samples: 12 inch x 12 inch sample of actual material and color charts showing manufacturer's full range of colors for Architect’s selection.

1.4 QUALITY ASSURANCE

A. Provide acoustical panels, diffusers and fabrics of each type required from one (1) manufacturer, of uniform texture and color.

B. Installer. Provide evidence of appropriate experience in system installation and that installation method proposed is acceptable to panel manufacturer.

C. Single Source Responsibility: Obtain acoustical panel materials from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Carefully protect work during shipment, storage and installation.

B. Deliver materials to job site and store elevated above floor in an enclosed space with proper ventilation and protection from damage.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers must have a minimum of five (5) years’ experience manufacturing equivalent products to those specified:
   1. Wood Fiber Acoustical Panels: Tectum Inc., Newark Ohio.
   2. Or equal in accordance with requirements for substitution.

2.2 MATERIALS

A. Wood Fiber Interior Panels:
   1. Basis of Design: **Tectum Direct-Attach High NRC**
   2. Material: Tectum Wood Fiber.
   3. Shape: Rectangular
   4. Thickness: One (1) inch face plus one (1) inch furring strip.
   5. Weight: 3.3 lbs/SF.
   6. Edge: Beveled long edge; square short edge.
   7. Mounting Method: C-20 (direct attach w/ 3/4" furring strips @ 24 inches on center). Voids filled with batt insulation.
   8. NRC: 0.80.
   9. Size:
      a. Walls: 24 inches wide by 8-feet length.
   10. Finish/Color: Factory finish in two (2) custom colors selected by Architect.
   11. Mounting Style: Mount on 3/4 inch furring strips at 24 inch on center both ways on walls. Type instructed by manufacturer to suit application. Provide all fasteners, and furring strips for a complete single source installation. Fasteners and anchorage accessories shall be corrosive resistant.
   12. Orientation: Horizontal rows; see Interior Elevation Drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify dimensions to insure proper fabrication of materials.

3.2 INSTALLATION

A. Install wall panels only after all wet work has been completed and temperature conditions approximate conditions when space will be occupied.

B. Install wall panels in accordance with manufacturer's instructions and approved shop drawings.

C. Install wall panels in proper alignment. Shim wall track as necessary to provide a level frame work.

D. Remove wall panels, ceiling diffusers, and fabrics are damaged and unacceptable to Architect and replace with new undamaged materials at no expense to Owner.

END OF SECTION

SECTION 09 90 10 PAINTING AND COATING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Surface preparation and field painting of exposed items and surfaces.
   2. Field preparation and painting of factory primed metal products and fabrications.
   3. Accessories necessary for a complete installation.

1.3 DEFINITIONS

A. Standard coating terms defined in ASTM D16 apply:
   1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
   2. Eggshell refers to low sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
   3. Semigloss refers to medium sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
   4. Full gloss refers to high sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data:
   1. Submit technical data and information for block fillers, primers, paints, and coatings, including label analysis and instructions for handling, storing, and applying each coating material proposed for use:
      a. Indicate manufacturer's instructions for special surface preparation procedures, substrate conditions requiring special attention.
      b. Material List: Provide inclusive list of required coating materials. Indicate each material and cross reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number, series, and general classification.
      c. Submit Zero VOC compliant products only.

B. Samples:
   1. Submit for each type of paint system and in each color and gloss of topcoat:
      a. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
      b. Provide list of material and application for each coat of each sample. Label each sample as to location and application.
      c. Submit samples on following substrates for review of color and texture only:
         1) Concrete: Provide two 4-inch square samples for each color and finish.
         2) Concrete Masonry: Provide two 4" x 8" samples of masonry, with mortar joint in the center, for each finish and color.
         3) Painted Wood: Provide two 12-inch square samples of each color and

material on hardboard.

4) Ferrous and Nonferrous Metals: Provide two 4-inch square samples of flat metal and two 8 inch long samples of solid metal for each color and finish.

C. Product List: Submit list of including each paint system, color, and location of application. Use same product and location designations indicated in Finish Schedule.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with Federal and State/Local toxicity and air quality regulations and with Federal requirements on content of for heavy metals including but not limited to: lead and mercury. Do not use solvents in paint products that contribute to air pollution.
   2. Performance and Durability:
      a. ASTM D16 Standard Test Method for Load Testing Refractory Shapes at High Temperatures.
      b. ASTM D2486 Standard Test Method for Scrub Resistance of Interior Wall Paint.
      c. ASTM D2805 Standard Test Method for Hiding Power of Paints by Reflectometry.
      d. ASTM D4828 Standard Test Method for Practical Washability of Organic Coatings.

B. Applicator Qualifications: A firm or individual having minimum 5 years documented experience in applying paints and coatings similar in material, design, and extent to those indicated.

C. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

1.6 WARRANTY

A. Written warranty signed by the manufacturer and the installer in which the manufacture and installer agree to repair or replace paint and primers that fail within specified warranty period:
   1. Failures include, but are not limited to, the following:
      a. Flaking or delamination of paint with the substrate.
      b. Rust, scale, similar imperfections due to improper surface preparation.
      c. Thinning or watering of paint beyond that considered acceptable of paint manufacturer.
      d. Failure to achieve dry film thickness (DFT) recommended by manufacturer for each coat in a paint system.
      e. Deterioration or loss of color of paint beyond normal weathering.
   2. Warranty Period: One year from date of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F (7 degrees C):
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

PART 2 PRODUCTS

2.1 MATERIALS

A. Basis of Design is **Dunn Edwards Corporation paints.** Subject to compliance with requirements, provide first quality, 100% acrylic, commercial or industrial products of one of

the specified manufacturers. Residential products are not permitted:

1. Proprietary Names: Paint Schedule is based on a single manufacturer for convenience. With exception to the paint used in the theater. Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that named products are required to the exclusion of comparable products of specified manufacturers. Furnish product technical data, including per cent solids by weight and volume; VOC content limits and emissions data; and certificates of performance for comparable paint products of specified manufacturer.
2. Other Acceptable Paint Manufacturers:
   a. Sherwin-Williams Co.
   b. Vista Paint

B. Material Compatibility: Provide each paint system including block fillers, primers, and finish coats, that are compatible with one another and with substrates indicated under conditions of service and application, demonstrated by manufacturer based on testing and field experience.

C. Material Quality: Provide manufacturer's best quality commercial paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint material containers not displaying manufacturer's product identification will not be acceptable. Residential quality paint products are not permitted.

D. Chemical Components of Interior Paints and Coatings:
   1. Provide products complying with limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and SCAQMD Rule1113:
      a. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
      b. Restricted Components: Paints and coatings shall not contain components restricted by the EPA and the SCAQMD.

E. Accessories: Materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

F. Patching Materials: Latex filler compatible with paint systems.

G. Fastener Head Cover Materials: Latex filler.

H. Theater Black: No Exceptions or alternates.

2.2 SOURCE QUALITY CONTROL

A. Testing of Paint Materials:
   1. Owner reserves the right to invoke to engage the services of a qualified testing agency to sample paint materials:
      a. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to site, samples may be taken at the site. Samples will be identified, sealed, and certified by testing agency.
      b. Testing agency will perform tests for compliance with product requirements.
      c. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying

materials, the two paints are incompatible.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Apply waterborne paints when temperatures of surfaces to be painted and surrounding air are between 50 degrees F and 90 degrees F (10 degrees and 32 degrees C).

B. Do not thin or add water to waterbased paints, including waterbased alkyds.

C. Weather Conditions:
   1. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
   2. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F (3 degrees C) above dew point; or to damp or wet surfaces.
   3. Minimum Application Temperatures for Water based Paints: Between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C).

D. Apply solvent thinned paints when temperatures of surfaces to be painted and surrounding air are between 45 degrees F and 95 degrees F (7 degrees F and 35 degrees C):
   1. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.
   2. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

E. Provide lighting level of 80-foot candles (860lx) measured midheight at substrate surface.

F. Labels: Do not paint over Underwriters Laboratories, Factory Mutual, other code required labels, or equipment name, identification, performance rating, or nomenclature plates.

3.2 EXTRA MATERIALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:
   1. Paint: 2 percent, but not less than 1 gallon (3.8 L) of each material and color applied.

3.3 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for maximum moisture content and conditions affecting performance of the work.

B. Test substrates after repairing and cleaning substrates but prior to application of paint and coatings:
   1. Maximum moisture content of substrates when measured with an electronic moisture meter as follows:
      a. Concrete: 12 percent.
      b. Fiber Cement Board: 12 percent.
      c. Masonry (Clay and CMUs): 12 percent.
      d. Wood: 15 percent.
      e. Gypsum Board: 12 percent.
      f. Plaster: 12 percent.

2. Test cementitious and plaster cement/stucco for alkalinity (pH).

C. Gypsum Board Substrates: Verify taped joints are tapes and finishing compound is sanded smooth.

D. Plaster Substrates: Verify plaster has fully cured. Verify existing plaster is in good condition and can receive new paint coating.

E. Spray Textured Ceiling Substrates: Verify surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers:
   1. Verify previously painted surfaces can be stripped to bare substrate, repaired if necessary, and prepared to receive new paint system consisting of primer and two top coats at a minimum:
      a. Note: Previously painted surfaces have failed to accept new paint systems. Determined cause of failure and take corrective measures to ensure each surface accepts new paint system. Failure of new paint system is not permitted.

G. Commence paint and coating application after correcting unsatisfactory conditions and surfaces are dry. Application of coating indicates applicator's acceptance of surfaces and conditions.

3.4 PREPARATION

A. Coordination of Work:
   1. Review work in which primers are provided to ensure compatibility of the total system for various substrates. Notify Architect of anticipated problems when using materials specified over substrates primed by others:
      a. Preprimed Substrates: Inspect existing conditions in which primers are factory applied to ensure compatibility of the total system for each substrate. Notify Architect of anticipated problems when using the materials specified over factory primed or preprimed substrates.
      b. Existing Painted Surfaces: Inspect previously painted surfaces to ensure compatibility of the existing paints with new paint system for each substrate. Notify Architect of anticipated problems.
      c. Correct defects and clean surfaces affecting bond with paint system. Remove existing paints exhibiting loose surface defects showing signs of rust, scale, or delamination.
      d. Seal marks which may bleed through surface finishes.

B. Surface Preparation:
   1. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified. Provide barrier coats over incompatible primers or remove and reprime. If removal is impractical or impossible because of size or weight of item, provide surface applied protection before surface preparation and painting:
      a. Remove hardware and hardware accessories, plates, lighting fixtures, and similar items that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface applied protection before surface preparation and painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
      b. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface applied protection if any.
      c. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

d. Clean and prepare surfaces to receive paint according to manufacturer's written instructions for each substrate condition and as specified. Provide barrier coats over incompatible primers, existing paint or coating, or remove and reprime.
e. Correct defects and clean surfaces affecting bond with paint or coating system. Remove existing coatings exhibiting loose surface defects. Seal marks which may bleed through surface finishes.

C. Cleaning:
1. Before applying paint or surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning. Schedule cleaning and painting so dust and contaminants from the cleaning process will not fall on wet, newly painted surfaces:
a. Remove incompatible primers, including factory applied primers, and reprime substrate with compatible primers or apply barrier coat as necessary to produce paint systems indicated.
b. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
c. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
d. Galvanized Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
e. Aluminum Substrates: Remove surface oxidation.

D. Mildew and Mold Removal: Remove mildew and mold by high power washing (pressure range of 1500 to 4000 psi) with solution of trisodium phosphate and bleach. If substrate is too soft for high power washing, scrub substrate with solution. Rinse with clean water and allow surface to dry.

E. Protective Coverings: Provide protections for duration of the work, including covering furnishings and decorative items. Protect and mask adjacent finishes and components against damage, marking, overpainting, and injury. Clean and repair or replace damage caused by painting.

F. Renovated Surfaces:
1. Clean surface free of loose dirt and dust. Except at gypsum board surfaces, remove existing paint and coatings to bare substrate and prepare substrates to receive new paint system. Test substrate to verify it will bond with primer and receive new paint system without failure. If test fails, clean surface to base substrate and apply barrier coat. Retest to verify surface will accept new paint system:
a. Remove surface film preventing proper adhesion and bond.
b. Wash glossy paint with a solution of sal soda and rinse thoroughly.
c. Remove loose, blistered, and defective paint and varnish; smooth edges with sandpaper.
d. Clean corroded iron and steel surfaces.
e. Repair and blend into portland cement plaster.
f. Prime bare surfaces.
g. Tone varnished surfaces with stain bringing to uniform color.
h. If existing surfaces cannot be put in acceptable condition for finishing by customary cleaning, sanding, and puttying operations, notify Owner and do not proceed until correcting unsatisfactory conditions.

G. Cementitious Substrates:
1. Prepare concrete surfaces to receive paint. Remove efflorescence, chalk, dust, dirt, grease, oils, release agents, mold, mildew, and existing paint. Roughen as necessary

to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation:

a. Use abrasive blast cleaning methods if recommended by paint manufacturer.
b. Do not paint surfaces if moisture content or alkalinity of surfaces exceeds that permitted in manufacturer's written instructions:
    1) Determine alkalinity and moisture content of surfaces by performing appropriate pH testing. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct condition prior to application of paint.
    2) Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m).
    3) Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation after substrates have obtained percent relative humidity level recommended by paint manufacturer.
    4) Perform additional moisture tests when recommended by manufacturer. Proceed with installation when moisture content complies with that permitted in manufacturer's written instructions.
    5) Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water. Allow to thoroughly dry.
c. Clean concrete floors to receive paint or coating with a 5 percent solution of muriatic acid or etching cleaner. Flush floors with clean water to remove acid; neutralize with ammonia, rinse, allow to dry; vacuum before painting.

H. Ferrous Metals:
1. Clean ungalvanized ferrous metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations:
    a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC SP6/NACE No. 3.
    b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

I. Galvanized Ferrous Metal Substrates: Clean galvanized surfaces with nonpetroleum based solvents leaving surface free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

J. Shop Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC PA1 for touching up shop primed surfaces.

K. Aluminum Substrates: Clean surfaces to remove oil, grease, surface oxidation, and contaminants in accordance with SSPC SP1 Solvent Cleaning. Lightly abrade surface with a nonmetallic pad.

L. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

M. Plaster/Stucco Substrates:
1. Remove contaminants, release agents, curing compounds, efflorescence, chalk, mold, mildew, and similar deterrents. Spot patch existing plaster to eliminate blisters,

buckles, excessive crazing, and to check cracking, dryouts, efflorescence, sweat outs, and similar deflects the prevent plaster from bonding with paint or coatings. Sand or texture repair or patch to match adjacent finish and to remove trowel marks and arises:

a. Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
b. Deep Cracks: Clean out and fill deep cracks with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
c. Do not paint surfaces if moisture content or alkalinity of surfaces exceeds that permitted in manufacturer's written instructions. Test for alkali using litmus paper.
d. Allow patching and repair compounds to set and cure before painting.

N. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

O. Wood Substrates:
1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime, stain, or seal wood to be painted. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
4. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
5. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

P. Pipe Covering and Insulation: Clean to remove loose, foreign, and objectionable material before applying sealing coat.

Q. Preparation of Substrates for Wallcovering:
1. Prime and seal substrate with release coat in accordance with wallcovering manufacturer's recommendations for substrate:
a. Assure compatibility with product of wall covering manufacturer.
b. Fill indentations in substrate and prime with opaque white primer before applying release coat.
c. Apply release coat in accordance with manufacturer's recommendations.

R. Barrier Coat: Provide barrier coats over incompatible primers or remove and reprime. Notify Owner in writing of anticipated problems using specified finish coat material over previously coated substrates.

S. Material Preparation:
1. Mix and prepare paint materials according to manufacturer's written instructions:
a. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
b. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
c. Do not use thinners for water-based paints.
d. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated:
   1. The term *exposed surfaces* includes areas visible when permanent or built in fixtures, grilles, convector covers, covers for finned tube radiation, and similar components are in place. Extend coatings in these areas to maintain system integrity and provide desired protection.
   2. Use applicators and techniques suited for paint and substrate indicated.
   3. Provide finish coats compatible with primers.
   4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   5. Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces:
      a. Field painting of exposed surfaces include bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory applied final finish.
      b. Areas visible when permanent or built in fixtures, grilles, convector covers, covers for finned tube radiation, and similar components are in place.
      c. Extend coatings in areas, as required, to maintain system integrity and provide desired protection.
   6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
   7. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   8. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   9. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   10. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or surface imperfections. Cut in sharp lines and color breaks.
   11. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
   12. Provide finish coats compatible with primers used.
   13. Sand lightly between each succeeding enamel or varnish coat.

B. Items not to Receive Paint: Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

C. Applicators:
   1. Apply paints and coatings by brush, roller, spray, or applicators recommended by manufacturer:
      a. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
      b. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool recommended by manufacturer for material and texture required.
      c. Spray Equipment: Use airless spray equipment with orifice size recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness:
   1. Apply paint materials no thinner than manufacturer's recommended spreading rate to

achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer:

a. Measure film thickness on magnetic surfaces by use of Elcometer thickness gauge and on nonmagnetic surfaces by pit gauge or Tooke Gauge.

E. Application:

1. Apply first coat to surfaces that have been cleaned, pretreated, or prepared for painting as soon as practicable after preparation and before subsequent surface deterioration:
   a. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
   b. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished after removing rust and scale and priming or touching up surface sand if acceptable to topcoat manufacturers.
   c. If undercoats, stains, or conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
   d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried and cured to where it feels firm and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

F. Mechanical and Electrical Work:

1. Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces:
   a. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
   b. Prime and paint uninsulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, heat exchangers, tanks, ductwork, conduit, switchgear, and paintable insulation except where items are prefinished.
   c. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
   d. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
   e. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.
   f. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
   g. Concealed Members: Wherever steel and metal parts to receive paint are built into and concealed by construction, paint as specified for exposed parts so finish painting is complete before members are concealed.

G. Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Painting is limited to items exposed in equipment rooms and occupied spaces:
   a. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
   b. Prime and paint uninsulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, heat exchangers, tanks, ductwork, conduit, switchgear, and paintable insulation except where items are prefinished.

c. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
d. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
e. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.
f. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

H. Block Fillers: Apply block fillers to concrete masonry block at rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply prime coat, recommended by manufacturer, to material required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or defects due to insufficient sealing.

J. Finish Coats:
1. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance without bleed through:
a. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or surface imperfections is not acceptable.
b. Transparent (Clear) Finishes: Use multiple coats to produce glass smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

L. Touch Up:
1. Touch up marred, scraped, and blemished areas of surfaces which were factory primed or previously coated:
a. Prepare and touch up scratches, abrasions, and blemishes and remove foreign matter before proceeding with succeeding coats.
b. Touch up marred, scraped, and blemished areas of factory primed or previously coated surfaces.
c. Feather touch up coating overlapping minimum 2 inches onto adjacent unblemished areas producing smooth, uniform surface.
d. As soon after erection and installation as possible, touch up fasteners, welded surfaces and surroundings, field connections, and areas on which shop coat has been abraded or damaged with specified primer before corrosion and other damage occurs from exposure.

3.6 FIELD QUALITY CONTROL

A. Dry Film Thickness (DFT) Testing:

1. Tests for dry film thickness may be determined by using a Tooke Scale and microgroover, an electronic scanner, or the Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness:
   a. Contractor shall touch up and restore painted surfaces damaged by testing.
   b. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.7 CLEANING AND PROTECTION

A. It is of the upmost importance the sites remain in a safe, clean, and well-maintained condition. At the end of each day, leave the site ready to use by staff and students. Protect staff and students and the learning environment throughout the work.

B. Cleanup: At the end of each day, remove empty cans, rags, rubbish, and discarded paint materials from site. After completion of painting work, clean glass and paint spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. Provide *Wet Paint* signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work. After related work is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

E. At completion of painting activities, touch up and restore damaged or defaced painted surfaces.

F. Waste Management: Legally dispose of unused paint and paint containers in accordance with manufacturer’s recommendations and environmental regulations.

PART 4 SCHEDULES

A. The following is a schedule of typical painted items and does not specifically include every item that is to receive paint but should establish type and quality of finish for all items normally included in a complete paint job.

B. Exterior Surfaces (Note: Exterior surfaces are divided into two (2) different categories, based upon color and level of graffiti resistance required. System 1 will be used when standard earthtone colors or neutral colors are specified, and System 2 will be used when bright colors (primary reds, yellows, and oranges) are specified and/or when a graffiti resistant coating is required:
   1. Galvanized Metal:
      a. Surface Preparation: Acid etch galvanized surfaces that have not weathered at least six (6) months prior to beginning painting operations. Krud Kutter Metal Clean and Etch.
      b. Primer: One (1) coat Ultrashield ULDM00 DTM Gray Primer.
      c. Finish: Two (2) coats Ultrashield ULSH40 Low Sheen High Performance Acrylic Urethane.
      d. Finish: Two (2) coats US Coatings RustGrip 2300 1-2 Mils DFT.
   2. Un-galvanized Metal:

a. Primer: One (1) coat Ultrashield ULDM00 DTM Gray Primer.
b. Finish: Two (2) coats Ultrashield ULSH40 Low Sheen High Performance Acrylic Urethane.

3. Concrete and CMU:
   a. Primer/Finish: (2) coats Eff-Stop Premium ESPR00 Masonry Primer / (2) coats US Coatings AquaGrip 2600 3-5 Mils DFT.
4. Wood (Includes plywood siding and wooden trim):
   a. Primer: One (1) coat EZ-Prime EZPR00 Exterior Wood Primer.
   b. Finish: Two (2) coats Spartashield SSHL60 100% Acrylic Gloss.
5. Fiber-Cement Materials:
   a. Primer: One (1) coat Eff-Stop Premium ESPR00 Masonry Primer.
   b. Finish: Spartashield SSHL60 100% Acrylic Gloss.
6. All piping in mechanical rooms shall be painted in their entirety, in the following colors:
   a. Aristoshield ASHL70 High-Gloss Enamel:
      1) Gas lines: Orange
      2) Domestic cold water: White
      3) Domestic hot water: Pink
      4) Heating hot water: Red
      5) Condenser water: Green
      6) Chilled water: Blue

C. Interior Surfaces:
1. Galvanized Metal:
   a. Primer: One (1) coat Ultrashield Galvanized Metal Primer ULGM00.
   b. Finish: Two (2) coats Aristoshield ASHL50 Semi-Gloss Enamel.
2. Shop-Primed Ferrous Metals (Use for metal doors and frames and miscellaneous metal items):
   a. Shop coat by others.
   b. One (1) coat over Steel: Bloc-Rust Premium BRPR00 Rust Preventative Primer; Aluminum: Ultrashield Galvanized Metal Primer ULGM00.
   c. Two (2) coats Aristoshield ASHL50 Semi-Gloss Enamel.
3. Gypsum Wallboard:
   a. Primer: One (1) coat Vinylastic Premium VNPR00 Acrylic Wall Sealer.
   b. Finish: Two (2) coats Spartawall Premium SWLL50 Acrylic Latex Semi-Gloss.
4. Primer Concrete and CMU (Enamel):
   a. One (1) coat Smooth Blocfil Premium SBPR00 100% Acrylic Block Filler.
   b. Finish: Two (2) coats Spartawall Premium SWLL50 Acrylic Latex Semi-Gloss.
5. Wood (Painted):
   a. Primer: Interkote Premium IKPR00 100% Acrylic Enamel Undercoater.
   b. Finish: Aristoshield ASHL50 Semi-Gloss Enamel.
6. Wood (Stained):
   a. Stain: Gemini Craftsman Collection Wiping Stain CCW Water-Based Series.
   b. Finish (First Coat): WB-0230 Gemini Titanium Clear Urethane Satin
   c. Finish (Second Coat): Gemini WB-0230 Gemini Titanium Clear Urethane Satin.
7. Gypsum Wallboard (Epoxy) – Kitchens, bathrooms, laboratories, etc.:
   a. Primer: One (1) coat US Coatings AquaGrip 2600 2-3 Mils DFT.
   b. Finish: Two (2) coats US Coatings AquaGrip 2600 3-5 Mils DFT per coat.
8. CMU (Epoxy Paint) – Where indicated on plans.
   a. Primer: Two (2) coats Smooth Blocfil Premium SBPR00 100% Acrylic Block Filler.
   b. Finish: Two (2) coats US Coatings AquaGrip 2600 3-5 Mils DFT.
9. CMU (Chemical Protection Sealer) – Where indicated on plans.
   c. Primer: N/A
   d. Finish: Two (2) coats Moxie Shield 1500 Concrete Sealer.
10. Pipe and fittings, including but not limited to copper and brass, at kitchen areas (but excluding aluminum, stainless steel, nickel and chrome plated pipe and fittings):

a. Primer: One (1) coat; US Coatings RustGrip 2300 1-2 Mils DFT.
b. Finish: Two (2) coats bright aluminum paint, US Coatings UreGrip 3000 VOC 2-3 Mils DFT per coat.

D. Paint Types: Refer to the Finish Schedule in the Drawings.

END OF SECTION

SECTION 10 14 00 SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Room identification signs.
   2. Restroom signs.
   3. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data: Technical data for each type of signage.

B. Shop Drawings:
   1. Submit fabrication and installation details and attachments to other work:
      a. Show sign mounting heights and locations.
      b. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples: Submit one sample of each specified sign type, full-sized.

1.4 QUALITY ASSURANCE

A. Field Inspections:
   1. All new tactile signage must be field inspected after installation per CBC 11B-703.1.1.2.

B. Accessibility Requirements:
   1. Raised characters shall comply with CBC Section 11B-302.2.
      a. Depth: It shall be 1/32-inch (0.8 mm) minimum above their background, shall be sans serif uppercase, and be duplicated in Braille.
      b. Height: It shall be 5/8-inch (15.9 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter “I.” See CBC Section 11B-703.2.5.
      c. Finish and Contrast: Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background. See CBC Section11B-703.5.1.
      d. 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. See CBC Sections 11B-703.22.4 and 11B-703.2.8.
      e. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8.
      f. Format: Text shall be in a horizontal format. See CBC Section 11B-703.2.9.
      g. Braille: It shall be contracted (Grade 2) and shall comply with CBC Sections 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.

h. Mounting Height: Tactile characters on signs shall be located 48 inches minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. See CBC Section and Figure 11B-703.4.4.
i. Mounting Location:
    1) 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 leafs.
        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 leafs.
        e) So that a clear floor space of 18 inches x 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45-degree open position.
j. Visual Characters: Shall comply with CBC Section 11B-703.5 and shall be 40 inches minimum above finish floor or ground.
k. Pictograms: Shall comply with CBC Section 11B-703.6.
l. Symbols of Accessibility: Shall comply with CBC Section 11B-703.7.
m. Variable Message Signs: Shall comply with CBC Section 11B-703.8.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers:
    1. Subject to compliance with requirements, provide products by one of the following:
        a. Apco Signs
        b. ASI Modulex, Inc.
        c. Best Sign Systems, Inc.
        d. InPro Corporation (IPC).
        e. Mohawk Sign Systems.
        f. Nelson-Harkins Industries.
        g. Seton Identification Products.
        h. Stamprite Supersine; a division of Stamp Rite Inc.
        i. Vomar Products, Inc.

B. Acrylic Sheet: ASTM D4802, category standard with manufacturer for each sign, Type UVF (UV filtering).

C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.2 SIGNAGE

A. Solid Plastic Tactile Room, Restroom and Miscellaneous Identification Signs:
    1. 1/4-inch thick, Graphic Process Sand Carved with pre-drilled holes for mounting screws:
        a. Sign Panel Perimeter:
            1) Edge Condition: Square cut.
            2) Corner Condition in Elevation: 3/8” radius.
        b. Mounting at Walls: Stainless steel vandal-proof pin-in-head torx screws
        c. Mounting at Glazing: Clear silicone adhesive

d. Text and Typeface:
   1) Accessible raised characters and Braille. Finish raised characters to contrast with background color, and finish Braille to match background color:
      a) Raised Characters: Refer to drawings
      b) California Contracted Grade 2 Braille: Refer to drawings
      c) Pictograms: Field height of minimum 6 inches; no characters or braille in pictogram field; nonglare, field contrast to pictogram, text descriptors below pictogram field
      d) Accessibility Symbols: Where used, symbols shall comply with CBC 11B-703.7.
e. Color: As selected by Architect from manufacture's full range of standard colors.
f. For exterior uses, fabricate signs from exterior grade materials with UV inhibitor.

2.3 FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

E. Aluminum Finishes:
   1. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
   2. Baked Enamel or Powder Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of signage work. Verify sign support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

B. Proceed with installation after correcting unsatisfactory conditions.

3.3 INSTALLATION

A. Install signs using mounting methods indicated and according to manufacturer's written

instructions:

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Interior Wall Signs:
   a. Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door:
      1) See drawings for the mounting height and location of each sign.
4. Before installation, verify sign surfaces are clean and free of materials or debris that impair installation.

B. Mounting Height:
   1. Tactile characters on signs shall be located 48 inches minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface, pursuant to CBC Section and Figure 11B-703.4.1.

C. Mounting Location:
   1. A tactile sign shall be located as follows, pursuant to CBC Section and Figure 11B-703.4.2:
      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 leafs.
      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 leafs.
      e. So that a clear floor space of 18 inches by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45-degree open position.

D. Mounting Methods:
   1. Exposed Fastener: Install vandal-resistant fastener; set screw head flush with sign face.

E. Visual Characters shall comply with CBC Section 11B-703.5 and shall be 40 inches minimum above finish floor or ground.

F. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

G. DSA Inspections: Signs and identifications or other information shall be field inspected after installation and approved by Division of the State Architect prior to the issuance of a final certificate of occupancy, or final approval where no certificate of occupancy is issued. The inspection shall include, but not limited to, verification that Braille dots and cells are properly spaced, and the size, proportion, and type of raised characters are in compliance with CBC, Section 11B-703.1.1.2.

3.4 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 21 13 TOILET COMPARTMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. HDPE toilet partitions, floor mounted, overhead braced.
   2. All required accessories for installation.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Within four (4) weeks of award of contract, submit:
      a. Complete shop drawings for the Architect's approval, showing all required field measurements, all details and elevations, plans and sections required to indicate all conditions.
      b. Manufacturer's installation instructions.
      c. Samples: 2x3 inch samples in each color.

B. Certification: Provide a certificate of compliance attesting that all materials are in accordance with manufacturer’s specifications.

C. Warranty: Twenty five year against breakage, corrosion and delamination under normal conditions.

1.4 REFERENCES

A. ASTM A666 – Standard Specification for Stainless and Heat-Resistant Chromium-Nickel Steel Plate, Sheet and Strip.

B. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

D. National Fire Protection Association (NFPA) 286 – Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.5 QUALITY ASSURANCE

A. Accessibility Requirements:
   1. Comply with applicable requirements.
      a. Americans with Disabilities Act of 1990, as amended.
         1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
      b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
         1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations,

Commercial Buildings and Public Housing.

B. Manufacturer Qualifications: Minimum 5 years' experience in manufacture of solid plastic toilet compartments with products in satisfactory use under similar service conditions.

C. Installer Qualifications: Minimum 5 years' experience in work of this Section.

D. Field Measurements:
1. Field verify dimensions prior to submittals and fabrication.

E. Performance Requirements:
1. Fire Resistance: Partition Materials shall comply with the following requirements, when tested in accordance with ASTM E84, Class B:
   a. Tested to Meet ASTM E84, Class B flame spread/smoke developed rating.
2. Material Fire Ratings:
   a. National Fire Protection Association (NFPA) 286: Pass.
   b. International Code Council (ICC): Class B.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Any one (1) of the following manufacturers whose product meets or exceeds the specifications for those specified is approved for use on the Project. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding those specified for design, size, finish, and fabrication and comply with Division 01 requirements for substitutions in order to be considered:
1. Sanymetal
2. Metpar Corp.
3. Scranton Products
4. Or Architect approved substitute.

2.2 MATERIALS

A. Basis of Design: Hiny Hiders by Scranton Products.

B. Doors, Panels and Pilasters:
1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
3. 1 inch thick with edges rounded to 1/4-inch radius.
4. Fire hazard classifications: Not required.

C. Headrail: heavy duty aluminum extrusions, anodized with anti-grip configuration, and shall be fastened to the pilaster tops.

2.3 HARDWARE

A. Hinges:
1. Full height, continuous stainless steel, through bolted to door and pilasters with stainless steel, Torx head sex bolts.
2. Provide spring loaded, self-closing hinge at accessible stalls.
3. Operate accessible stalls per 11B-404.2.9.

B. Door Strike and Keeper:
   1. 6 inches long, fabricate from heavy-duty extruded aluminum with bright dip anodized finish, with wrap-around flanges secured to pilasters with stainless steel tamper resistant Torx head sex bolts.
   2. Bumper: Extruded black vinyl.
   3. Accessible compartment: 11B-604.8.1.

C. Latch and Housing:
   1. Heavy-duty extruded aluminum.
   2. Latch housing: Bright dip anodized finish.
   3. Slide bolt and button: Black anodized finish.
   4. Accessible Latch to comply with 11B-404.

D. Coat Hook/Bumper:
   1. Combination type, chrome plated Zamak.
   2. Equip outswing handicapped doors with second door pull and door stop.
   3. Coat Hook Location:
      c. Accessible Stalls only: 11B-604.8.3.
         1) Height: 48 inches A.F.F. maximum.

E. Door Pulls: Chrome plated Zamak.
   1. Accessible Stalls: 11B-404.2.7.

F. Accessible Toilet Compartments:
   1. Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds maximum. CBC Section 11B-604.8.1.

2.4 COMPONENTS

A. Doors and Dividing Panels: 55 inches high, mounted 14 inches above finished floor with aluminum heat-sinc fastened to bottom edges.

B. Pilasters: 82 inches high, fastened to pilaster sleeves with stainless steel tamper resistant Torx head sex bolt.

C. Pilaster Sleeves: 3 inches high, one-piece molded HDPE, secured to pilaster with stainless steel tamper resistant Torx head sex bolt.

D. Wall Brackets: 54 inches long, extruded PVC fastened to pilaster and panels with stainless steel tamper resistant Torx head sex bolts.

E. Color: Black.

F. Headrail: Heavy-duty extruded aluminum, anti-grip design, 20ga statin finish, fastened to headrail bracket with stainless steel tamper resistant Torx head sex bolt and at top of pilaster with stainless steel tamper resistant Torx head screws.

G. Headrail Brackets: 20 gage stainless steel, satin finish, secured to wall with stainless steel tamper resistant #12 Torx head screws into metal stud backing.

2.5 PRIVACY SCREENS

A. Provide privacy screens between urinals and/or as indicated on drawings.

B. Panels and Pilasters: 1 inch (25 mm) thick with edges rounded to a radius. Screens mounted at 14 inches (356 mm) above the finished floor.
   1. Aluminum Heat Sink fastened to bottom edges.
   2. Color: Black

C. Screen Type: Pilaster Supported
   1. Configuration: Floor to Ceiling pilaster supported screen
   2. Attach to floor and ceiling with stainless steel angles. Attach angles to pilasters with 3/4 inch (19 mm) stainless steel tamper resistant Torx head screws.

D. Size: 18 inches (457 mm) wide by 55 (1397 mm) inches high.

E. Pilaster Sleeves: 3 inches high, one-piece molded HDPE, secured to pilaster with stainless steel tamper resistant Torx head sex bolt.

F. Wall Brackets: 54 inches long, extruded PVC fastened to pilaster and panels with stainless steel tamper resistant Torx head sex bolts.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Install all toilet partitions where indicated on the drawings, and as indicated on the shop drawings, anchoring all components firmly in place for long life under hard use and in complete accordance with the manufacturer's recommendations.

C. Provide blocking/anchoring devices to secure to wall. Anchoring devices must be compatible to wall type to ensure adequate strength.

3.2 CLEANING AND ADJUSTING

A. Clean surfaces free of dirt, oil, grease and other contaminants which detract from appearance of partitions.

B. Except for compartments for the handicapped, adjust doors to remain at a uniformly open position when unlocked.

3.3 REPLACEMENT OF DEFECTIVE MATERIALS

A. Defaced, damaged, scratched or marred materials will not be permitted, will be considered defective, and rejected. Rejected materials shall be replaced with new materials at no additional expense to Owner.

END OF SECTION

SECTION 10 26 13 – CORNER GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Requirements including but not limited to:
   1. Corner guards.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements of each type corner guard specified.
   2. Manufacturer's installation requirements.
   3. Manufacturer's cleaning and maintenance instructions.

B. Shop Drawings: Show locations of each item and installation details. Provide elevations of non-standard conditions.

C. Samples:
   1. Color charts consisting of actual product pieces, demonstrating full range of available colors, for Architect’s color selection.
   2. 12 inch long piece in full size profiles of corner guard in color selected.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame Spread Index: 25 or less.
      b. Smoke Developed Index: 450 or less.

   2. Accessibility Requirements: Comply with applicable requirements.
      a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) 2010.
      b. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.
      c. Texas Accessibility Standards (TAS) 2012.

B. Source Limitations: Obtain corner guards products from single source from single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store corner guards in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 degrees F (21 degrees C) during the period vinyl materials are stored.
   2. Keep vinyl materials out of direct sunlight.

3. Store wall protection components for a minimum of 72 hours, or until material attains a minimum room temperature of 70 degrees F (21 degrees C).
    a. Store corner guard covers in a vertical position.

1.6 WARRANTY

A. Warranty: Written warranty in which the manufacturer agrees to repair or replace components of wall protection units that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
    b. Deterioration of metals, metal finishes, vinyls, and other materials beyond normal use.

2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Continuous 6063-T6 aluminum retainer behind entire height of corner guard, minimum 0.060 inch thick.

B. Vinyl Materials: Chemical and stain resistant, high impact resistant vinyl with integral color throughout; extruded and sheet material as required, thickness as indicated.

C. Fasteners: Aluminum, nonmagnetic stainless steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security type fasteners where exposed to view.

D. Adhesive: Recommended by protection product manufacturer.

2.2 WALL PROTECTION

A. Basis of Design: 160 Series as manufactured by InPro Corporation (IPC). Other manufacturers are subject to compliance with requirements.
1. Construction Specialties, Inc.; (800) 233-8493.
2. JL Industries, Inc.; (800) 554-6077.
3. Korogard Wall Protection Systems.; (855) 753-5474.
4. Nystrom, Inc.; (800) 547-2635

B. High Impact, Vinyl Cover Corner Guards: Assembly consisting of snap on, vinyl cover that is flush with adjacent wall surface, installed over retainer; including mounting hardware; fabricated with 90 degree or 135 degree turn to match wall condition; full wall height.
1. Cover: Extruded rigid vinyl, minimum 0.078 inch (2.0 mm) wall thickness.
    a. Profile: Nominal 2 inch (50 mm) long leg and 1/4 inch (6 mm) corner radius.
    b. Height: 8 feet (2.4 m).
    c. Color: Selected by Architect from manufacturer’s full range of colors.

2. Continuous Retainer: Minimum 0.060 inch (1.5 mm) thick, one piece, extruded aluminum.
3. Retainer Clips: Impact absorbing clips.

2.3 FABRICATION

A. Fabricate corner guards according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.4 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the work.

B. Examine walls to which corner guards will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

C. Proceed with installation after correcting unsatisfactory conditions.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall protection.

B. Prior to installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Mounting Heights: Install wall protection in locations and at mounting heights indicated on Drawings.

C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
   1. Provide anchoring devices and suitable locations to withstand imposed loads.
   2. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and vinyl covers at different locations along the run, but no closer than 12 inches (305 mm) apart.

3. Adjust end and top caps as required to ensure tight seams.

3.4 CLEANING

A. Immediately after completion of installation, clean vinyl covers and accessories using a standard ammonia based household cleaning agent.

END OF SECTION

SECTION 10 28 13 TOILET ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Public use washroom accessories.
   2. Public use shower room accessories.
   3. Private use bathroom accessories.
   4. Warm air dryers.
   5. Underlavatory guards.
   6. Custodial accessories.
   7. Accessories necessary for a complete installation.

1.3 PERFORMANCE REQUIREMENTS

A. Sanitary Facility Elements:
   1. Elements of sanitary facilities shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612.
   2. Grab bars in toilet facilities and bathing facilities shall comply with CBC Section 11B-609.
   3. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges. The space around the grab bars shall be as follows:
      a. 1 ½ inches between the grab bar and the wall.
      b. 1 ½ inches minimum between the grab bar and projecting objects below and at the ends.
      c. 12 inches minimum between the grab bar and projecting objects above.
   4. Grab Bars to meet DSA IR 16-12 – Grab Bar Design and Connections: 2022 CBC.
      a. Grab Bars shall be designed to resist a single concentrated load of 250 lbs. applied in any direction at any point o the grab bar such as to produce the maximum load effect.

1.4 SUBMITTALS

A. Product Data:
   1. Technical Data including construction details, material descriptions, dimensions of individual components and profiles, and finishes:
      a. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
      b. Include electrical characteristics.

B. Samples:
   1. Full size, for each exposed product and for each finish specified:
      a. Approved full size Samples will be returned and may be used in the Work.

C. Product Schedule: Show types, quantities, sizes, and installation locations by room of each accessory required. Identify locations using room designations indicated.

D. Maintenance Data: Submit for inclusion in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Accessibility Requirements:
   1. Comply with applicable requirements:
      a. Americans with Disabilities Act of 1990, as amended:
         1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design
      b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
         1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Source Limitations: Obtain products from single source from single manufacturer.

1.6 WARRANTY

A. Written warranty signed by manufacturer in which manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period:
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Toilet accessories schedule is based on Bobrick Washroom Equipment. Subject to compliance with requirements, provide products by one of the following:
      a. AJW Architectural Products.
      b. American Specialties, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. General Accessory Manufacturing Co.
      f. GAMCO Specialty Accessories; a division of Bobrick.

B. Stainless Steel: ASTM A666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

C. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

D. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

E. Galvanized Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot dip zinc coating.

F. Galvanized Steel Mounting Devices: ASTM A153/A153M, hot dip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear glass mirrors, nominal 6.0 mm thick.

2.2 COMPONENTS

A. Underlavatory Guard:
   1. Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with piping and/or burns from piping; allow service access without removing coverings:
      a. Product: Truebro LavShield Protective Lavatory Enclosure.
      b. Material and Finish: Antimicrobial, molded plastic, white.
      c. Provide at all lavatories.

2.3 FABRICATION

A. Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

3.2 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F446.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items. Remove temporary labels and protective coatings. Clean and polish exposed surfaces according to manufacturer's written recommendations.

PART 4 SCHEDULE

SECTION 10 28 13 TOILET ACCESSORIES

4.1 ACCESSORY SCHEDULE

A. TA-1 - Soap Dispensers:
   1. Mounting: Surface.
   2. Operation: Automatic; Battery Operated
   3. Model No.: B-2111 (vertical)
   4. Locations: One at each Lavatory.

B. TA-2 - Mirrors:
   1. Mounting: Surface.
   2. Model No.: B-2908
   3. Size: 24 inches by 36 inches (600 mm by 900 mm), unless shown otherwise.
   4. Finish: Tempered Glass
   5. Locations: One at each Lavatory.

C. TA-3 - Toilet Paper Dispensers:
   1. Mounting: Surface.
   2. Model No.: B-2890
   3. Locations: Non-accessible water closets and toilet stalls.

D. TA-4 – N/A

E. TA-5 - Grab Bars: Typical Accessible Toilet Stalls:
   1. Size/Finish: 42” x 1-1/2 inch diameter satin stainless steel
   2. Clearance: 1-1/2 inch between rail and wall.
   3. Model No.: B-6806.
   4. Mounting: Attach with concealed mounting kit. Mount parallel to floor.
   5. Location: Accessible water closets and toilet stalls.

F. TA-6 - Sanitary Napkin Dispensers:
   1. Mounting: Recessed.
   2. Model No.: B-3706C
   3. Operation: Free Vend
   4. Capacity: 20 Napkins/ 30 Tampons.
   5. Locations: Girls Restroom

G. TA-7 - Sanitary Napkin Disposal:
   1. Mounting: Surface.
   2. Model No.: B-270.
   3. Capacity: 1.0 gal.
   4. Locations: Women’s non-accessible toilet stalls.

H. TA-8 – N/A

I. TA-9 – N/A

J. TA-10 – N/A

K. TA-11 - Clothes Hook:
   1. Mounting: Surface.
   2. Model No.: B-6717.
   3. Locations: All toilet stall doors.

L. TA-12 – N/A

M. TA-13 – N/A

N. TA-14 - Paper Towel Dispenser:
   1. Mounting: Surface
   2. Operation: Automatic; Battery Operated
   3. Model No.: American Specialties Inc., #204523AC
   4. Locations: Refer to drawings.

O. TA-15 – N/A

P. TA-16 – N/A

Q. TA-17 – N/A

R. TA-18 - Toilet Paper Dispensers:
   1. Mounting: Semi-recessed (Less than 4” projection).
   2. Model No.: B-3888.
   3. Location: Accessible water closets and toilet stalls.

S. TA-19 - Seat Cover Dispenser:
   1. Mounting: Surface.
   2. Model No.: B-221
   3. Location: All water closets and toilet stalls.

T. TA-20 - Sanitary Napkin Disposal:
   1. Mounting: Recessed.
   2. Model No.: B-353.
   3. Locations: Women’s accessible toilet stalls.

END OF SECTION

SECTION 10 44 00 FIRE EXTINGUISHER AND CABINETS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
1. Fire Extinguisher Cabinets.
2. Fire Extinguishers

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and technical data to indicate specification compliance.
2. Manufacturer’s installation instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Specifications are based on the products of named manufacturers. Other listed manufacturers who produce products equivalent to those specified are approved for use on the Project. Other manufacturers must have a minimum of five (5) years’ experience manufacturing equivalent to those specified and comply with Division 01 requirements regarding substitutions to be considered:
1. Larsen's Manufacturing Co.
2. The Williams Bros. Corporation of America.
3. J. L. Industries, Inc.
4. Potter-Roemer.

2.2 MATERIALS

A. Fire Extinguishers and Cabinets must comply with CBC Sections 11B-307, 11B-308, 11B-309, and 11B-403.

B. Fire Extinguisher Cabinets (FEC):
1. Basis of Design: **Clear VU 1515G25, by JL Industries, Inc.**
2. Size: 24 inches x 10-1/2 inches x 4 inches inside tub dimension.
3. Type: Fully-recessed, 3/8 inch flat trim; ADA compliant.
4. Tub Construction: 22 gauge min. steel with standard baked acrylic enamel interior finish.
5. Door and Frame: 18 gauge min. 304 stainless steel door and frame with vertical decal lettering "FIRE EXTINGUISHER" in red color.
6. Glazing: Clear acrylic bubble.
7. Hardware: Continuous concealed piano hinge constructed of material which matches door and trim material. Satin finish pull handle with cam cylinder lock with safety pull designed to release upon firm pull on handle (Larsen’s “Larsen-Loc”™, J.L. Industries “Saf-T-Lok”™; or equivalent).
8. Finish of Exterior: #4 Stainless steel.

9. Fire rating: as occurs, provide fire rated cabinet, for one or two hour rated conditions as indicated or required by specific location. Cabinet shall be tested and approved by Warnock Hersey to ASTM E814, and shall bear the Warnock Hersey label.

C. Fire Extinguishers (F.E):
   1. Models/Types:
      a. Multipurpose dry chemical with 10 lbs. capacity: C rating conforming to MP10 Series. UL Rating: 4A:80B:C.
   2. Mounting: Provide eye brackets for direct wall mounting to hook and for mounting in Fire Extinguisher cabinets. Refer to drawings for location and quantity.
   3. Provide initial inspection tag for each extinguisher.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fire extinguishers and cabinets in openings in accordance with manufacturer's printed instructions.

B. Install fire extinguishers and cabinets where indicated on the drawings, or if not indicated, in locations required by governing code and as directed by Owner.

END OF SECTION

SECTION 10 51 53 LOCKER ROOM BENCHES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Pre-manufactured Benches.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.
   2. Manufacturer's installation instructions.

B. Shop Drawings: Indicate size, material, and finish. Show location and installation procedures. Include details of joints, attachments and clearances.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Accessibility Requirements - Comply with applicable requirements:
      a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) 2010.
      b. 2022 California Building Code.
         1) Section 11B-225.2.1.
         2) Section 11B-811.

B. Preinstallation Conference: Conduct conference at site.

1.5 WARRANTY

A. Warrant the work specified herein against defects in material and workmanship to the original purchaser for three (3) years.

B. Defects shall include, but not be limited to, the following:
   1. Rapid deterioration of finish.
   2. Loose or missing parts.
   3. Non-functioning components and mechanisms.
   4. Rust, delamination, warp, rot or breakage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers are subject to compliance with requirements; provide products by one of the following:

1. Hollman, (972)815-4000
2. Or approved equal

2.2 LOCKER ROOM BENCHES

A. Basis of Design: Oslo Bench, by Hollman

B. ADA Benches:
   1. Model: Oslo ADA Wall Mounted Model OBADA2
   2. Bench Material: Solid Surface.
   3. Size: 20 inches wide x 48 inches long.
   4. Height: 18 inches.
   5. Color: As selected from manufacturer’s full line of standard and premium solid surface colors.
   6. Accessories: Wall Brackets.

C. Legs:
   1. Manufacturer’s stainless steel, rectangular legs with provisions for attachment to bottom of bench and anchorage to floor.
   2. Finish: Brushed stainless steel.

D. Wall Brackets:
   1. Location: ADA Benches, with adjoining wall surface.
   2. Quantity: (2) per bench.
   3. Finish: Manufacturer's baked enamel finish.
   4. Color: Black

PART 3 EXECUTION

3.1 INSTALLATION

A. Assemble and install locker room benches plumb, level, and flush in the locations shown on the drawings in accordance with the manufacturer’s instructions.

B. Install and anchor locker room benches to the floor and wall as instructed by the manufacturer.

END OF SECTION

SECTION 11 48 50 GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Basketball equipment.
   2. Volleyball equipment.

1.3 DEFINITIONS

A. FIBA: Federation Internationale de Basketball Amateur (The International Basketball Federation).

1.4 SUBMITTALS

A. Product Data - For each type of product:
   1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
   2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings - For gymnasium equipment:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.
   3. Include transport and storage accessories for removable equipment.

C. Samples: For each exposed product and for each item and color specified.

D. Samples for Initial Selection: For each type of gymnasium equipment.

E. Samples for Verification - For the following products:
   1. Basketball Net: Full size.

F. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finish flooring.

G. Qualification Data: For Installer.

H. Product Certificates: For each type of gymnasium equipment.

I. Sample Warranty: For special warranty.

J. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products or entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

A. Special Warranty - Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period:
   1. Failures include, but are not limited to, the following:
      a. Basketball backboard failures including glass breakage.
      b. Faulty operation of basketball backstops.
   2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain each type of gymnasium equipment from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.3 BASKETBALL EQUIPMENT

A. Basis-of-Design Product - Subject to compliance with requirements, provide Porter Athletic, Inc. Ceiling hung and wall hung systems to be complete:
   1. **Porter Athletic Equipment Company** (Basis of Design).
   2. Draper Inc.
   3. Jaypro Sports, LLC.
   4. L. A. Steelcraft Products, Inc.
   5. P. W. Athletic Mfg. Co.
   6. Performance Sports Systems.
   7. Spalding Equipment.
   8. Or approved Equil.

B. General: Provide equipment complying with requirements in FIBA's Basketball Rule Book Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.

C. Provide manufacturer's recommended connections of size and type required to transfer loads to building structure. See Structural Drawings:
   1. Goal Height Adjuster - Adjustable from 8 to 10 feet 1 inch, with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing:
      a. Operation: Electric; key switched.

D. Backstop Safety Padding: Standard 326 series, color selected by Architect. Safety Padding on Main court backstops only.

E. Basketball Backboards:
   1. Main Court: Rectangular Glass, Model # 208.
   2. Side Courts: Rectangular Glass, Model # 208.

F. Goal Mounting Assembly - Compatible with goal, backboard, and support framing; with hole

pattern that is manufacturer's standard for goal attachment:

1. Main Court: Direct Mount **90949000** – Ceiling Suspended, Forward Fold, Front Braced Backstop; Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard, and rigidity and stability of goal are maximized.
2. Side Courts: Direct Mount **90955000** – Ceiling Suspended, Side Fold, Side Braced Backstop; Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard, and rigidity and stability of goal are maximized.

G. Basketball Goals - Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring:

1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication per manufacturer's standard design.
2. Type:
   a. Main Court: **00245500 Ultra Flex-Goal** with tube tie net attachment system.
   b. Side Court: **00245500 Ultra-Flex-Goal** with tube tie net attachment system.
3. Breakaway Characteristics: Positive-lock movable breakaway design, with manufacturer's standard breakaway mechanism including preset pressure release, set to release at 230-lb load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
4. Field Adjustment: Provide rim that is field-adjustable for rebound elasticity without being removed from the backboard.
5. Mount - Rear:
   a. Net Attachment: Tube tie for attaching net to rim.
   b. Finish: Manufacturer's standard finish, color to be selected by Architect.
6. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit rim diameter, and as follows:
7. Cord: Made from white nylon.
8. Competition Cord: Antiwhip, made from white nylon cord not less than 120-gm thread and not more than 144-gm thread.

H. Backstop Electric Operator - Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory prewired motor controls, starter, gear reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system:

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
3. Operator Mounting: Wall mounted board.
4. Motor Electrical Characteristics:
   a. Voltage: 120 V, 208-220 V or NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
   b. Horsepower: 1 hp.
   c. Phase: Single.
5. Remote Control Station(s) - NEMA ICS 6, Type 1 enclosure for surface mounting and momentary contact, three position, switch operated control with up, down, and off functions:
   a. Group Key Switch Control Stations: One switch per each backstop.
   b. Keys: Provide two sets of dual keys per station.
   c. Switches, Ganged: Single faceplate with multiple switch cut outs [for two switches operating two backstops.
6. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.

2.4 VOLLEYBALL EQUIPMENT

A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
   1. **Jaypro Sports, LLC.** (Basis of Design).
   2. Porter Athletic Equipment Company
   3. Draper Inc.
   4. IPI by Bison.
   5. L. A. Steelcraft Products, Inc.
   6. P. W. Athletic Mfg. Co.
   7. Performance Sports Systems.
   8. Spalding Equipment.
   9. Approved Equal.

B. Provide equipment complying with requirements in USAV's *USA Volleyball Rule Book*.

C. Floor Insert – Brass finished floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than 12 inches (305 mm) long to securely anchor pipe sleeve in floor substrate indicated; one per post standard quantity as indicated:
   1. Basis of Design: **PVB-755** 3-1/2 inch brass floor sleeve for synthetic floor by Jaypro Sports.
   2. Floor Plate: Lockable, hinged access cover, designed to be flush with adjacent flooring. Provide one tool for unlocking access covers.
   3. Refer to details for existing floor conditions.

D. Post Standards - Removable, paired volleyball post standards and a center post standard for multicourt play as indicated. Adjustable, telescoping height. Designed for easy removal from permanently placed floor insert supports. Fabricated from combined steel and extruded aluminum pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with factory applied, polyester powder coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
   1. Nominal Pipe or Tubing Diameter: 3-1/2-inch (89 mm) OD at base:
   2. Net Height Adjuster - Sliding collar and lock mechanism designed for infinite Preset net hooks designed for incremental height adjustment, complete with fittings; designed for positioning net at heights indicated:
      a. Net Heights: Between tennis net height and boys'/men's volleyball net height, 42 and 95-5/8 inches (1067 and 2430 mm) for ages 12 and under net height and boys'/men's volleyball net height, 84 and 95-5/8 inches (2130 and 2430 mm) or more.
   3. Height Markers: Clearly marked at regulation play heights for elementary school, girls/women, boys/men volleyball and tennis.

E. Net: 32 feet (9.75 m) long; one per pair of paired post standards:
   1. Width and Mesh - 36 inches (910 mm) with 4-1/2 inch (114 mm) square mesh made of black polyester string:
      a. Hem Band Edges: White, 2-inch (50 mm) wide top binding; black, 1-inch (25 mm) wide bottom and side bindings; tie offs at top and bottom of each side end of net; and 1/4 inch (6 mm) diameter rope, at least 42 feet (12.8 m) long, threaded through top hem of binding.
   2. Dowels: Not less than 1/2-inch (13 mm) diameter fiberglass or 1-inch (25 mm) diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.

F. Net Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip] ratchet type winch with cable length and fittings for connecting to net lines, positive release mechanism, and permanently fixed handle. Mount net tensioner on post standard at side away from court. Provide end post with post top pulley. Provide opposing post with welded-steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.

G. Bottom Net Lock Tightener: Provide quick release type tension strap; a spring loaded, self-locking tensioner; a turnbuckle; a pulley; or other device and linkage fittings designed to quickly and easily tighten bottom line or net.

H. Judges' Stands: Provide adjustable height units designed to be freestanding, folding for storage with wheels for transporting. Fabricate welded steel tubing units with finish and color to match post standards.

I. Safety Pads - Comply with NCAA and NFHS requirements. Provide pads consisting of not less than 1-1/4 inch (32 mm) thick, multiple impact resistant crosslinked or closed cell polyethylene foam filler covered by puncture and tear resistant fabric cover, not less than 14 oz./sq. yd. (475 g/sq. m) PVC coated polyester, treated with fungicide for mildew resistance; with fire test response characteristics indicated, and lined with fire retardant liner. Provide pads with hook and loop closure or attachments for the following components and locations:
   1. Post Standards: Wraparound three- or four-sided style, designed to totally enclose each standard to a height of not less than 66 inches (1680 mm); one per post.
   2. Net Lines: Four per net.
   3. Judges' Stands: Designed to totally enclose each unit.
   4. Fabric Cover Flame Resistance Ratings: Complies with NFPA 701.
   5. Fabric Color: Selected by Architect.
   6. Graphics: Custom graphics as indicated.
   7. Wall Pads: 2x6, WB LipTB Class A Fire, hung vertically with looped rings to hang on wall. Minimum of 4 pads at each end of main basketball goal locations. See plan for location.

J. Post Standard Transporter: Wheeled unit designed for transporting a single post.

K. Wall Storage Rack: Unit designed for mounting on walls and for storing post standards in vertical position with retaining arms, fittings for padlock, and mounting hardware; number of units as required to provide storage for specified equipment.

L. Storage Cart: Wheeled unit designed for transporting and storing volleyball equipment and passing through 36 inch (910 mm) wide door openings. Fabricate welded steel tubing units with heavy duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium

equipment.

3.2 COORDINATION

A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.

B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

3.3 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work:
   1. Verify critical dimensions.
   2. Examine supporting structure, subfloors, and footings below finished floor.
   3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.

B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.

C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout:
   1. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.

D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.

3.5 ADJUSTING

A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.6 CLEANING

A. After completing gymnasium equipment installation, inspect components. Remove spots,

dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION

ECTION 11 61 43 STAGE CURTAINS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide Class Act Performer, manually operated platform curtain system as indicated on the drawings:
   1. Types of platform curtains specified in this section include the following:
      a. Front Setting: Valance and front curtain.
      b. Cyclorama Setting: Wrap around Rear Curtain and Borders.

B. Section includes theater curtains and track:
   1. Front Settings: Valance and Front Curtain.
   2. Cyclorama Setting: Wrap around Rear Curtain and Borders.

1.3 DESCRIPTION OF WORK

A. Provide Class Act Performer, manually operated platform curtain system as indicated on the drawings:
   1. Types of platform curtains specified in this section include the following:
      a. Front Setting: Valance and front curtain.
      b. Cyclorama Setting: Wrap around Rear Curtain and Borders.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, and general recommendations, including data which substantiates that materials comply with requirements.

B. Certification: Submit manufacturer's certification that platform curtains comply with requirements for flame resistance.

C. Shop Drawings: Submit shop drawings, including plans, elevations, and detail sections of typical rigging elements. Show anchors, hardware, operating equipment, and other components included in manufacturer's standard product.

D. Submit fabric manufacturer's standard color card, together with 12" square physical sample (any color) for each fabric required.

1.5 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications:
   1. Firm with not less than ten years of successful experience in fabrication and installation of platform curtains similar to those required for this project.
   2. Approved theatre rigging contractors:
      a. Stagecraft Industries, Inc. Portland, Oregon (503) 286-1600.

B. Flame Resistance Requirements:
   1. Provide platform curtains, which are certified to be flame resistant in accordance with

requirements of NFPA 70l.

2. Permanently attach label to each curtain indicating whether curtain is permanently and inherently flame resistant, or whether it will require retreatment after dry cleaning.

PART 2 PRODUCTS

2.1 PRODUCTS

A. Materials:
   1. Front Setting Curtain Fabric:
      a. Woven Cotton Velour: Napped fabric of l00% cotton; 54" width minimum; not less than 40 backing ends per inch, 40 pile ends per inch, and 32 picks per inch; 640 pile tufts per square inch; other characteristics as follows:
      b. Heavy Weight: Fabric weighing not less than 23 ounces per linear yard before flameproofing, with pile height of approximately l25 mils.
      c. Products are subject to compliance with requirements; provide one of the following heavy weight velour fabrics:
         1) "Memorable", K&M Fabrics, Inc.
         2) "Overture", JB Martin, Inc.
      d. Lining: Yarn-dyed denim cloth of l00% cotton, woven in a warp- faced twill; 54" minimum width.
      e. Color: Match Architect's samples.
   2. Cyclorama Setting Fabric:
      a. SuperSet: 100% Cotton short-napped fabric on one side, woven on other side, weighing not less than 16 oz per running yard before flameproofing; 54-inch minimum width.
      b. Products are subject to compliance with requirements; provide one of the following cotton fabrics:
         1) "Colored SuperSet Cloth" -Stagecraft Ind. Inc.
      c. Color: Match Architect's sample.
   3. Metal Products:
      a. Steel Tube: 16 gauge; 1 ½" unless otherwise indicated. Paint with a flat, rust-inhibitive primer and finish coat paint.
      b. Steel Pipe: Schedule 40 1 ½" unless otherwise indicated. Paint with a flat, rust-inhibitive primer and finish coat paint.
      c. Supports, Clamps, and Anchors: Steel in manufacturer's standard gages, of adequate size to support loads, painted after fabrication.
      d. Support Chain / Aircraft Cable: Chain or aircraft cable of adequate size to support loads. Provide means for adjustment on all suspension points.
      e. Inserts, Bolts and Fasteners: Manufacturer's standard units, unless otherwise indicated.

2.2 FABRICATION

A. Curtains:
   1. General - Provide not less than 50% additional fullness for curtains, unless otherwise indicated. Horizontal seams and fabric less than half-width are not permitted:
      a. Vertical Hems: Provide vertical hems not less than 2" wide, double-stitched and machine-sewn with no salvage material visible from front of curtain.
      b. Turnbacks: Where specified, provide turnbacks, formed by folding 12" of face fabric back at leading edge of panels and securing by sewing across top hem and grommeting through both layers of fabric.
      c. Top hems: Reinforce top hems by double-stitching 3-l/2" wide heavy jute webbing to top edge with minimum l" of face fabric turned under.
      d. Pleats: Provide fullness in curtains by sewing 6" of additional material into box

pleats spaced at l2" centers along top hem reinforcing. Provide not less than #2 brass grommets spaced at l2" and centered on box pleats, for tie lines or "S" hooks.

e. Bottom Hems: Except for curtains which hang to floor, provide bottom hems not less than 3" deep. For floor-length curtains, provide 5" hems with separate interior heavy canvas chain pockets equipped No. 8 jack chain. Stitch chain pocket so chain rides 2" above bottom edge of curtain.
f. Lining: Where specifically indicated, provide lining in same fullness as face fabric, and finished 2" shorter than face fabric. Unless otherwise specified, provide lining constructed of same fiber type as face fabric. Attach lining to face fabric along bottom line at seams with 4" long strips of heavy woven cotton tape.
g. Sewn-In Overlaps: As needed, sew in overlaps for entrance on /off platform in wrap around back curtain. Allow for approximately 6” overlaps. Provide 1” red webbing sewn on off platform side of overlap.
h. Draw Handles: Provide on off platform side of Leading and Trailing Edges of Wrap-Around back setting, 6-inch cloth handles fabricated of 1” nylon webbing inside like fabric.

2. Front Setting:
   a. Valance: Fabricate valance of heavy weight cotton velour. Fully lined.
   b. Front Curtain: Fabricate front curtain of heavy weight cotton velour, with 12" turnbacks at leading edge. Fully lined.
3. Cyclorama Setting:
   a. Borders: Fabricate using 16oz SuperSet fabric. No lining.
   b. Wrap around Rear Curtain: Fabricate using 16oz SuperSet fabric. No lining.
4. Curtain Tracks:
   a. Front Setting: Box track of adequate size for curtain with live end double pulley and single pulleys of min. 4” dia. Provide curtain carriers of molded nylon bodies with wheels parallel to body with 3/8” cord for manual operation.
   b. Provide carriers with neoprene or rubber bumper, heavy-duty swivel eye and trim chain for attachment of curtain snap or "S" hook.
   c. Products/Manufacturers - Provide one of the following:
      1) Atlas Silk Model No. 401.
      2) Silent Steel Model No.280.
      3) Stagecraft Model No. 400.
   d. Rear Setting: I Beam track rigged for walk draw operation. Carriers with neoprene or rubber bumper, heavy-duty swivel eye and trim chain for attachment of curtain "S" hooks, with end stops.
   e. Strongback Battens: Fabricate battens from 1 ½” diameter 16 gauge or Sch. 40 pipe with minimum number of joints as necessary for required lengths. Connect pipe by means of steel pipe sleeve inserts not less than 18 inches long, and secure with four bolts, or other equally secure method. Shop paint completed pipe battens with good quality paint and primer in black color.
   f. Battens: Fabricate battens from 1 ½” diameter 16 gauge or Sch. 40 pipe with minimum number of joints as necessary for required lengths. Connect pipe by means of steel pipe sleeve inserts not less than 18 inches long, and secure with four bolts, or other equally secure method. Shop paint completed pipe battens with good quality paint and primer in black color.
   g. Product/Manufactures - Provide one of the following:
      1) Atlas Silk Model No. 301-w.
      2) Stagecraft Model No. 300-w.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for supporting members, blocking, clearances, and other conditions affecting performance of platform curtain work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Furnish layouts for inserts, clips and other supports required to be installed by other trades for support of tracks and battens.

3.3 INSTALLATION

A. General:
   1. Install materials in accordance with manufacturer's printed instructions and recommendations, and to comply with governing regulations.

B. Battens:
   1. Install battens by suspending at proper heights with steel chains or cables spaced at not more than recommended spacing.
   2. Secure chains either directly to structures or to inserts, or other devices which are secure and appropriate to structure.

C. Tracks:
   1. Ceiling-Mounted: Drill track at intervals not greater than manufacturer's recommended spacing and fasten either directly to structure or other devices which are secure and appropriate to structure.
   2. Wall-Mounted: Install tracks by suspending from manufacturer's bracket clamps securely mounted to wall construction at recommended spacing.
   3. Overlap: for center-parting curtains with not less than 2'- 0" overlap of track sections at center, supported by special lap clamps.

D. Curtains:
   1. Track-Hung: Secure curtains to track carriers with track manufacturer's special heavy-duty "S" hooks or snap hooks

END OF SECTION

SECTION 11 66 23 WALL PADDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Wall padding for gymnasium walls.
   2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

A. Product Data: Technical data for each type of product, including assembly, disassembly, and storage instructions for removable equipment and to indicate the performance, fabrication procedures, product variations, and accessories.

B. Shop Drawings: Submit plans, elevations, sections, details, and attachments to other work.

1.4 WARRANTY

A. Written warranty in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period:
   1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: **Jaypro Sports**; (800)-243-0533. Other manufacturers are subject to compliance with requirements as specified in Division 01 under Substitutions.

2.2 MATERIALS

A. Basis of Design: **Wallguard Impact Wall Padding JWP-I-26ZZ** by Jaypro Sports.

B. Wall Padding:
   1. Composition: Heavy Duty Vinyl Cover, low smoke polychloroprene latex compound with U.V. pigments for weather resistance.
   2. Backing: 7/16-inch oriented strand board (OSB) for permanent mounting.
   3. Thickness: 2-inch.
   4. Width: 24 inches.
   5. Height: 72 inches.
   6. Finish: Leather emboss finish.
   7. Weight: Minimum weight of 14 oz. per square yard.
   8. Colors: To be selected by Architect from full line of manufacturer’s colors.
   9. Grip Tensile Strength: 365 lbs x 348 lbs.
   10. Tongue Tear: 92 x 83 lbs

C. Impact Resistance: Meets or exceeds impact standards as defined in ASTM F2440-04. All

pads without certification shall not be approved as equals.

D. Fire Resistance: Vinyl meets or exceeds NFPA 101 Life Safety Code for Class A rating (Flame Spread 0-25, Smoke Development 0-450) and California State (CSFM) test requirements.

E. Attachment: Z-Clip Top & Bottom: Pad construction with z-clip attachment on top and bottom of pad assembly. Pads shall be supplied with z-clips attached to pad assembly.
   1. Provide min 16 gage metal stud backing as required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance.

B. Proceed with installation after correcting unsatisfactory conditions.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions.

B. Modify any padding with cutouts to facilitate electrical switches, outlets, signage, or other items. Cutouts shall be straight, clean, and centered about wall items. All cutouts shall be fully wrapped and secured with matching vinyl.

C. Mount Wall Padding 4 inches above finished floor.

3.3 PROTECTION

A. For installations of gymnasium wall pads with finished floor already installed, provide means of protecting the floor to prevent damage.

3.4 CLEANING

A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop applied finishes according to manufacturer's written instructions.

END OF SECTION

SECTION 11 66 43 ELECTRONIC SCOREBOARD

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Single-sided LED basketball scoreboard.

B. Reference Standards:
   1. Standard for Electric Signs, UL 48.
   2. Standard for CSA C22.2 #207.
   3. Federal Communications Commission Regulation Part 15.
   4. National Electric Code.

1.3 SUBMITTALS

A. Product data: Submit manufacturer’s product illustrations, data and literature that fully describe the scoreboards and accessories proposed for installation.

B. Shop drawings: Submit mechanical and electrical drawings.

C. Maintenance data: Submit manufacturer’s installation, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. For indoor use only.

B. Source Limitations: Obtain each type of scoring equipment and electronic displays through one source from a single manufacturer.

C. ETL listed to UL 48.

D. NEC compliant.

E. FCC compliant.

F. ETLC listed to CSA 22.2 #207.

1.5 WARRANTY

A. Provide 5 years of no cost parts exchange including standard shipping on electronics parts and radios due to manufacturing defects.

B. Provide toll-free service coordination.

C. Provide technical online and phone support during Daktronics business hours.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Product delivered on site.

B. Scoreboard and equipment to be housed in a clean, dry environment.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Daktronics, Inc., 201 Daktronics Drive, P.O. Box 5128, Brookings, SD 57006-5128 or equal approved.

2.2 PRODUCT

A. Daktronics BB-2155 single-sided basketball scoreboard displays period time to 99:59, HOME and GUEST scores to 199, PERIOD to nine, team FLS (fouls) to 19, PLYR (player) number to 99, player FOUL to nine, T.O.L. (time outs left) to nine and indicates possession and bonus. During the last minute of the period, scoreboard displays time to 1/10 of a second. Electronic captions automatically change when volleyball and wrestling modes are selected. Scoreboard can also score any sport requiring a clock, score and period function.

2.3 SCOREBOARD

A. General information:
1. Dimensions: 6'-0" (1.83 m) high, 10'-0" (3.05 m) wide, 0'-6" (152 mm) deep.
2. Base weight: 275 lb (125 kg) – options may increase weight.
3. Base power requirement: 350 W – options may increase wattage.

B. Construction:
1. All-aluminum construction.
2. Scoreboard back, face, and perimeter: 0.063" (1.60 mm) thick.
3. Cabinet withstands high-velocity impact from air-filled sports balls without the need for protective screens.

C. Digits and Indicators:
1. LED digit technology.
2. UniView® (UV) – enhanced digits with diffusant lenses over the LEDs that blend the light for a uniform bar look and 140° viewing angle.
3. Clock and score digits: 13" (330 mm) high.
4. PERIOD, FLS, PLYR/FOUL and T.O.L. digits: 10" (254 mm) high.
5. Bonus indicators: 4" (102 mm) high.
6. Possession arrows: 3" (76 mm) high.
7. Clock/colon, PERIOD, PLYR/FOUL and T.O.L. digits and bonus indicators: amber LEDs.
8. Score and FLS digits and possession indicators: Red LEDs.
9. Seven bar segments per digit.

D. Vinyl Captions:
1. Applied directly to scoreboard face.
2. HOME and GUEST captions: 6" (152 mm) high.
3. PERIOD and T.O.L. captions: 4" (102 mm) high.
4. Color: standard white or others available upon request.

E. Electronic Captions:
1. FLS and PLYR/FOUL captions: 6" (152 mm) high.
2. Color: amber LEDs.

F. Horn:
1. Vibrating horn mounted inside the scoreboard cabinet behind the face.
2. Sounds automatically when period clock counts down to zero.
3. Sounds manually as directed by operator.

G. Power Cord:
1. Cord is 11' (3.35 m) long.
2. Cord plugs into a standard grounded outlet.

H. Accessory Equipment:
1. Vinyl striping applied around the clock and scoreboard face.
2. Two 17" (432 mm) high, 21" (533 mm) wide aluminum panels in upper corners with vinyl logo/sponsor decoration.
3. Standalone Time of Day (scoreboard acts as a clock when control console is unplugged/off).
4. Advantage time option for wrestling mode – PLYR and FOUL digits reversed.
5. Different sounding 12 VDC horn in place of buzzer horn.
6. Hardware for suspension installation.

2.4 SCORING CONSOLE

A. Console is an All Sport® 5000 controller.

B. Scores multiple sports using changeable keyboard inserts.

C. Controls multiple scoreboards, stats displays and shot clocks, including other All Sport 5000 controlled displays currently owned by customer.

D. Recalls clock, score, and period information if power is lost.

E. Runs Time of Day and Segment Timer modes.

F. Console includes:
1. Rugged aluminum enclosure to house electronics.
2. Sealed membrane water-resistant keyboard.
3. 32-character backlit LCD to verify entries and recall information currently displayed.
4. Power cord that plugs into a standard grounded outlet; 6 watts max.
5. Control cable to connect to the control receptacle junction box (wired system only).
6. Hand-held switch for main clock start/stop and horn.
7. Soft-sided carrying case.

G. Accessory Equipment:
1. 2.4 GHz spread spectrum radio system with frequency hopping technology and 64 non-interfering channels; system includes a transmitter installed inside the console and a receiver installed inside the scoreboard(s).
2. Hard carrying case.
3. Battery pack.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Limitations: Do not install scoring equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its

intended use.

B. Field Measurements: Coordinate scoreboard location and height with the customer. Verify dimensions by field measurements.

C. Supply weight and mounting method for owner to verify that building structure is capable of supporting the scoreboard's weight in addition to the auxiliary equipment.

3.2 EXAMINATION

A. Verify that mounting surface is ready to receive scoreboard. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.

3.3 INSTALLATION

A. Power conduit, cables and outlet boxes to be provided and installed by the electrical contractor. Signal raceways, conduit and boxes to be provided by the electrical contractor. Electrical contractor is also responsible for any required wire and terminators between each scoreboard and control location.

B. Mount scoreboards and interior displays to wall in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.

3.4 INSTALLATION - CONTROL CENTER

A. Provide boxes, cover plates and jacks as required to meet control specification requirements. Control cables to control panels shall be concealed.

B. Test the operation of the scoreboard, controller and all control jacks; leave control unit in carrying case and other loose items with owner's designated representative.

C. Conduct operator training on the scoreboard/controller operation

END OF SECTION

SECTION 11 66 53 GYMNASIUM DIVIDERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes: Electrically operated fabric gymnasium divider.

1.3 SUBMITTALS

A. Submit Plans and manufacturers documentation including support:
   1. List of proposed products and product data.
   2. Loads to be transmitted to building structural members and requirements for supplementary bracing and structural support members.
   3. Shop drawings showing layout, elevations, dimensions, fabrication details, method of attachment and electrical wiring diagrams.
   4. Manufacturer must provide calculations and reports for tests performed by an independent testing laboratory accredited by the American Association of Laboratory Accreditation (A2LA) that clearly demonstrate compliance with minimum safety factors included in product specifications.
   5. Certificates for Divider Curtain Vinyl and Mesh to prove they meet the requirements of GreenGuard Gold.
   6. Samples of fabric for selection by Architect.
   7. Manufacturer's installation and maintenance instructions.

1.4 QUALITY ASSURANCE

A. Source limitation: All components including curtain, suspension system, electric winches, and controls for divider shall be products of a single manufacturer.

B. All welding to be performed by personnel having passed Welder Qualification testing in accordance with American Welding Society (AWS) code D1.1 or higher. Manufacturer to provide certification and test results upon request.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver divider until building is enclosed and other construction within gymnasium is substantially complete.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. **Jaypro Sports,** 976 Hartford Turnpike, Waterford CT, 06385; (800)-243-0533.
   1. Electrically Operated, Roll-Up Gymnasium Divider **#RC-690.**

B. Manufacturers of equivalent products submitted and approved in accordance with Division 1

2.2 GYMNASIUM DIVIDER

A. Type: Electrically Operated, Roll-Up Gymnasium Divider:
   1. Including motor, belts, controls, clamps for attachment to building structure, threaded rod supports, and other components required for complete functional installation.

B. Operation: Curtain rolled up and down by belts wound onto overhead rotating drive pipe operated by electrical motor.

C. Configuration: Rectangular shape with straight bottom and extending across room as indicated on Drawings.
   1. Maximum dimension of stored divider: 2 feet from bottom of structural support to bottom of rolled curtain.
   2. Minimum required clearance between vertical curtain edges and adjacent fixed objects: 6 inches.
   3. Provide 36 inches space between curtain ends and walls or fixed objects to allow passage space around divider.

D. Operating mechanism: Drive pipe winch powered with 1 HP, 110VAC, 60-cycle, single-phase, reversible capacitor, C-Face motor with thermal overload protection. Winch assembly shall carry a five-year warranty. Provide with load holding worm gear reduction and integral limit switches to control curtain travel. Drive pipe shall rotate in pipe support assemblies spaced at approximately 8 feet.

E. Attachment: Attach to structural support with beam clamps, hanger brackets, and 1/2-inch diameter threaded rods. Attachment clamps designed to be capable of supporting a minimum of 5,000 lbs. each and provided in sufficient number to provide a combined minimum 45:1 attachment point safety factor.

F. Hoist belts: 3 inch wide polyester webbing attached to drive pipe, passing under bottom batten, and terminating at top batten. Space belts at approximately 12 to 14 feet.

G. Bottom roller: 4-1/2 inch diameter steel pipe with aluminum strip for attachment of curtain.

2.3 CURTAIN

A. Full height curtain:
   1. Bottom 8 feet: Opaque solid vinyl coated polyester fabric:
   2. Weight: 18 ounces per SY.
   3. Resistant to rot, mildew, and ultraviolet light.
   4. Flammability: Rated self-extinguishing in accordance with California State Fire Marshall Title 19.
   5. Color: Selected by Architect from manufacturer's standard range.

B. Upper curtain section: Vinyl coated polyester mesh.
   1. Weight: 9 ounces per SY.
   2. Resistant to rot, mildew, and ultraviolet light.
   3. Flammability: Rated self-extinguishing in accordance with California State Fire Marshall Title 19.
   4. Color: Selected by Architect from manufacturer's standard range.

C. Seams: Vertical and electronically welded with 1 inch (25 mm) full contact weld.

D. Outer edge hems: Tripple turned with double welds.

E. Top edge: Solid fabric in triple thickness and double welded to mesh to form 6 inches (152 mm) wide pocket for top pipe batten.

F. Bottom edge cut square for attachment to roller pipe with aluminum stop strip.

2.4 CURTAIN SAFETY DEVICE

A. Winch shall be Jaypro Model CW-1800 with built-in Curtain Lock over-speed arrest system. Curtain Lock to be directly speed sensitive to automatically lock divider curtain in position at any time during storage or operation. In the event of an over-speed situation (greater than 1.5 feet per second) caused by malfunction of the hoisting apparatus, whether sudden or gradual, device will immediately activate.

2.5 CONTROLS

A. Provide key lock, 3-position, momentary contact wall control switch to lower, raise, and stop gymnasium divider. Provide with switch box and plastic cover plate.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate support of gymnasium divider with roof structure to ensure proper distribution of loads and adequacy of attachment points.
   1. Ensure that building structure has been designed for loads of specific gymnasium divider to be provided.
   2. Provide additional structural framing members where suggested by manufacturer.

B. Coordinate configuration, size, and installation of gymnasium divider with height, slope, and type of building structure and lighting fixtures, mechanical equipment, ductwork, fire-suppression system, bleachers, athletic equipment, and other potential obstructions.

C. Field verify dimensions prior to fabrication.

D. Coordinate electrical requirements for motorized operating mechanism to ensure proper power source, conduit, wiring, and boxes for keyed switches. Prior to installation, verify type and location of power supply.

E. For installations made after synthetic flooring is installed, provide protection and exercise care not to damage flooring.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions and shop drawings.

B. Install even and level with curtain hanging 2 inches above floor in down position.

C. Install control switch such that operator has view of complete gymnasium divider during lowering and raising.

D. Adjust limit switches of electric winch to ensure accurate position in both stored and lowered positions.

3.3 TESTING AND DEMONSTRATION

A. Operate divider curtains to ensure proper lifting and lowering. Adjust as required to ensure smooth operation and accurate positioning.

B. Demonstrate to Owner's designated representatives' complete operation and required maintenance.

END OF SECTION

SECTION 12 24 13 ROLLER WINDOW SHADES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes window shades:
   1. Motorized operation

1.3 SUBMITTALS

1. Shop Drawings: Plans, elevations, sections, product details, installation details, operation clearances, wiring diagrams and relationship to adjacent work.
   a. Provide plan showing all motor and switch locations.
   b. Provide elevation drawings showing shade band layout. Indicate any necessary seam or batten locations and align with mullions where possible.

1.4 DELIVERY, STORAGE AND HANDLING

1. Deliver in factory-labeled packages, marked with manufacturer and product name, and location of installation using same room designations indicated on drawings.

1.5 PROJECT CONDITIONS

A. Environmental limitations: Install roller shades after finish work including painting is completed.

1.6 WARRANTY

A. Special Warranty:
   1. Manufacturer's standard form in which manufacturer agrees to repair or replace components of roller shades that fails in materials or workmanship within specified warranty period:
      c. Warranty Period: 10 years

B. Installer’s Warranty: 1 year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Roller shades are subject to compliance with requirements. Provide either the named product or an equal product by one of the other manufacturers specified:
   1. MechoShade Systems, Inc. (District Standard) Sonny Flink 818-346-0308, Local Contact: Don 805-481-2761.
   2. Draper Inc.
   3. Hunter Douglas.
   4. Or approved equal.

2.2 ROLLER SHADES

A. Basis of Design: Electroshade iQ2, by MechoShade Systems, Inc.

B. Solar Shade Cloth:
1. Classic Blackout 0700 Series. Opaque vinyl coated fabric material; same color reverse side.
2. Content: 73% vinyl, 27% fiberglass.
3. Openness Factor: 0%.
4. Color: As selected by Architect from manufacturer's full line of standard colors.

2.3 ACCESSORIES

A. Fascia:
1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Notching of Fascia for manual chain shall not be acceptable.

2.4 SHADE BAND

A. Shade Bands:
1. Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable:
   a. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
   b. Shade Band and Shade Roller Attachment:
      1) Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades, and less than 2.55 inches for motorize shades are not acceptable.
      2) Provide for positive mechanical engagement with drive / brake mechanism.
      3) Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
      4) Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
      5) Any method of attaching shade band to roller tube that requires the use of adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.5 SHADE FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to

roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate hem as follows:
1. Standard concealed hem bar.

2.6 COMPONENTS

A. Access and Material Requirements:
1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Motorized Operating System:
1. Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system:
   a. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   b. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
   c. Remote Control:
      1) Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
         a) Individual Switch Control Station: Three-position, toggle-style, wall-switch-operated control station with open, close, and center off functions.
         b) Group Control Station: Three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for single-switch group control.
         c) Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.
   d. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
   e. Operating Features:
      1) Group switching with integrated switch control; single faceplate for multiple switch cutouts.

PART 3 EXECUTION

3.1 ROLLER-SHADE INSTALLATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Install roller shades level, plumb, and aligned with adjacent units, according to manufacturer's written instructions:

D. Electrical Connections: Connect motor-operated roller shades to building electrical system.

E. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

F. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

END OF SECTION

SECTION 12 93 13 BICYCLE RACKS AND LOCKERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: Include full range of standard color selections.

B. Shop Drawings: Indicate materials, dimensions, tolerances, welding, fasteners, hardware, mounting, finish, and accessories.

C. Quality Assurance Submittals:
1. Qualifications: Proof of manufacturer qualifications.
2. Manufacturer’s Installation Instructions.

1.3 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer Qualifications: Minimum five years’ experience in producing bicycle racks of the type specified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials and finish from damage during handling and installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed whose product meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years’ experience manufacturing products meeting or exceeding the specifications and comply with requirements regarding substitutions to be considered:
1. AAA Ribbon Rack Co., Inc.
2. Bike Security Racks, Co., Inc.
3. Huntco Supply, LLC.

B. Specifications are based on products by Huntco Supply, LLC.

2.2 BICYCLE RACKS

A. Model: The Rambler Multi-Bike Rack

1. Fabrication: 2-3/8 inch O.D., 0.154 inch wall, Schedule 40 steel pipe.
2. Bicycle Capacity: 9 “loops” or 180 degree bends (5 on top, 4 below) per rack; 11-bike capacity per 9-loop rack.
3. Mounting: Embedded
4. Finish: T304 Stainless Steel #4 satin finish.

2.3 BICYCLE LOCKERS

A. Model: The Single Bike Locker (BV-1).
   1. Fabrication: 12 GA steel doors and frame, 14 GA steel body.
   2. Dimensions: 75”L x 39”W x 48”H
   3. Capacity: (1) Bicycle
   4. Mounting: Surface
   5. Lock: Pistol Grip – U-Lock/Padlock.
   6. Finish: Powder Coated
   7. Color: As selected by Architect from manufacturer’s full list of standard colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates upon which bicycle racks will be installed:
   1. Verify that surfaces are clean, flat and level.

B. Coordinate with responsible entity to perform corrective Work on unsatisfactory substrates.

C. Commencement of Work by installer is acceptance of substrate.

3.2 INSTALLATION

A. Install bicycle racks in accordance with manufacturer’s installation instructions.

B. Install bicycle racks level, plumb, square, accurately aligned, correctly located per drawings, and without warp.

C. Embedded mounting: Direct embedment of bicycle rack to be minimum of 10 1/2 inches in concrete in accordance with manufacturer’s instructions.

D. Use hardware and fasteners in accordance with manufacturer’s instructions.

E. Repair minor damage to finishes in accordance with manufacturer’s instructions and as approved by Architect.

3.3 CLEANING

A. Follow manufacturer’s instructions.

3.4 PROTECTION

A. Protect bicycle racks from damage due to other construction operations.

END OF SECTION

SECTION 14 42 16 VERTICAL WHEELCHAIR LIFTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements including but not limited to:
   1. Vertical wheelchair lift.
   2. Accessories necessary for a complete installation.

1.3 DEFINITIONS

A. Comparable Product: Product demonstrated and approved through submittal process, or where indicated as a produce substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

1.4 SUBMITTALS

A. Product Data - Manufacturer’s data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation manual.
   4. Show Maximum and average power demands.

B. Shop Drawings - Submit plans, elevations, sections, details, attachments to other work, and required clearances:
   1. Indicate dimensions, weights, loads, and points of load to building structure.

C. Qualification Data: Submit data for Installer.

1.5 QUALITY ASSURANCE

A. Comply with CBC Section 11B-401 – General, and DSA guidelines for Chairlift.

B. Comply with ASME A17.1 – Safety Code for Elevators and Escalators.

C. Comply with ASME A17.5 – Elevator and Escalator Electrical Equipment.

D. Comply with ASME A18.1 Standard for lifts in public installations.

E. Manufacturer Qualifications: Firm with minimum 10 years’ experience in manufacturing of vertical platform lifts, with evidence of experience with similar installations of type specified.

F. Installer Qualifications - An authorized representative, having minimum 10 years documented experience, who is trained and approved by manufacturer:
   1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to site.

G. Source Limitations - Obtain vehicle lifts and accessories through one source from a single manufacturer:
   1. Provide major components manufactured by a single manufacturer.

1.6 WARRANTY

A. Warranty Period: Two-year warranty parts from date of substantial completion.

PART 2 PRODUCTS

2.1 VERTICAL WHEELCHAIR LIFT

A. Acceptable Manufacturer: Garaventa Lift; United States - P.O. Box 1769, Blaine, WA 98231-1769. Canada – 18920 – 36th Ave., Surrey, BC V3Z 0P6. ASD. Toll Free: 800-663-6556. Tel: (604) 594-0422. Fax: (604) 594-9915. Email: productinfo@garaventalift.com Web www.garaventalift.com

B. Genesis Opal Lift; 16995-Q-DS:
   1. Model GVL-OP-42; 45 inches Maximum lifting height.
   2. Model size: As indicated on drawings.

C. Capacity: 750 lbs. (340 kg) rated capacity.

D. Vertical Speed: 10 feet (3 m) per minute nominal.

E. Top Landing: Equipped with a power-operated roll up 3 feet 6 inches (1.07 m) high. Provide gate with both mechanical and electrical contacts, which prevent operation of the platform unless gate is fully deployed.

F. Lower Landing: Equip platform with a power-operated passenger-restraining arm and rotating ramp/roll stop. Provide restraining arm and roll stop with both mechanical and electrical contacts, which prevents operation of platform unless both barriers are in guarding position.

G. Enclose mechanical and electrical mechanisms and protect from weather.

H. Power Requirements: Install dedicated breaker protected service 208 / 240 VAC, 3-wire, 20-amp, single-phase service supplied from building power source. Dedicated breaker protected service supplied by Owner or Owner’s Representatives.

I. Lift platform stores beneath the lowest stair until needed.

J. Fabrication: Construct lift of steel or aluminum panels and frames with welded or bolted connections.

K. Operation: Low voltage (24 VDC) operation with constant pressure control switches, designed to be easily operated by a person with limited dexterity according to ADA requirements.

L. Controls: Equip lift with controls at top and bottom landings and platform. Provide a security key switch on lower control station to prevent unauthorized use.

M. Emergency Stop Button: Provide an illuminated emergency stop button on each control panel.

N. Emergency Alarm System: Audible alarm that is automatically activated when the emergency stop button is depressed.

O. Limit Switches: Equip lift with redundant upper and lower limit switches. Provide mechanical stops to limit travel in both directions.

P. Emergency Power: Provide backup battery capable of operating the lift through its full range of travel for 5 cycles at rated load.

Q. Manual Lowering Device: Provide device to manually lower or raise platform.

R. Finishes:
1. Apply metal surfaces with a corrosion resistant powder coating.
2. Colors:
   a. Aluminum Extrusions: Champagne.
   b. Ferrous Components: Satin Grey.
   c. Lift finish: Color to be selected by Architect from Manufactures standard colors.

S. Stair Handrails: Molded vinyl cover; black.

T. Standard Floor Treatment for Steps and Upper Landing: Composite vinyl; color, black. Provide contrasting color strip on each step and upper landing nosing.

U. Floor Treatment for Steps and Upper Landing: Black non-slip commercial flooring provided. Flooring treatment can be provided by the Owner and installed by others. Coordinate use of Owner's material with lift manufacturer before placing order.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

C. Proceed with installation after correcting unsatisfactory conditions.

3.2 INSTALLATION

A. Comply with ASME A18.1 and manufacturer's written instructions for installation of lifts unless otherwise indicated.

B. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

C. Adjust stops for accurate stopping at each landing.

D. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.

E. Test safety devices and verify smoothness of required protective enclosures and other surfaces.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.

B. Operating Test: In addition to acceptance testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include twelve (12) months' full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

A. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.

B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.

C. Check operation of lifts with Owner's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly

END OF SECTION

SECTION 23 34 39 HIGH-VOLUME, LOW-SPEED PROPELLER FANS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes
   1. The ceiling-mounted circulation fan is the model scheduled with the capacities indicated. The fan shall be furnished with standard mounting hardware and variable speed control to provide cooling and destratification.

B. Summary of Work
   1. Installation of the fan, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses and disconnect switches, other than those addressed in the installation scope of work, shall be provided by others. Factory installation services are available through Big Ass Fans. Consult the appropriate installation scope of work for information on the available factory installation options, overview of customer and installer responsibilities, and details on installation site requirements.

C. References
   1. National Fire Protection Association (NFPA)
   2. Underwriters Laboratories (UL)
   3. Restriction of Hazardous Substances (RoHS)
   4. European Community (CE)
   5. European Standards (EN)
   6. Canadian Standards Association (CSA)
   7. National Electrical Manufacturers Association (NEMA)
   8. National Electrical Code (NEC)
   9. Occupational Safety and Health Administration (OSHA)
   10. International Organization for Standardization (ISO)

1.3 SUBMITTALS

A. Shop Drawings: Drawings detailing product dimensions, weight, and attachment methods.

B. Product Data: Specification sheets on the ceiling-mounted fan, specifying electrical and installation requirements, features and benefits, and controller information.
   1. Schedule:
      a. For installation and operation.

C. Installation Guide: The manufacturer shall furnish a copy of all operating and maintenance instructions for the fan. All data is subject to change without notice.

1.4 QUALITY ASSURANCE

A. Certifications
   1. The fan assembly, as a system (with or without light kit), shall be Intertek/ETL-certified and built pursuant to the guidelines set forth by UL standard 507 and CSA standard

22.2 No. 113.
2. The fan shall be compliant with NFPA 13—Standard for the Installation of Sprinkler Systems, NFPA 72—National Fire Alarm and Signaling Code, and NFPA 70—National Electrical Code (NEC).
3. Controllers shall comply with National Electrical Code (NEC) and Underwriters Laboratories (UL) standards and shall be labeled where required by code.

B. Manufacturer Qualifications
1. The fan and any accessories shall be supplied by Big Ass Fans, which has a minimum of twenty (20) years of product experience.
2. ISO 9001 compliant
3. The manufacturer shall not be listed on the Air Movement and Control Association International Inc. (AMCA) Certified Ratings Program (CRP) Non-Licensed Products report in the previous 36 months.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.

B. The fan and its components must be stored in a safe, dry location until installation.

1.6 WARRANTY

A. The manufacturer shall replace any products or components defective in material or workmanship for the customer free of charge (including transportation charges within the USA, FOB Lexington, KY), pursuant to the complete terms and conditions of the Big Ass Fans Warranty in accordance to the following schedule:
1. Mechanical: 15 years
2. Electrical: 7 years (no factory install†††); 15 years (factory install††††)
3. Labor: 1 year
   a. Mechanical: Defined as mechanical components of the fan, including, the gearbox, fan hub, motor frame, mounting, airfoils, and winglets.
   b. Electrical: Defined as electrical and electronic components of the fan, including the motor, motor drive, variable frequency drive, and any standard controller or accessories.
   c. The No Factory Install Warranty Period defined above for "Electrical" applies to proper installations by any other state-qualified or licensed electrical contractor.
   d. The Factory Install Warranty Period defined above for "Electrical" requires installation to be purchased from Big Ass Fans and performed by a factory-approved, Big Ass Fans Certified Installer.
   e. The Warranty Period for light kits is limited to 1 year (parts).
   f. All reasonable costs of repair or replacement will be paid or reimbursed provided customer obtains pre-approval.
   g. The Warranty period for any manufacturer defects or flaws to surface finishes is limited to 1 year.
   h. All products are considered for indoor use only unless specifically specified on the product label.
   i. See the complete warranty for more details.

B. The warranty shall not require the submission of a post installation form or photographs of the installed fan(s) to the manufacturer for the warranty to be in effect.

C. The warranty shall not require the periodic submission of maintenance records for the warranty to remain in effect.

PART 2 PRODUCT

2.1 MANUFACTURER

A. Basis of Design: **Big Ass Fans Powerfoil X3.0**; Delta T LLC, dba Big Ass Fans, PO Box 11307, Lexington, Kentucky 40575. Phone (877) 244-3267. Fax (859) 233-0139. Website: www.bigassfans.com

2.2 HIGH VOLUME, LOW SPEED FANS

A. Basis of Design: **Powerfoil X3.0, Model PFX3-14**; 14 foot diameter

B. Complete Unit
   1. Regulatory Requirements:
      a. The entire fan assembly shall be Intertek/ETL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2 No. 113.
      b. The controller shall be compliant with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) The device may not cause harmful interference, and (2) The device must accept any interference received, including interference that may cause undesirable operation.
   2. Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.

C. Onboard Fan Control
   1. The onboard fan controller shall be constructed using a variable frequency drive (VFD) that is pre-wired to the motor and factory-programmed to minimize the starting and braking torques for smooth and efficient operation. The onboard controller shall be prewired to the motor using a short run of flexible conduit with a dedicated ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI). A 15-ft incoming power cord shall be pre-wired to the controller with one of the following plugs: NEMA L6-20P Twist-Lock Plug, NEMA L6-30P Twist-Lock Plug, NEMA L15-20P Twist Lock Plug, NEMA L16-20P Twist-Lock Plug.
   2. For fans with single-phase input, conversion to three-phase output takes place at the VFD.

D. Airfoil System
   1. The fan shall be equipped with eight (8) Powerfoil airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.
   2. The fan shall be equipped with eight (8) Powerfoil winglets (standard) or eight (8) Powerfoil Plus winglets (optional) on the ends of the airfoils and eight (8) AirFences® positioned on the airfoils at the optimum location for performance. Both the winglets and AirFences shall be molded of a polypropylene blend. The standard color of the winglet and AirFence shall be “Safety Yellow.”

E. Motor
   1. The fan motor shall be an AC induction type inverter rated at one of the following:
      a. 3450 RPM, 200–240/400–480 VAC, 50/60 Hz, three-phase, 1 hp
      b. 1725 RPM, 200–240/400–480 VAC, 50/60 Hz, three-phase, 1.5 hp
      c. 1725 RPM, 200–240/400–480 VAC, 50/60 Hz, three-phase, 2 hp
      d. 3450 RPM, 575–600 VAC, 50/60 Hz, three-phase, 1 hp
      e. 1725 RPM, 575–600 VAC, 50/60 Hz, three-phase, 1.5 hp
      f. 1725 RPM, 575–600 VAC, 50/60 Hz, three-phase, 2 hp
   2. The motor shall be totally enclosed, fan cooled (TEFC) with an IP44 NEMA

classification. A NEMA 56C standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in 32°F to 122°F (0°C to 50°C) ambient conditions.

3. The motor shall have a C-face attachment that shall enable technicians to detach the motor for easy field service. The C-face motor adapter shall be designed to work with the NitroSeal™ gearbox.

F. Gearbox

1. The fan gearbox shall be a NitroSeal™ Drive designed specifically for the Powerfoil X series. The gearbox shall include a high-efficiency, hermetically sealed, nitrogen-filled, offset helical gear reducer with two-stage gearing, a hollow output shaft, cast iron housing, double lip seals, high quality SKF Explorer Series bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit. Lubrication shall be high-grade, low-foaming synthetic oil with extreme pressure additives and a wide temperature range and shall be lubricated for the life of the product (no oil changes required).
2. The gearbox shall be equipped with a hollow shaft threaded to accept a ¾” NPT fitting in which wiring, piping, etc., can be routed to below the fan. A standard junction box can be affixed to this hollow shaft to allow for installing optional features such as lights or cameras. The inclusion of the hollow shaft shall be specified at the time of order.

G. Mounting Post

1. The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds, and be powder coated for corrosion resistance and appearance.

H. Mounting System

1. The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The design of the upper mount shall provide two axes of rotation. This design shall allow for adjustments to be made after the mount is installed to the mounting structure to ensure the fan will hang level from the structure.
2. The upper mount shall be of ASTM A-36 steel, at least 3/16” thick, and powder coated for appearance and corrosion resistance. No mounting hardware or parts substitutions, including cast aluminum, are acceptable.
3. All mounting hardware shall be SAE Grade 8 or equivalent.

I. Hub

1. The fan hub shall be 19” (48 cm) in diameter and shall be made of precision cut aluminum for high strength and light weight. The hub shall consist of two (2) aluminum plates, eight (8) aluminum spars, and one (1) aluminum spacer fastened with a pin and collar rivet system. The overall design shall provide a flexible assembly such that force loads experienced by the hub assembly shall be distributed over a large area to reduce the fatigue experienced at the attachment point for the fan blade.
2. The hub shall be secured to the output shaft of the gearbox by means of ten (10) high strength bolts. The hub shall incorporate four (4) safety retaining clips made of 1/4” (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.

J. Safety Cables

1. The fan shall be equipped with an upper safety cable that provides an additional means of securing the fan assembly to the building structure. The upper safety cable shall have a diameter of Ø3/8” (1 cm).
2. The fan shall be equipped with two lower safety cables pre-attached to the fan hub that shall provide an additional means of securing the fan to the extension tube. The lower safety cables shall have a diameter of 1/4” (0.6 cm).

3. The safety cables shall be fabricated out of 7 x 19 galvanized steel cable. The end loops shall be secured with swaged Nicopress® sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).
4. Field construction of safety cables is not permitted.

K. Digital Variable Speed Wall Controller
1. The fan shall be equipped with a digital variable speed wall controller. The user interface shall be an intuitive touchscreen interface.
2. The controller shall be mounted to a standard rectangular or square outlet box.
3. A 150-ft (45.7-m) CAT5 cable shall be provided for connecting the controller to the fan's VFD and to provide power to the controller.
4. The controller mounting location shall meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.
5. The controller shall have an IP55 rating.
6. The controller shall provide fan start/stop, speed, and direction control functions.
7. The controller shall provide diagnostic and fault history information for the connected fan, as well as the ability to configure fan parameters with the assistance of Big Ass Fans Customer Service.
8. The controller interface shall be able to be secured with a passcode to prevent unauthorized access to fan controls and settings.
9. The controller shall operate out of the box without setup and upon connection to CAT5 cable.

L. Fire Control Panel Integration
1. Includes a 10–30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.

M. Guy Wires
1. Included for installations with extension tubes 4 ft (1.2 m) or longer to limit the potential for lateral movement.

PART 3 EXECUTION

3.1 PREPARATION

A. Fan location shall have a typical bar joist or existing I-beam structure from which to mount the fan. Additional mounting options may be available.

B. Mounting structure shall be able to support weight and operational torque of fan. Consult structural engineer if necessary.

C. Fan location shall be free from obstacles such as lights, cables, or other building components.

D. Check fan location for proper electrical requirements. Consult installation guide for appropriate circuit requirements.

E. Each fan requires dedicated branch circuit protection.

F. Before the controller is installed, the fan system shall be installed by a factory-certified installer according to the instructions in the fan Installation Guide.

G. Install a rectangular or square outlet box at the controller mounting location.

3.2 INSTALLATION

A. The fan shall be installed by a factory-certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle irons for bar joist applications. Big Ass Fans recommends consulting a structural engineer for installation methods outside the manufacturer's recommendation and a certification, in the form of a stamped print or letter, submitted prior to installation.

B. Minimum Distances
   1. Airfoils shall be at least 10 ft (3.05 m) above the floor.
   2. Installation area shall be free of obstructions such as lights, cables, sprinklers, or other building structures with the airfoils at least 2 ft (0.61 m) clear of all obstructions.

C. The fan shall not be located where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems or radiant heaters. Additional details are in the Big Ass Fans Installation Manual.

D. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
   1. The maximum fan diameter shall be 24 ft (7.3 m).
   2. The HVLS fan shall be centered approximately between four adjacent sprinklers.
   3. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft (0.9 m).
   4. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72—National Fire Alarm and Signaling Code.

E. Mount the controller to a flat, readily accessible surface that is free from vibration and away from foreign objects and moving equipment. The controller mounting location must meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.

END OF SECTION

SECTION 26 01 00 ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

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.

CONTRACTOR QUALIFICATIONS

1.7 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.”

CODES, PERMITS AND FEES

1.8 Comply with all applicable laws, ordinances, rules, regulations, codes, or rulings of governmental units having jurisdiction as well as standards of CEC and serving utility requirements.

1.9 Obtain permits, fees, inspections, meter and the like, associated with work in each section of this Division.

1.10 Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Act (OSHA).

EXAMINATION OF PREMISES

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

STANDARDS

1.12 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.

1.12.1 2022 California Electrical Code (CEC), Part 3 Title 24 CCR.
1.12.2 National Fire Protection Association.
1.12.3 Underwriters' Laboratories, Inc. (UL).
1.12.4 Certified Ballast Manufacturers' Association (CBM).
1.12.5 National Electrical Manufacturers' Association (NEMA).
1.12.6 Institution of Electrical & Electronics Engineers (IEEE).
1.12.7 American Society for Testing & Materials (ASTM).
1.12.8 National Board of Fire Underwriters (NBFU).
1.12.9 National Board of Standards (NBS).
1.12.10 American National Standards Institute (ANSI).
1.12.11 Insulated Power Cable Engineers Association (IPECS).
1.12.12 Electrical Testing Laboratories (ETL).
1.12.13 National Electrical Safety Code (NESC).
1.12.14 2022 California Building Code (CBC), Part 2, Title 24 CCR.
1.12.15 2022 California Fire Code (CFC), Part 9, Title 24, CCR.
1.12.16 2022 NFPA 72 with California State Amendments
1.12.17 National Electrical Testing Association (NETA), 2010 or most current

DEFINITIONS

1.13 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.

1.14 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'.

1.15 Finish Space: Any space ordinarily visible, including exterior areas.

WORK AND MATERIALS

1.16 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.

1.17 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.

SHOP DRAWINGS AND SUBMITTALS

1.18 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.
1.19 Shop drawings submittal demonstrate to the Architect that the Contractor understands the design concept. The Contractor demonstrates their understanding by indicating

which equipment and material they inten 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 etween submittals and specifications are discovered either prior to or after submittals are processed, notify the Architect immediately.

1.20 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.

1.21 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.

EQUIPMENT PURCHASES

1.22 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.

1.23 Provide all materials of similar class or service by one manufacturer.

COOPERATIVE WORK

1.24 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.

1.25 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.

VERIFICATION OF DIMENSIONS

1.26 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.

1.27 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.

CLOSING-IN OF UNINSPECTED WORK

1.28 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.

EXCAVATION AND BACKFILL

1.29 All excavation and backfill shall be in accordance with Division 1 of these specifications and as noted below.

1.30 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.

1.31 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.

1.32 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.

1.33 Trenches shall be filled with the specified material. Sod, if any, shall be removed in cut sections and replaced in same manners.

1.34 Provide pumps and drainage of all open trenches for purposes of installing electrical duct and wiring.

1.35 Perform all backfilling in accordance with the requirements of and under the direction of the Geotechnical Engineer.

1.36 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.

CONCRETE

1.37 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.

1.38 See other sections for additional requirements for underground vaults, cable ducts, etc.

ACCESSIBILITY

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

1.40 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.

1.41 Where located in fire rated assemblies, provide doors which match the rating of the assembly and are approved by the jurisdictional authority.

1.42 Refer to 'finish schedule' for types of walls and ceilings in each area and the architectural drawings for rated wall construction.

1.43 Coordinate work of the various sections to locate specialties requiring accessibility with others to avoid unnecessary duplication of access doors.

FLASHING

1.44 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.

IDENTIFICATION OF EQUIPMENT

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

1.45.1 General:

1.45.1.1 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.

1.45.1.2 All auxiliary systems, including communications, shall be labeled to indicate function.

1.45.2 Lighting and Local Panelboards:

1.45.2.1 Panel identification shall be with white and black micarta nameplates. Letters shall be no less than 3/8" high.

1.45.2.2 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.

1.45.3 Distribution Switchboards and Feeders Sections:

1.45.3.1 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.

1.45.3.2 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.

1.45.4 Disconnect Switches, Motor Starters and Transformers:

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

1.45.5 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.

CONSTRUCTION FACILITIES

1.46 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.

1.47 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.

GUARANTEE

1.48 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.

PATENTS

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

PLUMBING (DIVISION 22) / HEATING, VENTILATING, AND AIR CONDTIONING (DIVISION 23) / ELECTRICAL – COORDINATION REQUIREMENTS

1.50 All electrical work performed for this project shall conform to the California Electrical Code, to Local Building Codes and in conformance with Division 22, 23, and 26 of these specifications, whether the work is provided under the “Plumbing”, “Heating, Ventilating, and Air Conditioning”, or the “Electrical” Division of these specifications. Where the Division 22 and/or Division 23 Contractor is required to provide electrical work, he shall arrange for the work to be done by a licensed Division 26 Contractor, using qualified electricians. The Division 22 and/or Division 23 Contractor shall be solely and completely responsible for the correct functioning of all equipment regardless of who provided the electrical work.

1.51 The work under Division 22 and/or Division 23 shall include the following:

1.51.1 All motors required by mechanical equipment.

1.51.2 All starters for mechanical equipment which are not provided under the electrical division as part of a motor control center or otherwise indicated on the electrical drawings.

1.51.3 All wiring interior to packaged equipment furnished as an integral part of the equipment.

1.51.4 All control **wiring and conduit** for mechanical control systems.

1.51.5 All control systems required by mechanical equipment.

1.52 The work under Division 26 shall include the following:

1.52.1 All power wiring and conduit; and conduit only for EMS control conductors between each building and the main control panel.

1.52.2 Electrical disconnects as shown on the electrical drawings.

1.52.3 Starters forming part of a motor control center.

1.53 All power wiring and conduit to equipment furnished under Division 22 and/or Division 23 shall be provided under Division 26. Control wiring and conduit, whether line voltage or low voltage, shall be provided under the division which furnishes the equipment.

1.54 Power wiring shall be defined as all wiring between the panelboard switchboard overcurrent device, motor control center starter or switch, and the safety disconnect switch or control panel serving the equipment. Also, the power wiring between safety disconnect switch and the equipment line terminals.

1.55 Control wiring shall be defined as all wiring, either line voltage or low voltage, required for the control and interlocking of equipment, including but not limited to wiring to motor control stations, solenoid valves, pressure switches, limit switches, flow switches, thermostats, humidistats, safety devices, smoke detectors, and other components required for the proper operation of the equipment.

1.56 All motor starters which are not part of motor control centers and which are required for equipment furnished under this Division shall be furnished and installed by the Division furnishing the equipment and power wiring connected under Division 26. Motor starters and control devices in motor control centers shall be furnished and installed under Division 26.

1.57 Division 26 Contractor shall make all final connections of power wiring to equipment furnished under this Division.

1.58 Wiring diagrams complete with all connection details shall be furnished under each respective Section.

1.59 Motor starters supplied by Plumbing and/or Heating, Ventilating and Air Conditioning shall be fused combination type minimum NEMA Size 1, and conform to appropriate NEMA standards for the service required. Provide NEMA type 3R/12 gasketed enclosures in wet locations. Provide all starters with appropriately sized overload protection and heater strips provided in each phase, hand/off auto switches, a minimum of 2 NO and NC auxiliary contacts as required, and an integral disconnecting means. For ½ horsepower motors and below, when control requirements do not dictate the use of a starter, a manual motor starter switch with overload protection in each phase may be provided. Acceptable manufacturers are Allen Bradley, General Electric, Square D, Furnas and Cutler Hammer.

EQUIPMENT ROUGH-IN

1.60 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.

OWNER FURNISHED AND OTHER EQUIPMENT

1.61 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.

EQUIPMENT FINAL CONNECTIONS

1.62 Provide all final connections for the following:

1.62.1 All equipment furnished under this Division.

1.62.2 Electrical equipment furnished under other sections of the specification.

1.62.3 Owner furnished equipment as specified under this Division.

INSERTS, ANCHORS, AND MOUNTING SLEEVES

1.63 Inserts and anchors must be:

1.63.1 Furnished and installed for support of work under this Division.

1.63.2 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.

1.63.3 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.

SEISMIC ANCHORING

1.64 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.

1.65 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.

RUST PROOFING

1.66 Rust proofing must be applied to all ferrous metals and shall be in accordance with Section 05500 of these specifications and as noted below.

1.66.1 Hot-dipped galvanized shall be applied and after forming of angle-iron, bolts, anchors, etc.

1.66.2 Hot-dipped galvanized coating shall be applied after fabrication for junction boxes and pull boxes cast in concrete.

GENERAL WIRING

1.67 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.

1.68 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.

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

SEPARATE CONDUIT SYSTEMS

1.70 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.

1.71 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.

CLEANUP

1.72 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.

1.73 Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.

1.74 During the progress of the work, keep the premises clean and free of debris.

PAINTING

1.75 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.)

1.76 Paint all exposed conduit locations in finished spaces to match the finish on the surfaces they are attached to. Verify all color selections with the Architect prior to painting.

GENERAL DEMOLITION REQUIREMENTS

1.77 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.

1.78 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.

1.79 Perform demolition exercising proper care to prevent injury to the public, workmen and adjoining property.

1.80 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.

1.81 Rebuild to existing condition or better, existing work which has to be removed to allow the installation of new work as required.

1.82 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.

1.83 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.

1.84 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.

1.85 Patch areas requiring patching, including damage caused by removing, relocating or adding fixtures and equipment, damages caused by demolition at adjacent materials.

1.86 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.

1.87 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.

1.88 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.

1.89 **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.

1.90 **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.

1.91 **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.

1.92 **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.

PROJECT CLOSEOUT

1.93 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.

1.94 Equipment Lists and Maintenance Manuals:

1.94.1 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:

1.94.1.1 Name, model, and manufacturer.

1.94.1.2 Complete parts drawings and lists.

1.94.1.3 Local supply for parts and replacement and telephone number.

1.94.1.4 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.

1.95 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

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

1.97 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.

1.98 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.

CHANGES AND EXTRA WORK

1.99 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:

1.99.1 The material Costs shall **not exceed** the invoice pricing from an Electrical Distributor indicating the pricing provided at the time of bid. The Contractor shall submit a print out copy of the pricing with the change order to substantiate these values.

1.99.2 The labor Costs shall **not exceed** the latest edition of the “NECA Manual of Labor Units” **normal column**.

1.100 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:

1.100.1 The Material Costs shall **not be less than 80% of** the invoice pricing from an Electrical Distributor indicating the pricing provided at the time of bid. Restocking fees may also be included in this amount where applicable.

1.100.2 The Labor Costs shall **not be less than 80% of** the latest edition of the “NECA Manual of Labor Units” **normal column**.

1.101 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.

1.101.1 Couplings.

1.101.2 Set Screw or Compression Fittings, locknuts, Bushings and washers.

1.101.3 Conduit straps and associated screws or nails.

1.101.4 LB fittings or other specialty fittings or specialty mounting hardware may be included where needed.

1.102 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.

1.102.1 Locknuts, Bushings, tape, wire markers.

1.103 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.

1.103.1 Associated screws, nails, bolts, anchors or supports.

1.103.2 Locknuts, washers, tape.

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

1.104.1 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

1.104.2 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

1.104.3 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

1.105 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.

1.106 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.

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

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

1.107.2 Description of quantity for each item.

1.107.3 Description of (material cost per / quantity).

1.107.4 Description of (labor cost per / quantity).

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

ELECTRONIC FILES

1.108 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:

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

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

1.108.3 Provide written confirmation and agreement with the requirements described for payment of computer files, as described below.

1.109 Detail or riser diagram sheets, or any other drawings other than floor plans or site plans, ***will not be made available to the Contractor***.

1.110 Files will only be provided in the AutoCAD format in which they were created.

1.111 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.

1.112 CAD files will be made available via e-mail or on disk, depending on the quantity of files requested. The Contractor requesting the files will be required to pay $50.00 per drawing plan, or $300.00 maximum, whichever is ***less***.

END OF SECTION 26 01 00

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 <u>Common submittal mistakes which will result in the submittals being rejected:</u>

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.

2.2 Wire and cable for systems below120 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 hard wired 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:

	480 volt system	208 or 240 volt system
A Phase	Brown	Black
B Phase	Orange	Red
C Phase	Yellow	Blue
Neutral	Grey	White
Ground	Green	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 26 05 19

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 exothermite 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.

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 26 05 26

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 and MC-PCS cable are NOT permitted .

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 Conduits shall be provided with factory painted color coding, provide colored conduit for the following systems as follows:

2.4.1	Lighting and Power	Not Required
2.4.2	Emergency Power	Purple – White Lettering
2.4.3	High Voltage (over 600v)	Orange – Black Lettering
2.4.4	Security/Access Control	Green – Black Lettering

2.4.5	Fire Alarm	Red - White Lettering
2.4.6	Data	Blue – White Lettering
2.4.7	Fiber	Pink – Black Lettering
2.4.8	Audio Visual	Light Blue – Black Lettering
2.4.9	Intercom	Gray – Black Lettering

2.4.10 An alternate approved method would be to provide self-adhesive vinyl labels minimum ½" high lettering for conduits ¾" - 1" size, ¾" high for 1½" – 2½", 1¼" high for 3" – 4". Minimum 8" length on all conduits exposed within the building or above accessible ceilings at maximum 20'0" intervals and all penetrations through walls or floors and all junction boxes. Color shall match the above with lettering identifying each system.

2.5 Fire stopping material shall provide an effective seal against fire, heat, smoke and fire gases. Fire stopping material shall be tested to comply with ASTME 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.

2.6 Each length of conduit shall be stamped with the name or trademark of the manufacturer and shall bear the UL label.

2.7 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.

2.8 Plastic conduit shall be stored on a flat surface, and protected from the direct rays of the sun.

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 O.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 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.

3.10 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 ½" for power wiring and ¾" for communications and fire alarm systems unless otherwise noted. Conduit in slab or below grade shall be ¾" 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 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.

4.9 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.

4.10 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.

4.11 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.

4.12 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.

4.13 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.

4.14 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.

4.15 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.

4.16 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.

4.16.1 Water and waste piping not less than 3".

4.16.2 Steam and steam condensate lines not less than 12".

4.16.3 Radiation and reheat lines not less than 6".

4.17 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.

4.18 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.

4.19 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.

4.20 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.

4.20.1 For power conduits for conductors (600v and below), provide minimum 36” radius (vertical) and 72” radius (horizontal) bends.

4.20.2 For power conduits for conductors (greater than 600v), provide minimum 72” radius (vertical) and 72” radius (horizontal) bends.

4.21 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 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.

4.22 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.

4.23 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.

4.24 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.

4.25 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.

4.26 All conduits which are part of a paralleled feeder or branch circuit shall be installed underground.

4.27 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.

4.27.1 The Contractor shall coordinate all conduit requirements with each system supplier prior to bid to determine special conduit system requirements.

4.27.2 The Contractor shall provide a pull rope in all conduits for these systems.

4.27.3 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.

4.28 In addition to the above requirements, the following requirements shall apply to all data networking conduits:

4.28.1 Flexible metal conduit may only be used where required at building seismic and/or expansion joints.

4.28.2 All underground conduits shall be provided with minimum 24" radius elbows (vertical) and 60” (horizontal).

4.28.3 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.

4.28.4 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.

4.29 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.

4.30 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 <u>each</u> raceway channel with pull strings.

4.31 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.

END OF SECTION 26 05 33

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 <u>Common submittal mistakes which will result in the submittals being rejected:</u>

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 feraloy 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.

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 ¾" past boxes all around. Covers for 4" square boxes shall extend ¼" 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 ¾" 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 1-¼" or smaller, provide 4-11/16" square x 2-1/8" deep boxes. Where pull boxes are required on conduits larger than 1-¼" for straight pull through, provide eight times the conduit trade size for box length. Where pull boxes are required on conduits larger than 1-¼" 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 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 26 05 34

SECTION 26 05 43 UNDERGROUND PULL BOXES AND MANHOLES

PART 1 GENERAL

1.1 Furnish and install electrical underground pullboxes and manholes 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 The concrete for pull boxes and manholes shall be class 5500 psi or as noted on the drawings. All pullboxes and manholes and covers located in parking lots, driveways, roads, or any other driveable areas shall be traffic rated.

2.2 Each manhole shall be provided with a fiberglass ladder and ground rod. Ground rods shall be copper or a copper-clad steel 3/4" diameter by 10-feet long. All non-current carrying metallic components shall be grounded to the ground rods with minimum #6 copper wire.

2.3 All underground pullboxes shall be provided with steel bolt down type covers. Bolts shall be bronze or brass. All communication or signal system pullboxes shall be sized to comply with CEC Article 370 unless where other sizes are specifically noted on the drawings.

2.4 All underground pullbox and manhole covers shall be provided with either "electrical" or "telephone" or "fire alarm" markings. The telephone marking shall be used to identify telephone, T.V., clock or any other types of communication systems.

2.5 All power and communication systems shall be provided with separate pullboxes or manholes. Fire alarm circuits shall also be provided with separate pullboxes from any other type of communication systems.

PART 3 INSTALLATION

3.1 Shoring of the excavation shall be in accordance with all federal, state and local regulations.

3.2 Provide sealing material for the joints between sections per manufacturer’s instructions.

3.3 The contractor shall make the top and access assembly or lid flush with surrounding areas where installed in driveable or normal walking areas.

END OF SECTION 26 05 43

SECTION 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

RELATED DOCUMENTS

1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, 27, 28 Specification Sections, apply to this Section.

1.2 Acceptance and start-up testing requirements for electrical power distribution equipment and systems. Contractor shall retain and pay for the services of a recognized, independent testing firm for the purpose of performing inspections and tests as herein specified and as required by code.

1.2.1 The testing firm shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections.

1.2.2 It is the purpose of these tests to assure that all tested electrical equipment is operational and within industry and manufacturers tolerances, and is installed in accordance with design specifications.

1.2.3 The tests and inspections shall determine suitability for start-up and energization.

1.2.4 The following equipment shall be tested and calibrated:

1.2.4.1 Low voltage switches, fuses, and circuit breakers, 100A frame and larger.

1.2.4.2 Low voltage cables and feeders.

1.2.4.3 Motor Control Centers and adjustable frequency drives.

CODES, STANDARDS, AND REFERENCES

1.3 All inspections and tests shall be in accordance with the following codes and standards except as provided otherwise herein.

1.3.1 ANSI/IEEE C2: National Electrical Safety Code (NESC).

1.3.2 ANSI/NFPA 70: National Electrical Code, with California Amendments (CEC).

1.3.3 ANSI/NFPA 70E: Standard for Electrical Safety in the Workplace.

1.3.4 ANSI/NFPA 78: Lightning Protection Code.

1.3.5 ANSI/NFPA 101: Life Safety Code.

1.3.6 American Society for Testing and Materials – ASTM.

1.3.7 Applicable State and Local Codes, Ordinances and Standards.

1.3.8 California Code of Regulations (CCR), Title 8, Title 24.

1.3.9 Division 1, Section 019113, “General Commissioning Requirements”.

1.3.10 Institute of Electrical and Electronic Engineers – IEEE.

1.3.11 Insulated Cable Engineers Association – ICEA.

1.3.12 International Electrical Testing Association - NETA Accept: The NETA Acceptance Testing Specifications, latest edition.

1.3.13 National Electrical Manufacturers Association – NEMA.

1.3.14 Occupational Safety and Health Administration (OSHA) – 29 CFR 1910.7: OSHA Occupational Safety and Health Standards.

QUALIFICAITONS OF TESTING FIRM

1.4 All Inspections and tests shall utilize the following references:

1.4.1 Project design specifications.

1.4.2 Project design drawings

1.4.3 Project list of equipment to be inspected and tested

1.4.4 Manufacturer’s instruction manuals applicable to each particular equipment.

1.5 The testing firm shall be an independent testing organization with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1.6 The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems, with at least five (5) years of documented experience.

1.7 The lead, on-site, technical person shall be currently certified by the International Electrical Association (NETA), or National Institute for Certification in Engineering Technologies (NICET) in electrical power distribution system testing.

1.8 The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services.

1.9 The testing firm shall submit proof of the above qualifications with bid documents when requested.

1.10 The terms used herein, such as Testing Agency, Testing Contractor, Testing Laboratory, or Contractor Test Company, shall be construed to mean the testing firm.

SUBMITTALS

1.11 Provide submittals per Division 1, Section 013300, “Submittal Procedures”.

1.12 Qualifications of testing firm and personnel.

1.13 Certified test reports.

1.14 Two copies of blank forms for checklists, test reports, and other related forms for Engineer's review and approval.

GENERAL REQUIREMENTS

1.15 Routine insulation resistance, continuity, and rotation tests for all distribution and utilization equipment shall be performed prior to and in addition to acceptance tests specified herein.

1.16 The Testing Firm shall notify the Engineer no fewer than 3 working days prior to commencement of any testing.

1.17 Any system, material, or workmanship, which is found defective on the basis of Acceptance Tests shall be reported to the Engineer with recommendations for corrective action.

1.18 The Testing Firm shall maintain a written record of all tests, and upon completion of project, shall assemble and certify a final test report.

1.19 The final Test Report shall be submitted on conclusion of all required tests and corrective measures.

SAFETY AND PRECAUTIONS

1.20 Safety practices shall include, but will not be limited to, compliance with the following requirements:

1.20.1 Occupational Safety and Health Act.

1.20.2 Accident Prevention Manual for Industrial Operations, National Safety Council.

1.20.3 Applicable State and Local safety operating procedures.

1.20.4 Owners' Safety Practices.

1.20.5 National Fire Protection Association – NFPA 70E.

1.20.6 American National Standards for Personnel Protection.

1.21 All tests shall be performed with apparatus de-energized. Exceptions must be thoroughly reviewed to identify safety hazards and adequate safeguards must be devised.

1.22 The Testing Firm shall have a designated safety representative on the project site to supervise the testing operations with respect to safety.

1.23 Test Report:

1.23.1 The test report shall include the following:

1.23.1.1 Summary of Project.

1.23.1.2 List of testing equipment used.

1.23.1.3 Calibration date of testing equipment and due date of next calibration.

1.23.1.4 Ambient temperature and humidity at time of test.

1.23.1.5 Listing of equipment tested.

1.23.1.6 Test results.

1.23.1.7 Recommendations.

1.23.2 Furnish original and four copies of the complete report to the Architect/District in accordance with requirements of Contract Documents.

INSPECTION AND TEST PROCEDURES

1.24 Contractor shall provide the Testing Firm, a copy of related contract documents such as drawings, specifications, engineer-reviewed submittals, coordination study report including all relay settings and other necessary information.

1.25 Contractor shall supply a suitable source of power to each site and location per testing firm requirements.

1.26 Contractor shall notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.

1.27 Testing Firm shall review and evaluate all received documents and notify the Contractor and Engineer of any discrepancies in the documents and/or any other requirements immediately.

1.28 Testing Firm shall provide and comply with the following:

1.28.1 Acceptance test procedures for each individual equipment listed in Part 1 of this section for Engineer review and approval prior to any test and after thorough evaluation of the system. Testing shall conform to the International Electrical Testing Association (NETA) specifications and standards for electrical power distribution equipment and systems and manufacturer's instructions.

1.28.2 Refer to each individual specification section for testing requirements and comply.

1.28.3 Inspect installed equipment and report any discrepancy and/or deficiency with respect to the contract documents and governing codes prior to testing.

SYSTEM FUNCTION TEST

1.29 Perform system function test upon completion of equipment tests as defined in this section. It is the purpose of system function tests to verify proper interaction of all sensing, processing, and action devices.

1.30 Implementation.

1.31 Submit manufacturers' data on all items:

1.31.1 Develop test parameters for the purpose of evaluation performance of all integral components and their functioning as a complete unit within design requirements.

1.31.2 Test all interlocking devices.

1.31.3 Record the operation of alarms and indicating devices.

1.32 DEFICIENCIES

1.33 Submit manufacturers' data on all items.

1.33.1 All deficiencies reported by the Testing Firm shall be corrected by the Contractor and Acceptance and System Function Tests shall be repeated to verify conformance with requirements.

PART 2 PRODUCTS

2.1 Not applicable

PART 3 EXECUTION

END OF SECTION 26 08 00

SECTION 26 09 23 DIGITAL LIGHTING CONTROL SYSTEM

PART 1 GENERAL

1.1 Furnish and install automatic lighting controls as shown on the drawings and as specified herein Submit manufacturers' data on all items.

1.2 Equipment shall be UL listed, comply with those portions of CEC as applicable to electrical wiring work and comply with those portions of NEMA or UL pertaining to types of electrical equipment and enclosures. The equipment shall also be certified by the California Energy Commission.

1.3 The manufacturer of the lighting control equipment shall have been actively engaged in the manufacture of the types and capacities required for the application for at least three years. It is the sole responsibility of the Division 26 contractor to ensure that submittals of material meets the performance specifications contained herein.

1.4 All components and assemblies shall be factory pre-tested and burned-in as a system for 48 hours prior to shipping.

1.5 Control Intent – Control Intent includes, but is not limited to:

1.5.1 Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.

1.5.2 Initial sensor and switching zones

1.5.3 Initial time switch settings

1.5.4 Task lighting and receptacle controls

1.5.5 Emergency Lighting control (if applicable)

1.5.6 Manufacturer shall submit a point-to-point line diagram of the system configuration including all devices and accessories required to complete the system.

1.5.7 Manufacturer shall submit data sheets on the components and system submitted, with descriptions of hardware and software components.

SYSTEM DESCRIPTION & OPERATION

1.6 The Lighting Control and Automation system as defined under this section covers the following equipment:

1.6.1 Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications

1.6.2 Digital Switches – Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications

1.6.3 Handheld remotes for personal control – One-button dimming, two-button on/off, or five-button scene remotes provide control using infrared communications. Remote may be configured in the field to control selected loads or scenes without special tools

1.6.4 Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications can provide switching, bi-level, tri-level or dimming control for daylight harvesting

1.6.5 Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities

1.6.6 Digital Plug-Load Controllers – Self-configuring, digitally addressable, single relay, plenum-rated application-specific controllers. Selected models include integral current monitoring capabilities

1.6.7 Configuration Tools – Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow bi-directional communication of room variables and occupancy sensor settings. Computer software also customizes room settings

1.6.8 Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices

1.6.9 Digital Lighting Management (DLM) segment network – Linear topology, BACnet MS/TP network (1.5 twisted pair, shielded,) to connect multiple DLM local networks for centralized control

1.6.10 Network Bridge – provides BACnet MS?TP-compliant digital networked communication between rooms, panels and the Segment Manager or building automation system (BAS) and automatically creates BACnet objects representative of connected devices.

1.6.11 Segment Manager – provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting

1.6.12 Programming and Configuration software – Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication

1.6.13 LMCP Digital Lighting Management Relay Panel – provides up to 8, 24, or 48 mechanically latching relays. Relays include a manual override and a single push-on connector for easy installation or removal from the panel. Panel accepts program changes from handheld configuration tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital

networked communication between other lighting controls and/or building automation system (BAS)

1.6.14 Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

LIGHTING CONTROL APPLICATIONS

1.7 Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:

1.7.1 Space Control Requirements – Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.

1.7.2 Bi-Level Lighting – Provide multi-level controls in all spaces except toilet rooms, storerooms, library stacks, or applications where variable dimming is used

1.7.3 Task Lighting / Plug Loads – Provide automatic shut off of non-essential plug loads and task lighting in all spaces except toilet rooms and storerooms. Provide Automatic-ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area

1.7.4 Daylit Areas – Provide daylight-responsive automatic control in all spaces (conditioned or unconditioned) where daylight contribution is available as defined by relevant local building energy code:

1.7.4.1 All luminaires within code-defined daylight zones shall be controlled separately from luminaires outside of daylit zones

1.7.4.2 Daytime setpoints for total ambient illumination (combined daylight and electric light) levels that initiate dimming shall be programmed in compliance with relevant local building energy codes

1.7.4.3 Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings

1.7.4.4 Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.

1.7.5 Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four (4) pre-set lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to extinguish all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.

1.8 Submit shop drawings and manufacturers' data for all components including:

1.8.1 Manufacturer shall submit in bill-of-material form an itemized list of all materials supplied to meet the specification.

1.8.2 Manufacturer shall submit dimensional drawings of lighting control panel(s).

1.8.3 Manufacturer shall submit a point-to-point line diagram of the system configuration including all devices and accessories required to complete the system.

1.8.4 Manufacturer shall submit data sheets on the components and system submitted, with descriptions of hardware and software components

1.8.5 Composite wiring and/or schematic diagram of each control circuit as proposed to be installed

1.8.6 Show exact location of all digital devices, including at minimum sensors, room controllers, and switches for each area on reflected ceiling plans. (Contractor must provide AutoCAD format reflected ceiling plans)

1.8.7 Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies

1.8.8 Network riser diagram including floor and building level details. Include network cable specification and end-of-line termination details, if required. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades

QUALITY ASSURANCE

1.9 Manufacturer: Minimum 10 years' experience in manufacture of lighting controls

PROJECT CONDITIONS

1.10 Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1.10.1 Ambient temperature: 0° to 40° C (32° to 104° F)

1.10.2 Relative humidity: Maximum 90 percent, non-condensing.

WARRANTY

1.11 Provide a five-year limited manufacturer's warranty on all room control devices and panels

MAINTENANCE

1.12 Spare Parts:

1.12.1 The contactor shall provide as a part of this contract additional Control modules of each type used, Switches of each type used, Daylight sensors, Ceiling mounted occupancy sensors, Wall mounted occupancy sensors, Room controller, etc, three (3) for each type. 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 1 submittals**.

PART 2 PRODUCTS

2.1 Acceptable Manufacturers: **WattStopper, Digital Lighting Management (DLM)**

Substitutions:

2.2 Bidder's wishing to obtain approval on manufacturers other than those specified in these specifications or on the drawings shall comply with the following procedures:

2.2.1 All substitution requests shall be submitted to the Architect / Engineer no less than 10 business days prior to the project bid opening date. Approvals when accepted will be issued in the form of an addendum to the contract. No consideration for substitutions will be provided after the award of the contract.

2.2.2 The substitution request must include a statement indicating how the substituted product may impact the completion of the project.

2.2.3 The substitution request must include a statement indicating the difference in price (both list price and Contractor price) between the specified product and the substitution.

2.2.4 The substitution request must include a detailed analysis indicating <u>any</u> differences between the specified product and the substitution.

2.2.5 Catalog literature for both the specified and the substitution shall be provided along with contact information of the manufacturer for the substituted product.

2.3 The contractor shall pay the Engineer (at their current standard hourly rates) for the time spent reviewing substitutions. These costs will be included as an addendum to be issued to all bidders to include in their proposals and must be paid to the Engineer within 60 days of award of the project.

DIGITAL LIGHTING CONTROLS

2.4 Furnish the Company's system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

DIGITAL WALL SWITCH OCCUPANCY SENSORS

2.5 Wallbox mounted passive infrared PIR or dual technology (passive infrared and ultrasonic) digital occupancy sensor with 1 or 2 switch buttons

2.6 Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:

2.6.1 Digital calibration and pushbutton configuration for the following variables:

2.6.1.1 Sensitivity – 0-100% in 10% increments

2.6.1.2 Time delay – 1-30 minutes in 1 minute increments xx

2.6.1.3 Test mode – Five second time delay

2.6.1.4 Detection technology – PIR, Dual Technology activation and/or re-activation.

2.6.1.5 Walk-through mode

2.6.1.6 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network

2.6.2 Programmable control functionality including:

2.6.2.1 Each sensor may be programmed to control specific loads within a local network

2.6.2.2 Sensor shall be capable of activating one of 16 user-definable lighting scenes.

2.6.2.3 Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.

2.6.2.4 On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:

2.6.2.4.1 Ultrasonic and Passive Infrared

2.6.2.4.2 Ultrasonic only

2.6.2.4.3 Passive Infrared only

2.6.3 Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods

2.6.4 Two RJ-45 ports for connection to DLM local network

2.6.5 Two-way infrared (IR) transceiver to allow remote programming through handheld configuration tool and control by remote person controls.

2.6.6 Device Status LEDs including:

2.6.6.1 PIR detection

2.6.6.2 Ultrasonic detection

2.6.6.3 Configuration mode

2.6.6.4 Loading binding

2.6.7 Assignment of occupancy sensor to a specific load within the room without wiring or special tools

2.6.8 Assignment of local buttons to specific loads within the room without wiring or special tools

2.6.9 Manual override of controlled loads

2.6.10 All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall have an expected life of no less than 10 years.

2.7 BACnet object information shall be available for the following objects:

2.7.1 Detection state

2.7.2 Occupancy sensor time delay

2.7.3 Occupancy sensor sensitivity, PIR and Ultrasonic

2.7.4 Button state

2.7.5 Switch lock control

2.7.6 Switch lock status

2.8 Units shall not have any dip switches or potentiometers for field settings

2.9 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required

2.10 Two-button wall switch occupancy sensors, when connected to a single relay dimming room controller, shall operate in the following sequence as a factory default:

2.10.1 Left button

2.10.1.1 Press and release – Turn load on

2.10.1.2 Press and hold – Raise dimming load

2.10.2 Right button

2.10.2.1 Press and release – Turn off

2.10.2.2 Press and hold – Lower diming load

2.11 Low voltage momentary pushbuttons shall include the following features:

2.11.1 Load/Scene Status LED on each switch button with the following characteristics:

2.11.1.1 Bi-level LED

2.11.1.2 Dim locator level indicates power to switch

2.11.1.3 Bright status level indicates that load or scene is active

2.11.2 The following button attributes may be changed or selected using a wireless configuration tool:

2.11.2.1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

2.11.2.2 Individual button function may be configured to Toggle, On only or Off only.

2.11.2.3 Individual scenes may be locked to prevent unauthorized change.

2.11.2.4 Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.

2.11.2.5 Ramp rate may be adjusted for each dimmer switch.

2.11.2.6 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple load

2.12 WattStopper part numbers: LMPW, LMDW. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening

DIGITAL WALL OR CELING MOUNTED OCCUPANCY SENSOR

2.13 Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor

2.14 Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:

2.14.1 Digital calibration and pushbutton configuration for the following variables:

2.14.1.1 Sensitivity – 0-100% in 10% increments

2.14.1.2 Time delay – 1-30 minutes in 1 minute increments

2.14.1.3 Test mode – Five second time delay

2.14.1.4 Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.

2.14.1.5 Walk-through mode

2.14.1.6 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

2.14.2 Programmable control functionality including:

2.14.2.1 Each sensor may be programmed to control specific loads within a local network.

2.14.2.2 Sensor shall be capable of activating one of 16 user-definable lighting scenes.

2.14.2.3 Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off

2.14.2.4 On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:

2.14.2.4.1 Ultrasonic and Passive Infrared

2.14.2.4.2 Ultrasonic or Passive Infrared

2.14.2.4.3 Ultrasonic only

2.14.2.4.4 Passive Infrared only

2.14.3 Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.

2.14.4 One or two RJ-45 port(s) for connection to DLM local network

2.14.5 Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls

2.14.6 Device Status LEDs, which may be disabled for selected applications, including:

2.14.6.1 PIR detection

2.14.6.2 Ultrasonic detection

2.14.6.3 Configuration mode

2.14.6.4 Load binding

2.14.7 Assignment of occupancy sensor to a specific load within the room without wiring or special tools

2.14.8 Manual override of controlled loads

2.14.9 All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years

2.15 BACnet object information shall be available for the following objects:

2.15.1 Detection state

2.15.2 Occupancy sensor time delay

2.15.3 Occupancy sensor sensitivity, PIR and Ultrasonic

2.16 Units shall not have any dip switches or potentiometers for field settings

2.17 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

2.18 WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

DIGITAL WALL SWITCHES

2.19 Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configurations. Wall switches shall include the following features:

2.19.1 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

2.19.2 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

2.19.3 Configuration LED on each switch that blinks to indicate data transmission.

2.19.4 Load/Scene Status LED on each switch button with the following characteristics:

2.19.4.1 Bi-level LED

2.19.4.2 Dim locator level indicates power to switch

2.19.4.3 Bright status level indicates that load or scene is active

2.19.5 Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps

2.19.6 Programmable control functionality including

2.19.6.1 Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority.

2.19.6.2 Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels

2.19.7 All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years

2.20 BACnet object information shall be available for the following objects:

2.20.1 Button state

2.20.2 Switch lock control

2.20.3 Switch lock status

2.21 Two RJ-45 ports for connection to DLM local network

2.22 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching

2.23 The following switch attributes may be changed or selected using a wireless configuration tool:

2.23.1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa)

2.23.2 Individual button function may be configured to Toggle, On only or Off only.

2.23.3 Individual scenes may be locked to prevent unauthorized change.

2.23.4 Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours

2.23.5 Ramp rate may be adjusted for each dimmer switch.

2.23.6 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads

2.24 WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening

HANDHELD REMOTE CONTROLS

2.25 Battery-operated handheld devices in 1, 2 and 5 button configurations for remote switching or dimming control. Remote controls shall include the following features:

2.25.1 Two-way infrared (IR) transceiver for line of sight communication with DLM local network within up to 30 feet

2.25.2 LED on each button confirms button press

2.25.3 Load buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads

2.25.4 Inactivity timeout to save battery life

2.26 A wall mount holster and mounting hardware shall be included with each remote control

2.27 WattStopper part numbers: LMRH-101, LMRH-102, LMRH-105

DIGITAL PARTITION CONTROLS

2.28 Partition controls shall enable manual or automatic coordination of lighting controls in flexible spaces with up to four moveable walls by reconfiguring the connected digital switches and occupancy sensors

2.29 Four-button low voltage pushbutton switch for manual control.

2.29.1 Two-way infrared (IR) transceiver for use with configuration remote control.

2.29.2 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall

2.29.3 Configuration LED on each switch that blinks to indicate data transmission.

2.29.4 Each button represents one wall; Green button LED indicates status.

2.29.5 Two RJ-45 ports for connection to DLM local network.

2.30 WattStopper part number: LMPS-104. Available in white, light almond, ivory, grey and black; compatible with wall plates with decorator opening

2.31 Contact closure interface for automatic control via input from limit switches on movable walls (by others).

2.31.1 Operates on Class 2 power supplied by DLM local network.

2.31.2 Includes 24VDC output and four input terminals for maintained third party contract closure inputs.

2.31.2.1 Input max. sink/source current: 1-5Ma

2.31.2.2 Logic input signal voltage High: >18VDC

2.31.2.3 Logic input signal voltage Low: <2VDC

2.31.3 Four status LEDs under hinged cover indicate if walls are open or closed; supports LMPS-104 as remote status indicator.

2.31.4 Two RJ-45 ports for connection to DLM local network.

2.32 WattStopper part number: LMIO-102

DIGITAL DAYLIGHTING SENSORS

2.33 Digital daylighting sensors shall work with room controllers to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to a room controller. Daylighting sensors shall be interchangeable without the need for rewiring

2.33.1 Closed loop sensors measure the ambient light in the space and control a single lighting zone

2.33.2 Open loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones

2.33.3 Dual loop sensors measure both ambient and incoming daylight in the space to insure that proper light levels are maintained as changes to reflective materials are made in a single zone

2.34 Digital daylighting sensors shall include the following features:

2.34.1 The sensor's internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The

photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers

2.34.2 Sensor light level range shall be from 1-6,553 footcandles (fc).

2.34.3 The capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).

2.34.4 For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the “ON Setpoint” and the “OFF Setpoint” that will prevent the lights from cycling excessively after they turn off.

2.34.5 For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level

2.34.6 Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.

2.34.7 Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off

2.34.8 Optional wall switch override shall allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy

2.34.9 Integral infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls

2.34.10 Configuration LED status light on device that blinks to indicate data transmission

2.34.11 Status LED indicates test mode, override mode and load binding.

2.34.12 Recessed switch on device to turn controlled load(s) ON and OFF.

2.34.13 BACnet object information shall be available for the following daylighting sensor objects, based on the specific photocell’s settings:

2.34.13.1 Day and night setpoints

2.34.13.2 Off time delay

2.34.13.3 On and off setpoints

2.34.13.4 Up top three setpoints

2.34.13.5 Operating mode – on/off, bi-level, tri-level or dimming

2.34.14 One RJ-45 port for connection to DLM local network

2.35 A choice of accessories to accommodate multiple mounting methods and building materials. The photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62" thickness (LMLS-400, LMLS-500). Extended tube photosensors accommodate mounting materials from 0.62"-1.25" thickness (LMLS-400-L, LMLS-500-L). Mounting brackets are compatible with J boxes (LMLS-MB1) and wall mounting (LMLS-MB2). LMLS-600 photosensor to be mounted on included bracket below skylight well

2.36 Any load or group of load in the room can be assigned to a daylighting zone

2.37 Each load within a daylighting zone can be individually enabled or disabled for discrete control) load independence)

2.38 All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years

Closed loop digital photosensors shall include the following additional features:

2.39 An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.

2.40 Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software

2.41 Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads

2.42 WattStopper Product Number: LMLS-400, LMLS-400-L

Open loop digital photosensors shall include the following additional features:

2.43 An internal photodiode that measures light in a 60-degree angle cutting off the unwanted light from the interior of the room

2.44 Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone

2.45 Each of the three discrete daylight zones can include any non-overlapping group of loads in the room

2.46 WattStopper Product Number: LMLS-500, LMLS-500-L

Dual loop photosensors shall include the following additional features:

2.47 Close loop portion of dual loop device must have an internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from sources outside.

2.48 Open loop portion of dual loop device must have an internal photodiode that can measure light in a 60 degree angle, cutting off the unwanted light from the interior of the room

2.49 Automatically establishes application-specific set-points following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of load

2.50 Device must reference closed loop photosensor information as a base line reference. The device must be able to analyze the open loop photosensor information to determine if an adjustment in light levels is require

2.51 Device must be able to automatically commission setpoints each night to provide adjustments to electrical lighting based on changes in overall lighting in the space due to changes in reflectance within the space or changes to daylight contribution based on seasonal changes

2.52 Device must include extendable mounting arm to properly position sensor within a skylight well

2.53 WattStopper product number LMLS-600

DIGITAL ROOM CONTROLLERS AND PLUG – LOAD CONTROLLERS

2.54 Digital controllers for lighting and plug loads automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room and plug load controllers shall be provided to match the room lighting and plug load control requirements. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard Plug n' Go applications. The control units will include the following features:

2.54.1 Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room

2.54.2 Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf

2.54.3 Multiple room controllers connected together in a local network must automatically prioritize each room controller, without requiring any configuration or setup, so that loads are sequentially assigned using room controller device ID's from highest to lowest

2.54.4 Device Status LEDs to indicate:

2.54.4.1 Data transmission

2.54.4.2 Device has power

2.54.4.3 Status for each load

2.54.4.4 Configuration status

2.54.5 Quick installation features including:

2.54.5.1 Standard junction box mounting

2.54.5.2 Quick low voltage connections using standard RJ-45 patch cable

2.54.6 Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power

2.54.6.1 Turn on to 100%

2.54.6.2 Remain off

2.54.6.3 Turn on to last level

2.54.7 Each load shall be configurable to operate in the following sequences based on occupancy:

2.54.7.1 Auto-on/Auto-off (Follow on and off)

2.54.7.2 Manual-on/Auto-off (Follow off only)

2.54.8 The priority of each load output shall be reversible, via digital configuration, so that on is off and off is on

2.54.9 BACnet object information shall be available for the following objects:

2.54.9.1 Load status

2.54.9.2 Electrical current

2.54.9.3 Total watts per controller

2.54.9.4 Schedule state – normal or after-hours

2.54.9.5 Demand response control and cap level

2.54.9.6 Room occupancy status

2.54.9.7 Total room lighting and plug loads watts

2.54.9.8 Total room watts/sq ft

2.54.9.9 Force on/off all loads

2.54.10 UL 2043 plenum rated

2.54.11 Manual override and LED indication for each load

2.54.12 Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only). 120/277 volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347 volt models rated for 15A total load; plug load controllers carry application-specific UL 20 rating for receptacle control.

2.54.13 Zero cross circuitry each load

2.54.14 All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

2.55 On/Off Controllers shall include:

2.55.1 One or two relay configuration

2.55.2 Efficient 150 mA switching power supply

2.55.3 Three RJ-45 DLM local network ports with integral strain relief and dust cover

2.55.4 WattStopper product numbers: LMRC-101, LMRC-102

2.56 On/Off/Dimming enhanced Room Controllers shall include:

2.56.1 Real time current monitoring

2.56.2 Multiple relay configurations

2.56.2.1 One, two or three relays (LMRC-21 x series)

2.56.2.2 One or two relays (LMRC-22x series)

2.56.3 Efficient 250 mA switching power supply

2.56.4 Four RJ-45 DLM local network ports with integral strain relief and dust cover

2.56.5 Once dimming output per relay

2.56.5.1 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting. (LMRC-21x series)

2.56.5.2 Line Voltage, Forward Phase Dimming - Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward

phase compatible ELV, neon/cold cathode and incandescent loads. (LMRC-22x series)

2.56.5.3 Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver

2.56.5.4 The LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim

2.56.5.5 Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100% dimming range defined by the minimum and maximum calibration trim

2.56.5.6 Calibration and trim levels must be set per output channel

2.56.5.7 Devices that set calibration or trim levels per controller are not acceptable

2.56.5.8 All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable

2.56.6 Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events

2.56.7 Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value

2.56.8 The following dimming attributes may be changed or selected using a wireless configuration tool:

2.56.8.1 Establish preset level for each load from 0-100%

2.56.8.2 Set high and low trim for each load

2.56.8.3 Set lamp burn in time for each load up to 100 hours

2.56.9 Override button for each load provides the following functions:

2.56.9.1 Press and release for on/off control

2.56.9.2 Press and hold for dimming control

2.57 WattStopper product numbers: LMRC-211, LRMC-212, LMRC-221, LMRC-222

2.58 Plug Load Room Controllers shall include the following:

2.58.1 One relay configuration with additional connection for unswitched load

2.58.2 Configurable additive time delay to extend plug load time delay beyond occupancy sensor time delay (e.g. a 10 minute additive delay in a space with a 20 minute occupancy sensor delay ensures that plug loads turn off 30 minutes after the space is vacated)

2.58.3 Factory default operation is Auto-on/Auto-off, based on occupancy

2.58.4 Real time current monitoring of both switched and un-switched load (LMPL-201 only)

2.58.5 Efficient switching power supply

2.58.5.1 150mA (LMPL-101)

2.58.5.2 250mA (LMPL-201)

2.58.6 RJ-45 DLM local network ports

2.58.6.1 Three RJ-45 ports (LMPL-101)

2.58.6.2 Four RJ-45 ports (LMPL-201)

2.59 Wattstopper product numbers: LMPL-101, LMPL-201

DLM LOCAL NETWORK (Room Network)

2.60 The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building

2.61 Features of the DLM local network include:

2.61.1 Plug n' Go® automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached

2.61.2 Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup

2.61.3 Push n' Learn® configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network

2.61.4 Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver

2.62 Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room

devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable

2.63 If manufacturer's pre-terminated Cat 5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results

2.64 WattStopper Product Number: LMRJ-Series

DLM SEGMENT NETWORK (Room to Room Network)

2.65 The segment network shall be a linear topology, BACnet-based MS/TP subnet to connect DLM local networks (rooms) and LMCP relay panels for centralized control

2.65.1 Each connected DLM local network shall include a single network bridge (LMBC-300), and the network bridge is the only room-based device that is connected to the segment network

2.65.2 Network bridges, relay panels and segment managers shall include terminal blocks, with provisions for separate "in" and "out" terminations, for segment network connections

2.65.3 The segment network shall utilize 1.5 twisted pair, shielded, cable supplied by the lighting control manufacturer. The maximum cable run for each segment is 4,000 feet. Conductor-to-conductor capacitance of the twisted pair shall be less than 30 pf/ft and have a characteristic impedance of 120 Ohms

2.65.4 Network signal integrity requires that each conductor and ground wire be correctly terminated at every connected device

2.65.5 Substitution of manufacturer-supplied cable must be pre-approved: Manufacturer will not certify network reliability, and reserves the right to void warranty, if non-approved cable is installed, and if terminations are not completed according to manufacturer's specific requirements

2.65.6 Segment networks shall be capable of connecting to BACnet-compliant BAS (provided by others) either directly, via MS/TP, or through NB-ROUTERs, via BACnet/IP or BACnet/Ethernet. Systems whose room-connected network infrastructure require gateway devices to provide BACnet data to a BAS are unacceptable

2.66 WattStopper Product Number: LM-MSTP, LM-MSTP-DB

CONFIGURATION TOOLS

2.67 A wireless configuration tool facilitates optional customization of DLM local networks using two-way infrared communications, while PC software connects to each local network via a USB interface

2.68 Features and functionality of the wireless configuration tool shall include but not be limited to:

2.68.1 Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet

2.68.2 High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation

2.68.3 Must be able to read and modify parameters for room controllers, occupancy sensors, wall switches, daylighting sensors, network bridges and relay panels, and identify room devices by type and serial number

2.68.4 Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors

2.68.5 Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings

2.68.6 Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls

2.68.7 Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings

2.68.8 Verify status of building level network devices

2.69 WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

NETWORK BRIDGE

2.70 The network bridge module connects a DLM local network to a BACnet-compliant segment network for communication between rooms, relay panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication and an optically isolated EIA/TIA RS-485 transceiver

2.70.1 The network bridge shall be provided as a separate module connected on the local network through an available RJ-45 por

2.70.2 Provide Plug n' Go operation to automatically discover room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network

2.70.3 The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. BACnet objects will be created for the addition or replacement of any given in-room DLM device for the installed life of the system. Products requiring

that an application-specific point database be loaded to create or map BACnet objects are not acceptable. Systems not capable of providing BACnet data for control devices via a dedicated BACnet Device ID and physical MS/TP termination per room are not acceptable. Standard BACnet objects shall be provided as follows:

2.70.3.1 Read/write the normal or after hours schedule state for the room

2.70.3.2 Read the detection state of each occupancy sensor

2.70.3.3 Read the aggregate occupancy state of the room

2.70.3.4 Read/write the On/Off state of loads

2.70.3.5 Read/write the dimmed light level of loads

2.70.3.6 Read the button states of switches

2.70.3.7 Read total current in amps, and total power in watts through the room control

2.70.3.8 Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings

2.70.3.9 Activate a preset scene for the room

2.70.3.10 Read/write daylight sensor fade time and day and night setpoints

2.70.3.11 Read the current light level, in footcandles, from interior and exterior photosensors and photocells

2.70.3.12 Set daylight sensor operating mode

2.70.3.13 Read/write wall switch lock status

2.70.3.14 Read watts per square foot for the entire controlled room

2.70.3.15 Write maximum light level per load for demand response mode

2.70.3.16 Read/write activation of demand response mode for the room

2.70.3.17 Activate/restore demand response mode for the room

2.71 Wattstopper product number: LMBC-300

SEGMENT MANAGER

2.72 For networked applications, the Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web

browser utilizing either unencrypted TCP/IP traffic via a configurable port (default is 80) or 256 bit AES encrypted SSL TCP/IP traffic via a configurable port (default is 443)

2.73 Each segment manager shall have integral support for at least three segment networks. Segment networks may alternately be connected to the segment manger via external routers and switches, using standard Ethernet structured wiring. Each router shall accommodate one segment network. Provide the quantity of routers and switches as shown on the plans

2.74 Operational features of the Segment Manager shall include the following:

2.74.1 Connection to PC or LAN via standard Ethernet TCP/IP via standard Ethernet TCP/IP with the option to use SSL encrypted connections for all traffic

2.74.2 Easy to learn and use graphical user interface, compatible with Internet Explorer 8, or equal browser. Shall not require installation of any lighting control software to an end-user PC

2.74.3 Log in security capable of restricting some users to view-only or other limited operations

2.74.4 Automatic discovery of DLM devices and relay panels on the segment network(s). Commissioning beyond activation of the discovery function shall not be required to provide communication, monitoring or control of all local networks and lighting control panels

2.74.5 After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the use

2.74.6 Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On

2.74.7 Ability to set up schedules for rooms and panels, view and override current status of panel channels and relays and assign relays to groups. Schedules shall automatically set controlled zones or areas to either a normal hour or after hours mode of operation. Support for a minimum of 100 unique schedules, each with up to four-time events per day. Support for annual schedules, holiday schedules and unique date-bound schedules

2.74.8 Ability to group rooms and loads for common control by schedules, switches or network commands

2.74.9 Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature

2.74.10 Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; room schedule mode; room switch lock control; individual occupancy sensor state; room lighting power; room plug-load power; load ON/OFF state; load dimming level; panel channel schedule state; panel relay state; and Segment Manager Group schedule state control

2.74.11 The Segment Manager shall allow access and control of the overall system database via Native Niagara AX FOX connectivity. Systems that must utilize a Tridium Niagara controller in addition to the programming, scheduling and configuration server are not acceptable

2.75 Segment Manager shall support multiple DLM rooms as follows:

2.75.1 Support up to 120 network bridges and 900 digital in-room devices (LMSM-3E)

2.75.2 Support up to 300 network bridges and 2,200 digital in room devices, connected via network routers and switches (LMSM-6E)

2.76 WattStopper Product Numbers: LMSM-3E, LMSM-6E, NB-ROUTER, NB-SWITCH, NB-SWITCH-8, NB-SWITCH-16

PROGRAMMING, CONFIGUARION AND DOCUMENTATION SOFTWARE

2.77 PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional LMCI-100 USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication. Additional parameters exposed through this method include but are not limited to:

2.77.1 Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.

2.77.2 Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.

2.77.3 Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.

2.77.4 Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.

2.77.5 Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.

2.77.6 Load control polarity reversal so that on events turn loads off and vice versa.

2.77.7 Per-load DR (demand response) shed level in units of percent.

2.77.8 Load output pulse mode in increments of 1second.

2.77.9 Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer

2.78 Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:

2.78.1 Device list report: All devices in a project listed by type.

2.78.2 Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.

2.78.3 BACnet points report: Per room Device ID report of the valid BACnet points for a given site's BOM.

2.78.4 Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.

2.78.5 Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M documentation.

2.78.6 Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100%, 2 = all loads 75%, 3 = all loads 50%, 4 = all loads 25%, 5-16 = same as scene 1).

2.78.7 Occupancy sensor report: Basic settings including time delay and sensitivity(ies) for all occupancy sensors

2.79 Network-wide programming of parameter data in a spreadsheet-like programming environment including but not limited to the following operations

2.79.1 Set, copy/paste an entire project site of sensor time delays.

2.79.2 Set, copy/paste an entire project site of sensor sensitivity settings.

2.79.3 Search based on room name and text labels.

2.79.4 Filter by product type (i.e. LMRC-212) to allow parameter set by product.

2.79.5 Filter by parameter value to search for product with specific configurations

2.80 Network-wide firmware upgrading remotely via the BACnet/IP network

2.80.1 Mass firmware update of entire rooms

2.80.2 Mass firmware update of specifically selected rooms or areas

2.80.3 Mass firmware upgrade of specific products

2.81 WattStopper Product Number: LMCS-100, LMCI-100

LMCP LIGHTING CONTROL PANELS

2.82 Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:

2.82.1 Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 - 8 relays, 1 - 24 relays and 6 four-pole contactors, or 1 - 48 relays and 6 four-pole contactors

2.82.2 Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel

2.82.3 Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features

2.82.3.1 Removable, plug-in terminal blocks with connections for all low voltage terminations

2.82.3.2 Individual terminal block, override pushbutton, and LED status light for each relay

2.82.3.3 Direct wired switch inputs associated with each relay shall support 2-wire momentary switches only

2.82.3.4 Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches; digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs; digital IO modules capable of receiving momentary or maintained contact closure inputs or analog sensor inputs; digital daylighting sensors; and digital occupancy sensors. Inputs are divided into two separate digital networks, each capable of supplying 250mA to connected devices

2.82.3.5 True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet

2.82.3.6 Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously

2.82.3.7 Group and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any set of relays can be associated with a group for direct on/off control or pattern (scene) control via a simple programming sequence using the relay override pushbuttons and LED displays for groups 1-8 or a handheld IR programmer for groups 1-99

2.82.3.8 Relay group status for shall be provided through LED indicators for groups 1-8 and via BACnet for groups 1-99. A solid LED indicates that the last group action called for an ON state and relays in the group are on or in a mixed state

2.82.3.9 Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:

Electrical

2.82.3.9.1 30 amp ballast at 277V

2.82.3.9.2 20 amp ballast at 347V

2.82.3.9.3 20 amp tungsten at 120V

2.82.3.9.4 30 amp resistive at 347V

2.82.3.9.5 1.5 HP motor at 120V

2.82.3.9.6 14,000 amp short circuit current rating (SCCR) at 347V

2.82.3.9.7 Relays shall be specifically UL 20 listed for control of plug-loads

Mechanical

2.82.3.9.8 Replaceable, ½" KO mounting with removable Class 2 wire harness

2.82.3.9.9 Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel

2.82.3.9.10 Dual line and load terminals each support two #14 - #12 solid or stranded conductors

2.82.3.9.11 Tested to 300,000 mechanical on/off cycles

2.83 Isolated low voltage contacts provide for true relay status feedback and pilot light indication

2.84 Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection

2.85 Where indicated, lighting control panels designated for control of emergency lighting shall be provided with factory installed provision for automatic by pass of relays controlling emergency circuits upon loss of normal power. Panels shall be properly listed and labeled for use on emergency lighting circuits and shall meet the requirements of UL924 and NFPA 70 - Article 700

2.86 Integral system clock shall provide scheduling capabilities for panel-only projects without DLM segment networks or BAS control

2.86.1 Each panel shall include digital clock capability able to issue system wide automation commands to up to (11) eleven other panels for a total of (12) twelve networked lighting control panels. The clock shall provide capability for up to 254 independent schedule events per panel for each of the ninety-nine system wide channel groups

2.86.2 The clock capability of each panel shall support the time-based energy saving requirements of applicable local energy codes

2.86.3 The clock module shall provide astronomic capabilities, time delays, blink warning, daylight savings, and holiday functions and will include a battery back up for the clock function and program retention in non-volatile FLASH memory. Clocks that require multiple events to meet local code lighting shut off requirements shall not be allowed

2.86.4 The clock capability of each panel shall operate on a basis of ON/OFF or Normal Hours/After Hours messages to automation groups that implement pre-configured control scenarios. Scenarios shall include:

2.86.4.1 Scheduled ON / OFF

2.86.4.2 Manual ON / Scheduled OFF

2.86.4.3 Astro ON / OFF (or Photo ON / OFF)

2.86.4.4 Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)

2.86.5 The user interface shall be a portable IR handheld remote control capable of programming any panel in the system (LMCT-100)

2.86.6 The clock capability of each panel shall employ non-volatile memory and shall retain user programming and time for a minimum of 10 years

2.86.7 Schedules programmed into the clock of any one panel shall be capable of executing panel local schedule or Dark/Light (photocell or Astro) events for that panel in the event that global network communication is lost. Lighting control panels that are not capable of executing events independently of the global network shall not be acceptable

2.87 The lighting control panel can operate as a stand-alone system, or can support schedule, group, and photocell control functions, as configured in a Segment Manager controller, via a segment network connection

2.88 The lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation systems and other intelligent field devices. Digital communications shall be RS485 MS/TP-based using the BACnet® protocol

2.88.1 The panel shall have provision for an individual BACnet device ID and shall support the full 2^{22} range (0 – 4,193,304). The device ID description property shall be writable via the network to allow unique identification of the lighting control panel on the network

2.88.2 The panel shall support MS/TP MAC addresses in the range of 0 – 127 and baud rates of 9600k, 38400k, 76800k, and 115.2k bits per second

2.88.3 Lighting control relays shall be controllable as binary output objects in the instance range of 1 – 64. The state of each relay shall be readable and writable by the BAS via the object present value property

2.88.4 Lighting control relays shall report their true on/off state as binary input objects in the instance range of 1 – 64

2.88.5 The 99 group Normal Hours/After Hours control objects associated with the panel shall be represented by binary value objects in the instance range of 201 – 299. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the after hours mode

2.88.6 Setup and commissioning of the panel shall not require manufacturer-specific software or a computer. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the handheld IR programming remote. Provide BACnet objects for panel setup and control as follows:

2.88.6.1 Binary output objects in the instance range of 1 – 64 (one per relay) for on/off control of relays

2.88.6.2 Binary value objects in the instance range of 1 – 99 (one per channel) for normal hours/after hours schedule control

2.88.6.3 Binary input objects in the instance range of 1 – 64 (one per relay) for reading true on/off state of the relays

2.88.6.4 Analog value objects in the instance range of 101 – 199 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace-time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches

2.88.7 The description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel

2.88.8 The BO and BV 1 – 99 objects shall support BACnet priority array with a relinquish default of off and after hours respectively. Prioritized writes to the channel BV objects shall propagate prioritized control to each member relay in a way analogous to the BACnet Channel object described in addendum aa. (http://www.bacnet.org/Addenda/Add-135-2010aa.pdf)

2.88.9 Panel-aggregate control of relay Force Off at priority 2 shall be available via a single BV5 object. Force On at priority 1 shall be available via a single BV4 object

2.88.10 Lockout of all digital switch buttons connected to a given panel shall be command-able via a single BV2 object. The lock status of any connected switch station shall be represented as BV101-196

2.89 WattStopper Product Number: LMCP8, LMCP24 or LMCP48

USER INTERFACE

2.90 Each lighting control panel system shall be supplied with at least (1) handheld configuration tool (LMCT-100). As a remote programming interface the configuration tool shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following panel-specific functions as a minimum:

2.90.1 Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.

2.90.2 Relay Group creation of up to 99 groups. Group creation shall result in programming of all seven key relay parameters for member relays. The seven parameters are as follows: After-hours Override Time Delay, Normal Hours Override Time Delay, Action on Transition to Normal Hours, Action on Transition to After Hours, Sensor Action During Normal Hours, Sensor Action During After Hours, Blink-Warn Time for After Hours.

2.90.3 Program up to 254 separate scheduled events. Events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays. Holidays are also defined through the User Interface.

2.90.4 Program up to 32 separate Dark/Light events. Events shall have a selectable source as either calculated Astro with delay, or a digital IO

module with an integral 0-5V or 0-10V analog photocell. Dark/Light events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays.

2.90.5 Button binding of digital switches to groups shall be accessible via the handheld IR remote and accomplished from the digital switch station.

2.90.6 Programming of panel location information shall be accomplished by the handheld IR remote and include at a minimum LAT, LON, DST zone, and an approximate city/state location.

2.90.7 An additional handheld IR remote may optionally be specified to be permanently mounted to the panel interior via a retractable anti-theft lanyard to allow for convenient programming of the panel while assuring that the handheld programmer is always present at that panel. An unlimited number of handheld IR remotes may also be purchased for facilities staff as determined by the end user's representative.

2.91 WattStopper Product Number: LMCT-100

EMERGENCY LIGHTING CONTROL DEVICES

2.92 Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:

2.92.1 120/277 volts, 50/60 Hz, 20 amp ballast rating

2.92.2 Push to test button

2.92.3 Auxiliary contact for remote test or fire alarm system interface

2.93 WattStopper Product Numbers: ELCU-100, ELCU-200

PART 3 EXECUTION

PRE-INSTALLATION MEETING

3.1 A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:

3.1.1 Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.

3.1.2 Review the specifications for low voltage control wiring and termination.

3.1.3 Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

3.1.4 Discuss requirements for integration with other trades

CONTRACTOR INSTALLATION AND SERVICES

3.2 Contractor to install all devices and wiring in a professional manner. All line voltage connections to be tagged to indicate circuit and switched legs

3.3 Contractor to install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors. If pre-terminated cable is not used for room/area wiring, the contractor is responsible for testing each field-terminated cable. The contractor shall supply the Project Engineer with test results.

3.31 Performance of installed cables shall satisfy all current addendums to the EIA/TIA 568A standard for Category-5e wiring and the manufacturers installation requirements. The contractor must provide clear room by room, individual cable by cable testing of all UTP wiring provided for the lighting control system.

3.3.2 Upon completion of testing all cable links used as a part of the lighting control system, 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 Window format (i.e., Fluke Linkware software program).

3.3.3 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.

3.3.4 Contractor to install any room to room network devices using manufacturer-supplied LM-MSTP network wire. Network wire substitution is not permitted and may result in loss of product warranty per DLM SEGMENT NETWORK section of specification.

3.3.5 Low voltage wiring topology must comply with manufacturer's specifications. Contractor shall route network wiring as shown in submittal drawings as closely as possible, and shall document final wiring location, routing and topology on as built drawings

3.4 Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start up, contractor shall test all devices to ensure proper communication

3.5 Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings

3.5.1 Adjust time delay so that controlled area remains lighted while occupied

3.6 Provide written or computer-generated documentation on the configuration of the system including room by room description including:

3.6.1 Sensor parameters, time delays, sensitivities, and daylighting setpoints.

3.6.2 Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

3.6.3 Load Parameters (e.g. blink warning, etc

3.7 Post start-up tuning – After 30 days from occupancy contractor shall adjust sensor time delays and sensitivities to meet the Owner's requirements. Provide a detailed report to the Architect / Owner of post start-up activity

FACTORY SERVICES

3.8 Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system

3.9 The electrical contractor shall provide both the manufacturer and the electrical engineer with three weeks written notice of the system start up and adjustment date

3.10 Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system

COMMISSIONING SUPPORT SERVICES

3.11 On this project, a commissioning agent will be hired to verify the installation and programming of all building systems, which includes the lighting control system. Manufacturer should include an extra day of technician's time to review the functionality and settings of the lighting control hardware with the commissioning agent, including reviewing submittal drawings and ensuring that instructions on how to configure each device are readily available. Manufacturer is NOT responsible for helping the commissioning agent inspect the individual devices. It will be the commissioning agent's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the agent with this task.

3.12 The commissioning agent shall work with the electrical contractor during installation of the lighting control hardware to become familiar with the specific products. The agent may also accompany the manufacturer's technicians during their start-up work to better understand the process of testing, calibration and configuration of the products. However, the contractor and manufacturer shall ensure that interfacing with the agent does not prevent them from completing the requirements outlined in the contract documents

ACCEPTANCE TESTING SUPPORT SERVICES

3.13 On all California projects, a certified lighting controls acceptance test technician (CLCATT) must verify the installation of the lighting control system. Manufacturer should include an extra day of factory technician's time to assist the CLCATT review the functionality and settings of the lighting control hardware per the

requirements in the California State forms. It will be the CLCATT's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the CLCATT with this task

END OF SECTION 26 09 23

SECTION 26 22 13 DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.1 Furnish and install where indicated on the drawings dry type transformers with voltage and phase as shown on the drawings. The transformers shall be 60 Hz with KVA rating as shown on the drawings.

1.2 Submit shop drawings and manufacturer's data for each transformer including:

1.2.1 Incident energy level calculations

1.3 **Common submittal mistakes which will result in the submittal 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 Acceptable manufacturers are Square D, Eaton-Cutler Hammer, Siemens or General Electric.

2.2 Equipment manufactured by any other manufacturers not specifically listed in Section 2.1 are not considered equal, or approved for use on this project.

2.3 Energy efficient transformers shall be provided in compliance with NEMA TP-1 and requirements as outlined in the California Code of Regulations, Title 20: Division 2, Chapter 4, Article 4, Sections 1601-1609: Appliance Efficiency Regulations and California Code of Regulations, Title 24: part 6, Subchapter 2, Sections 110-11: Building Standards. Transformers shall also meet the Class 1 Efficiency levels for distribution transformers specified in Table 4-2 of the National Electrical Association (NEMA) TP-102002, Guide for Determining Energy Efficiency for Distribution Transformers" The TP-1 efficiency rating will apply to both conventional transformers and K-rated transformers.

2.4 Transformers shall comply with the latest NEMA and ANSI standards.

2.5 Transformers shall be encased in a sheet steel enclosure. Ten (10) KVA and smaller shall be non-ventilated, and above 10 KVA shall be ventilated, self-cooled. The core and coil assembly shall be completely isolated from the enclosure by means of neoprene rubber isolation pads or other acceptable vibration isolators. Transformers installed outdoors shall be provided with suitable rain shields and shall be UL listed for outdoor installation.

2.5.1 Fan cooled transformers will not be accepted.

2.6 Transformers shall have a 185EC insulation system and shall not exceed 115EC rise above a 40EC ambient under full load conditions.

2.7 Transformers shall be capable of operating at 100 PCT. for taps below normal. Transformers rated 30 KVA and larger shall be 6 - 2-1/2 PCT., four below, and two above normal.

2.8 Transformer cable termination compartment shall be rated at not more than 75 degrees C.

2.9 Transformers shall have aluminum windings.

2.10 Sound outputs of transformers shall not exceed the following levels, based on NEMA standard testing procedures:

KVA Rating	Decibel Sound Output
0 - 9	40
10 - 50	45
51 - 150	50
151 - 300	55
301 - 500	60

PART 3 EXECUTION

3.1 Dry type transformers larger than 112.5KVA rating shall have a minimum of twelve inches clearance between transformer ventilation openings and adjacent structure. Transformer connections shall be made with flexible conduit.

3.2 All lugs shall be torque tested in the presence of the inspector of record.

3.3 Transformers shall be anchored to the structure to resist seismic activity in accordance with Zone 4 requirements. Provide a minimum of four (4) ½-inch diameter anchor bolts for floor or roof mounted transformers.

3.4 Transformers mounted on roofs shall be installed on a roof curb. All conduits shall enter the transformer enclosure within the curbed area.

3.5 Arc Flash and Shock Hazard

3.5.1 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 1584-2018.

3.5.2 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.

3.5.3 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department.

3.5.4 The design goal is to minimize the incident energy to which a maintenance employee may be exposed.

END OF SECTION 26 22 13

SECTION 26 24 13 SWITCHBOARDS

PART 1 GENERAL

1.1 Furnish and install service entrance and distribution switchboards as herein specified and as shown on the drawings. In order to establish the minimum acceptable quality and type of equipment described in this section, the switchboard was technically and dimensionally designed around "Square D." If other acceptable manufacturer products listed in 2.1 are used, it shall be the responsibility of the Contractor to verify the equipment will meet the requirements of the design, both technically and dimensionally.

1.2 All electrical materials and equipment shall be new, and of the type and quality specified: Listed by Underwriters' Laboratories, and bear their label, where standards have been established; in compliance with the applicable standards of CEC (NFPA 70), NFPA, ANSI, IEEE, IPCEA and NEMA. All components and equipment enclosures shall be manufactured by the same manufacturer.

1.3 SUBMITTALS

1.3.1 Submit shop drawings and manufacturers' data on the switchboard and components including:

1.3.1.1 Equipment elevation diagrams indicating the bussing configurations and ampere ratings.

1.3.1.2 Coordination study and incident energy level calculations.

1.3.1.3 Metering equipment

1.3.1.4 Breakers or fused switches

1.3.1.5 Surge Protective Device (SPD)

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

1.4.1 Not including the Short Circuit and Coordination Study with the material submittals.

1.4.2 Not including all items listed in the above itemized description.

1.4.3 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.

1.4.4 Not including actual manufacturer's catalog information of proposed products.

1.4.5 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 MANUFACTURERS

2.1.1 Acceptable manufacturers are:

2.1.1.1 Siemens

2.1.1.2 Eaton

2.1.1.3 Square D

2.1.1.4 General Electric

2.2 Equipment manufactured by any other manufacturers not specifically listed in Section 2.1, are not considered equal or approved for use on this project.

2.3 Switchboards shall be of the dead front, safety type with voltage and ampere capacity as indicated. Provide a 25% minimum tin plated aluminum ground bus running the full length of the switchboards. The neutral bus shall be **100**% rated throughout.

2.4 Where conductor sizes exceed the standard breaker lug wire range, or where multiple conductors per phase are required, the manufacturer shall provide the breaker with suitable lugs for terminating the specified conductors.

2.5 All bussing shall be tin plated aluminum and braced for a short circuit current of 100,000 RMS symmetrical amperes minimum, or as noted on the drawings. Horizontal and vertical bussing shall be 100% fully rated; not tapered unless otherwise noted on the drawings. All sections shall have full height bus.

2.6 The main circuit breaker (480 volt or 208 volt, 800 amp or larger) shall be a stored energy solid state trip insulated case type breaker and shall consist of a three-pole electrically and mechanically trip-free circuit breaker with inter-pole barriers, arc quenchers, manual stored-energy closing mechanism, mechanical push-button trip, position indicator, and equipped for fixed mounting in the switchboard section. Main breaker shall be **100%** rated and shall be sized as indicated on the drawings. Minimum short circuit interrupting rating shall be 65,000 ampere symmetrical for all breakers in the main switchboard or as indicated on the drawings. For main breakers rated 2,500 amps and larger this rating shall be increased to 100,000 amps, or as indicated on the drawings.

2.6.1 The over current trip devices to be furnished with the main circuit breaker shall be of the three-phase construction and employ solid-state components in their design to afford combinations of long, short time, and instantaneous and ground fault characteristics (480 volt only) as specified. The circuit breaker and integral solid-state trip device shall be self-contained to include necessary power supply, transformers and tapped current level sensing transformers. An external source shall not be required to trip the circuit breaker under fault of overload conditions or to test the ground fault trip.

2.6.2 Field installed rating plug taps shall be provided.

2.6.3 Main breakers 400 amp and larger shall be solid state trip.

2.6.4 The main circuit breaker shall be provided with the following:

2.6.4.1 Adjustable longtime delay element pickup.

2.6.4.2 Adjustable short-time delay element pickup.

2.6.4.3 The instantaneous trip element pickup shall be adjustable from 1.5 to 10 times the sensor setting or none.

2.6.5 The feeder circuit breakers (480 volt or 208 volt, 400 amp or larger) shall be solid state trip molded case type breakers. They shall consist of a three-pole electrically and mechanically trip-free circuit breakers with inter-pole barriers, arc quenchers, manual closing mechanism, position indicator, and equipped for fixed mounting in the switchboard section. The breakers shall be a minimum of **80%** rated, unless otherwise identified on the drawings and shall be sized as indicated on the drawings. Minimum short circuit interrupting rating shall be 65,000 ampere symmetrical or as indicated on the drawings.

2.6.5.1 The overcurrent trip devices to be furnished with these circuit breakers shall be of the three-phase construction and employ solid-state components in their design to afford combinations of long, short time, and instantaneous and ground fault characteristics (480 volt only) as specified. The circuit breaker and integral solid-state trip device shall be self-contained to include necessary power supply, transformers and tapped current level sensing transformers. An external source shall not be required to trip the circuit breaker under fault of overload conditions or to test the ground fault trip.

2.6.5.2 Field installed rating plug taps shall be provided as required.

2.6.5.3 These circuit breakers shall be provided with the following:

2.6.5.3.1 Adjustable long-time delay element pickup.

2.6.5.3.2 Adjustable short-time delay element pickup.

2.6.5.3.3 The instantaneous trip element pickup shall be adjustable from 1.5 to 10 times the sensor setting.

2.6.5.3.4 Where the GFI function is required the settings shall be set at maximum levels.

2.7 Feeder breakers identified as 100% rating on the drawings may be molded case type below 1600 amp but 1600 amp and above shall be insulated case type. All breakers shall accept copper or aluminum conductors. Contractor must verify that the breaker can accept the possibility of aluminum conductors.

2.8 Circuit breakers less than 400 amps shall be molded case, trip free, quick-make, quick-break, thermal magnetic type, with handles clearly indicating rating and position-on, off, tripped.

2.9 Circuit breakers used in service entrance equipment, identified on the drawings shall have short circuit current ratings equal to the bracing and in no case smaller than 22,000 amperes RMS symmetrical.

2.10 The switchboard shall be manufactured to locate the utility company metering within the local utility company requirements, for maximum centerline height. This maximum height must include the 2-1/2" high (above finished grade) concrete housekeeping.

2.11 Provide a metal embossed nameplate adjacent to the switchboard rating, indicating the maximum short circuit current rating of the switchboard as determined by UL 891, September 30, 1982.

2.12 Where devices indicated are fusible type, fuses shall be Bussman or Littlefuse (no known equal).

2.13 Where a switchboard is indicated to be provided with an NEMA 3R (weatherproof) enclosure, the enclosure shall be manufactured to allow the equipment to mount flush against a vertical surface or wall. Rear roof equipment overhangs will not be permitted for weatherproof equipment.

2.14 Where auxiliary test kits or other devices are needed for setting breaker parameters they shall be supplied.

Service Entrance – Surge Protective Device

2.15 IEEE C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits

2.16 IEEE C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

2.17 IEEE C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits

2.18 California Electrical Code: Article 285

2.19 UL 1283 - Electromagnetic Interference Filters

2.20 SPD shall be UL 1449 labeled as Type 1 or Type 4 intended for Type 1 applications, verifiable at UL.com without need for external or supplemental over current controls. Every suppression component of every mode, including N-G, shall be protected by internal over current and thermal over temperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of the specification

2.21 SPD shall be factory installed integral to electrical distribution equipment

2.22 SPD shall be UL labeled with 20kA I-nominal (I-n)

2.23 SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR)

2.24 Standard Mode Protection paths: SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems.

2.25 SPD shall be connected to the buss of the distribution equipment with an appropriately sized 200kA SCCR rated disconnect

2.26 SPD shall meet or exceed the following criteria:

2.26.1 MAXIMUM 7-Mode sure current capability per phase shall be 400kA for mountain and desert areas with over 5 lightning strikes per year.

2.26.2 UL 1449 – Third Edition Revisions; effective September 29, 2009 Voltage Protection Ratings shall not exceed the following:

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

2.26.3 UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com)

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

2.27 SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of -50dB at 100 kHz

2.28 Suppression components shall be heavy duty ‘large block’ MOVs, each exceeding 30mm diameter.

2.29 SPD shall include a serviceable, replaceable module.

2.30 SPD shall be equipped with the following diagnostics:

2.30.1 Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service Led

2.30.2 Audible alarm with on/off silence function and diagnostic test function (excluding branch)

2.30.3 Form C dry Contacts

No other test equipment shall be required for SPD monitoring or testing before or after installation.

2.30.4 SPD shall have a 10 year warranty

Short-Circuit and Coordination Studies

2.31 The contractor shall provide the following studies; a time current and complete short-circuit study, equipment-interrupting or withstand evaluation, and a protective-device coordination study as described below for the distribution system. The equipment study shall be included with the equipment submittals. The studies shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the low-voltage distribution system. Normal system operating method, alternate operation, and operations which could result in maximum-fault conditions shall

be thoroughly covered in the study. The studies are to be reviewed by a Professional Engineer registered in the State of California.

2.31.1 **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**.

2.32 Short-Circuit Study

2.32.1 The study shall be in accordance with applicable ANSI and IEEE standards.

2.32.2 The study input data shall include the short-circuit single- and three-phase contributions from all sources, with the X/R ratio, the resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.

2.32.3 Short-circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each switchgear bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.

2.32.4 For the portions of a system utilizing medium- and high-voltage breakers, separate calculations shall be made for one-half cycle (close and latch) currents and interrupting currents. Calculations shall be for three-phase and phase-to-ground faults at each bus under consideration.

2.32.5 For the portions of a system utilizing low-voltage breakers (less than 1,000 volts), calculations shall be made for three-phase and phase-to-ground interrupting currents at each bus under consideration.

2.33 Equipment Evaluation Study

2.33.1 An equipment evaluation study shall be performed to assure the adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the maximum short-circuit momentary and interrupting duties. Series rating of over current protective devices shall be permitted to reduce the maximum available short circuit current to panelboard branch circuit breakers to no more than 10,000 amps symmetrical for the 120/208 volt system and 14,000 amps symmetrical for the 277/480 volt system.

2.34 Protective-Device Coordination Study

2.34.1 A protective-device coordination study shall be performed to select or to verify the selection of power fuse ratings, protective-relay characteristics and settings, ratios, and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and settings. Time current curves are to be colored to clearly indicate coordination.

2.34.2 The coordination study shall include all voltage classes of equipment from the source's incoming line protective device down to and including each motor control center and/or panelboard. The phase and ground over current protection

shall be included as well as settings for all other adjustable protective devices. Ground fault settings are to, as a minimum coordinate with a downstream 50 amp branch circuit breaker.

2.34.3 Protective device selection and settings shall be in accordance with requirements of the National Electrical Code and the recommendations of the ANSI/IEEE Standard 399, as applicable.

2.35 Study Report

2.35.1 The results of the power-system studies shall be summarized in a final report. The report shall include the following sections:

2.35.1.1 Description, purpose, basis, and scope of the study and a single-line diagram of the portion of the power system which is included within the scope of study.

2.35.1.2 Tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short-circuit duties and commentary regarding same.

2.35.1.3 Protective device coordination curves, with commentary.

2.35.1.4 The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system.

2.35.1.5 Fault-current tabulations including a definition of terms and a guide for interpretation.

2.35.1.6 The report must be submitted with the material submittal for the engineers approval.

2.36 Implementation

2.36.1 The contractor is to be responsible for providing over current devices which are in compliance with the results of the above study.

PART 3 EXECUTION

3.1 Switchboard shall be provided with adequate lifting means and capable of being rolled or moved directly to the floor without the use of floor sills.

3.2 Switchboard installation shall be done in accordance with National Electrical Installation Standards (NECA 400-1998) for installing and maintaining switchboards.

3.3 Provide 2-1/2" concrete housekeeping pads for service entrance and distribution switchboards. For switchboards containing local utility company metering equipment, the concrete pad must be flush with the front edge of the switchboard enclosure.

3.4 Provide permanently affixed engraved nameplate stating UL listed fault current rating of switchboard assembly. Locate adjacent to the equipment nameplate on front of switchboard.

3.5 All lugs shall be torque tested in the presence of the inspector of record.

3.6 Arc Flash and Shock Hazard

3.6.1 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 1584-2018.

3.6.2 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. The label is not to identify the party performing the study but only the technical information needed.

3.6.3 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department.

3.6.4 The design goal is to minimize the incident energy to which a maintenance employee may be exposed.

END OF SECTION 26 24 13

SECTION 26 24 16 PANELBOARDS

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 Coordination Study & 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 unless otherwise required to be higher based on the coordination study. 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 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 Multi-pole breakers shall have one common trip handle or be internally connected. Handle ties are not acceptable.

2.8 Circuit breakers for a multi-wire branch circuit shall be tied together with a factory breaker handle tie.

2.9 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.

2.10 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.

2.11 Acceptable manufacturers are Square D, Eaton, Siemens or General Electric.

2.12 Equipment manufactured by any other manufacturers not specifically listed in Section 2.10 are <u>not</u> considered equal, or approved for use on this project.

Surge Protective Device (SPD)

2.13 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.

2.14 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.

2.15 The SPD panelboard shall be top or bottom feed according to requirements. A circuit directory shall be located inside the door.

2.16 SPD shall meet or exceed the following criteria:

2.16.1 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.

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

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

2.16.3 SPD shall be UL labeled with 100kA Short Circuit Current Rating (SCCR).

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

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

2.18 SPD shall be UL labeled with a minimum 100kVA short circuit rated (SCCR).

2.19 UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

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

2.20 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.

2.21 Suppression components shall be heavy duty ‘large block’ MOVs, each exceeding 30mm diameter.

2.22 Type 4 SPD shall include a serviceable, replaceable module.

2.23 SPD shall be equipped with the following diagnostics:

2.23.1 Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.

2.23.2 No other test equipment shall be required for SPD monitoring or testing before or after installation.

2.24 SPD shall have a response time no greater than 1/2 nanosecond

2.25 SPD shall have a 10 year warranty

2.26 The SPD panelboard shall have removable interior

2.27 The SPD panelboard main bus shall be aluminum and rated for the load current required

2.28 The SPD panelboard shall include a 200% rated neutral assembly with copper neutral bus

2.29 The unit shall be provided with a safety ground bus

(SPD) Quality Assurance

2.30 Manufacturer Qualifications: Engage a firm with at least 5 years experience in manufacturing transient voltage surge suppressors.

2.31 Manufacturer shall be ISO 9001 or 9002 certified.

2.32 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.

2.33 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.

Short Circuit & Coordination Study

3.4 The contractor shall provide the following studies; a time current and complete short-circuit study, equipment-interrupting or withstand evaluation, and a protective-device coordination study as described below for the distribution system. The equipment study shall be included with the equipment submittals. The studies shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the low-voltage distribution system. Normal system operating method, alternate operation, and operations which could result in maximum-fault conditions shall be thoroughly covered in the study. The studies are to be reviewed by a Professional Engineer registered in the State of California.

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 Short-Circuit Study

3.5.1 The study shall be in accordance with applicable ANSI and IEEE standards.

3.5.2 The study input data shall include the short-circuit single- and three-phase contributions from all sources, with the X/R ratio, the resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.

3.5.3 Short-circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each switchgear bus, switchboard,

motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.

3.5.4 For the portions of a system utilizing medium- and high-voltage breakers, separate calculations shall be made for one-half cycle (close and latch) currents and interrupting currents. Calculations shall be for three-phase and phase-to-ground faults at each bus under consideration.

3.5.5 For the portions of a system utilizing low-voltage breakers (less than 1,000 volts), calculations shall be made for three-phase and phase-to-ground interrupting currents at each bus under consideration.

3.6 Equipment Evaluation Study

3.6.1 An equipment evaluation study shall be performed to assure the adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the maximum short-circuit momentary and interrupting duties. Series rating of over current protective devices shall be permitted to reduce the maximum available short circuit current to panelboard branch circuit breakers to no more than 10,000 amps symmetrical for the 120/208 volt system and 14,000 amps symmetrical for the 277/480 volt system.

3.7 Protective-Device Coordination Study

3.7.1 A protective-device coordination study shall be performed to select or to verify the selection of power fuse ratings, protective-relay characteristics and settings, ratios, and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and settings. Time current curves are to be colored to clearly indicate coordination.

3.7.2 The coordination study shall include all voltage classes of equipment from the source's incoming line protective device down to and including each motor control center and/or panelboard. The phase and ground over current protection shall be included as well as settings for all other adjustable protective devices. Ground fault settings are to, as a minimum coordinate with a downstream 50 amp branch circuit breaker.

3.7.3 Protective device selection and settings shall be in accordance with requirements of the National Electrical Code and the recommendations of the ANSI/IEEE Standard 399, as applicable.

3.8 Study Report

3.8.1 The results of the power-system studies shall be summarized in a final report. The report shall include the following sections:

3.8.1.1 Description, purpose, basis, and scope of the study and a single-line diagram of the portion of the power system which is included within the scope of study.

3.8.1.2 Tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short-circuit duties and commentary regarding same.

3.8.1.3 Protective device coordination curves, with commentary.

3.8.1.4 The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system.

3.8.1.5 Fault-current tabulations including a definition of terms and a guide for interpretation.

3.8.1.6 The report must be submitted with the material submittal for the engineer's approval.

3.9 Implementation

3.9.1 The contractor is to be responsible for providing over current devices which are in compliance with the results of the above study.

3.10 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.

3.11 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department.

3.12 The design goal is to minimize the incident energy to which a maintenance employee may be exposed.

END OF SECTION 26 24 16

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:

	HUBBELL	LEVITON	PASS & SEYMOUR
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:

	HUBBELL	LEVITON	PASS & SEYMOUR
Duplex	5352	5362	PS5362
GFCI	GFR5362	7899	2097
Isolated Ground	IG5362	5362IG	IG6300
Tamper Proof	------	8300SG	TR63H
USB	------	T5832	------ min. 3.6 amp charging capability
Controlled Type	BR20C2GN	5362-S2N	5362CDGN

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. All Controlled Receptacles shall be solid color 'Green' marked "Controlled" and with Universal Power Symbol.

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" coverplates.

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 All receptacles and line voltage switches shall be labeled on faceplate utilizing white Dymo-Tape with black lettering. Labeling format shall be 'XX-YY'. XX represents panel name and YY represents circuit number. Labels shall be placed below the top faceplate fastener and above the top edge of faceplate opening. In no circumstance shall they overlap the fastener or the receptacle.

3.2 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.

3.3 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.

3.4 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 26 27 26

SECTION 26 28 16 DISCONNECTS

PART 1 GENERAL

1.1 Furnish and install all disconnect switches as shown on the drawings and as required by the CEC.

1.2 Submit manufacturers' data for all disconnects and fuses.

1.2.1 Disconnects

1.2.2 Fuses

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 Acceptable manufacturers shall be Square D, Cutler Hammer, Siemens or General Electric.

2.2 Equipment manufactured by any other manufacturers not specifically listed in Section 2.1 are not considered equal, or approved for use on this project.

2.3 All switches shall be heavy-duty type, externally operated, quick-make, quick-break, rated 600 volts or 240 volts as required, with the number of poles and ampacity as noted. All switches for motors shall be HP rated. Switches shall have NEMA-Type 1 enclosures, except switches located where exposed to outdoor conditions shall have NEMA Type 3R enclosure. Switches generally shall be fused except where noted to be non-fused on the drawings.

2.4 Where fuses are indicated, fuses shall be Bussman or Littlefuse (no known equal). Fuses shall be current limiting type with time delay characteristics to suit the equipment served.

PART 3 EXECUTION

3.1 Mount all switches to structure or U-channel support. U-channel supports shall be cleaned and painted to prevent rust.

3.2 Switches shall be accessible with proper clearances in front per CEC 110-16.

3.3 All lugs shall be torque tested in the presence of the inspector of record.

3.4 Arc Flash and Shock Hazard

3.4.1 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.

3.4.2 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.

3.4.3 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department.

3.4.4 The design goal is to minimize the incident energy to which a maintenance employee may be exposed and in no case more than 8 cal./cm^2.

END OF SECTION 26 28 16

SECTION 26 33 23 EMERGENCY LIGHTING EQUIPMENT

PART 1 GENERAL

1.1 Furnish and install an uninterruptible emergency lighting Inverter System and Emergency Power Control Relays to provide a reliable source of emergency power, designed to operate during periods of utility line deficiencies without any interruption in power supplied to the connected load. The system shall provide and be capable of powering any combination of electronic, power factor corrected, fluorescent, LED, incandescent or HID lighting. Other connected loads shall include but not be limited to building management systems, motors, security systems and other critical voltage or frequency-sensitive electronic loads. The system shall operate from 0-100% loading and be rated to deliver full KVA rated output at unity power factor for a minimum of 90 minutes. Upon return to normal AC utility line power, the system shall recharge the batteries without any interruption of power supplied to the load.

1.2 The Inverter System shall be listed to or comply with these standards:

1.2.1 UL 924 Standard for Emergency Lighting and Power Equipment

1.3 The Emergency Power Control Relay shall comply with UL 924

1.4 Submit Manufacturers' data sheets for all components including:

1.4.1 Warranty

1.4.2 Wiring diagrams

1.4.3 Bill of materials.

1.4.4 Product catalog sheets or equipment brochures.

1.4.5 Product guide specifications.

1.4.6 Installation information, including weights and dimensions.

1.4.7 Drawings for requested optional accessories.

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

1.5.1 Not including all items listed in the above itemized description.

1.5.2 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.

1.5.3 Not including actual manufacturer's catalog information of proposed products.

1.5.4 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

Single Phase systems 2000VA or less

2.1 The Central Inverter System specified herein shall be:

2.1.1 Dual Lite “Synchron” DLS Series Inverter System.

2.1.2 Myers Power Products Illuminator CM series

2.1.3 Alternate manufacturers shall comply with these specifications and shall not exceed the physical dimensions and weights indicated on the drawing schedule.

2.1.4 All substitutions or alternates to those indicated shall be submitted for approval (7) days prior to the project bid date. Approvals when accepted will be issued in the form of an addendum. No consideration for substitutions will be provided afer the award of the contract.

2.1.5 The substitution request must include a statement indicating the difference in price of both the specified and alternate product, both contractor and list price. The substitution request must include a comparison of the features and capabilities between the specified and proposed systems, software and all components and warranty comparison.

2.1.6 Equipment as manufactured by Digital Signal Power Manufacturer (DSPM) has been reviewed and is not an approved alternate for this project.

Single Phase systems over 2000VA

2.2 The Central Inverter System specified herein shall be:

2.2.1 Dual Lite “Spectron LSN” Series Inverter System.

2.2.2 Myers Power Products Illuminator IE series

2.2.3 Alternate manufacturers shall comply with these specifications and shall not exceed the physical dimensions and weights indicated on the drawing schedule.

2.2.4 All substitutions or alternates to those indicated shall be submitted for approval (7) days prior to the project bid date. Approvals when accepted will be issued in the form of an addendum. No consideration for substitutions will be provided after the award of the contract.

2.2.5 The substitution request must include a statement indicating the difference in price of both the specified and alternate product, both contractor and list price. The substitution request must include a comparison of the features and capabilities between the specified and proposed systems, software and all components and warranty comparison

2.2.6 Equipment as manufactured by Digital Signal Power Manufacturer (DSPM) has been reviewed and is not an approved alternate for this project.

2.3 System operation shall be fully automatic. The charging system will maintain the batteries at full capacity at all times. On-board microprocessors will continuously monitor charger settings and the system's overall readiness. Diagnostic circuitry shall include a software-controlled charger, continuous monitoring of operating parameters, and programmable system testing capabilities. Individual alarms and system logs shall be provided. All alarms and logs shall be automatically recorded and readily displayed via the User Interface Display (UID). The system shall also include one RS232 serial port for remote communications.

2.4 Automatic overload and short circuit protection in normal and emergency mode shall consist of 150% momentary surge capability, 120% overload for 5 minutes, and 110% overload for 10 minutes. Protection shall also include a low battery voltage disconnect, AC input circuit breaker, a DC input breaker or Fuse, and an AC output fuse. A digitally generated sinusoidal output waveform (PWM) with less than 5% total harmonic distortion at rated linear load shall be provided to the connected load.

2.5 Available input voltage shall be as indicated on the drawings, with a frequency of 60Hz. The AIC rating shall be a minimum of 42,000 RMS symmetrical amperes.

2.6 Available output voltage shall be as indicated on the drawings, with a frequency of 60Hz + 0.05Hz.

2.7 The user interface display (UID) shall include an array of LED's, a 2-line, 40-character LCD display, and a keypad for system input. The UID shall be menu-driven and display individual system parameters using a numbered code (Hot Key). The LED array shall indicate, by color code, the following status modes:

2.7.1 AC output presence (green)

2.7.2 System ready (green)

2.7.3 Battery charging (red)

2.7.4 Inverter "ON" (amber)

2.7.5 Alarm functions (red)

2.8 To ensure only authorized personnel have system access, a multi-level password shall be required to change all functions and operating parameters. A continuous scrolling display of the following metered functions shall be provided:

2.8.1 AC input voltage, AC output voltage, AC output amps

2.8.2 Battery voltage, Battery charging amps, Battery discharge amps

2.8.3 Output volt-amps (VA), Output power (watts)

2.8.4 Ambient temperature

2.8.5 Last inverter run time, Total inverter run time, System run time, Date Time

2.9 Audible and visual alarms shall be provided, with automatic logging of the twenty-five most recent events. An alarm acknowledgment feature shall be provided, which will allow the user to silence only the current audible alarm without silencing other alarms or

clearing the alarm condition until the fault has been addressed. An alarm shall be sounded if any of the following operating conditions occur:

2.9.1 Low battery voltage, Near low battery voltage, High battery voltage

2.9.2 High AC input voltage, High AC output voltage, Low AC output voltage Output, overload (VA), Low remaining run time

2.9.3 High ambient temperature

2.9.4 Tripped circuit breaker

2.10 Manual and automatic test modes shall be provided.

2.10.1 Manual user-initiated system test at any time.

2.10.2 Automatic monthly and annual self-diagnostic tests.

2.10.3 Automatic recording of the last twenty events in a Test Results log.

2.11 A three-step float charger shall be software controlled and temperatures compensated, and charge the batteries continuously while in normal “standby” condition (non emergency mode). Following a power failure, the constant current charger mode shall be initiated until battery voltage reaches the equalize stage. Equalize stage shall be maintained until the charging current drops to .5 amps, or 0.3% of the battery amp/hour rating. Battery voltage shall then enter the float stage.

2.12 Batteries shall be designed to provide a minimum 1.5 hours rated output voltage to the connected load in emergency mode without dropping below 87.5% of nominal battery voltage.

2.12.1 The batteries shall be encased in an enclosure that permits easy maintenance without requiring removal.

2.12.2 Sealed Lead Calcium: Maintenance Free Construction requires no addition of water over its useful. Life expectancy is 10-years at 77F (25C) ambient temperature.

2.13 The following optional factory-installed equipment shall be provided:

2.13.1 Normally-On Output Circuit Breaker Options:

2.13.1.1 A maximum of fourteen monitored positions are available. Single pole 120V and 277V breakers occupy one position each, while double pole 240V breakers occupy two positions. Reference drawings for required number of output breakers required.

2.13.2 Provide Universal cabinet locks for all electronic and battery cabinets.

2.13.3 Provide, using the system’s RS232 port, a fax operating status reports is transmitted over a customer-supplied dedicated analog phone line to up to six locations. Phone numbers can be programmed locally using the unit keypad or computer terminal, or remotely via a modem. Each designated fax location automatically receives a unit status report following monthly and annual tests, or

when an alarm condition is detected. Status reports include readings on key operating parameters, as well as complete alarm and inverter log printouts, in uncoded, user-friendly descriptions. This option also provides for two-way communications thru terminal emulation software, such as HyperTerminal (not supplied with the inverter system).

2.13.4 Provide a factory-installed, internally-mounted two-position “make before break” switch. Compatible with all input/output combinations and any combination or quantity of output circuit breakers. Allows connecting the utility power supply to the load without placing the inverter in emergency mode.

2.14 Provide Maintenance, Service and Enhanced Warranty Plans. The following shall be provided to assure initial and long-term viability of the system through additional maintenance and service plans and/or through enhancements to the standard two-year electronics limited warranty.

2.14.1 Factory Start-Up shall be supplied as a service to the installing contractor. The Factory Start-Up process shall verify correct installation and operation of the inverter system. Trained, factory authorized technicians shall administer an on-site, point-by-point check of the system to include:

2.14.1.1 Internal electrical connections

2.14.1.2 AC input and Battery connections

2.14.1.3 System operating voltages

2.14.1.4 System operating parameters

2.14.1.5 Initial system “power-up

2.14.1.6 Battery discharge test

2.14.1.7 Correction of existing deficiencies

2.14.1.8 Final testing, calibration and recording

2.14.1.9 Training of available operating personnel

2.14.2 A Monitoring Program shall provide for the continuous monitoring of the inverter system by the Factory Technical Support Group. All monthly and annual system tests shall be reviewed and analyzed for early warning signs of system malfunction. Any failures shall be automatically relayed to the service department where corrective action can be recommended to the owner/operator. For activation, a user supplied dedicated analog phone line must be available.

2.14.3 Preventive Maintenance Plan (PMP) - The Preventive Maintenance Plan shall provide system coverage beyond the standard two-year factory warranty. PMP warranty service excludes the batteries, which are covered under a separate warranty plan. Installation of a Fax Modem option shall be provided for Preventive Maintenance Plan.

2.14.3.1 Additional 2-year warranty and 2-year service coverage, weekdays, Monday-Friday, 8AM to 5PM EST. If the standard factory warranty

has expired before selection and purchase of a PMP plan, an on-site evaluation shall be scheduled to determine if the system requires parts and/or labor to return to factory specifications. Parts and labor required shall be charged at additional costs.

2.15 The system shall be contained in a code gauge, steel NEMA 1 enclosure, finished in a scratch resistant, powder coat finish, with a key lock, conduit knockouts at the top and sides, and front opening doors. Enclosures shall be designed to allow stacking to minimize the overall system's footprint. All components shall be front accessible and incorporate a modular design and a quick disconnect means to facilitate servicing.

Emergency Power Control Relays - (Noted on the drawings as LVS EPC Control relay)

2.16 Insert Series power control modules are designed to allow locally switched lighting fixtures to be wired for emergency operation from either generator, inverter system, or secondary sources.

2.17 As Manufactured by:

2.17.1 "Highlights" HEPC Series Emergency Power Control modules (203) 575-2044 www.highliteslighting.com or approved equal.

2.17.2 LVS Controls (800) 982-4587 www.lvscontrols.com.

2.18 During normal operation, LEDs on the module's faceplate indicate the presence of both utility (Green) and emergency (red) power and the local switch will be capable of turning all circuit lighting fixtures on or off as required. During utility power failures, emergency lighting fixtures controlled by the module will illuminate regardless of local switch position. If, during normal operation, emergency backup power is lost, the module will automatically produce an audible alarm as an alert to this potentially hazardous condition.

2.19 Recent energy mandates require improved vigilance in the conservation of resources. By eliminating the need for night light circuits, power controls conserve energy by allowing all area ambient lighting to be turned off while still assuring the availability of emergency illumination in the event of a utility power failure.

2.20 The power control automatically initiates a test of the emergency lighting fixtures whenever the local switch is turned off. Upon turning off of the local switch, the designated emergency lighting fixtures will remain illuminated for an additional 5 seconds to assure system readiness. The power controls may also be checked manually at any time through the integral test switch provided on the module's faceplate. With the local lighting turned off and both utility and emergency power present, pressing the test switch will cause the controlled emergency fixtures to illuminate for 5 seconds.

2.21 Adapts locally switched lighting fixtures for emergency operation, bypasses local switch during power failures. Compatible with motion detector and photocells.

2.22 Full 20 amp load capability available for 120 or 277VAC operation. Approved for in-wall or in-ceiling applications.

2.23 Provided with Surge and short circuit protection.

2.24 Audible emergency power circuit failure alarm, Built-in manual emergency circuit test feature, Momentary test switch.

2.25 Provide a single module at each emergency lighting fixture where the lighting fixture is locally controlled by a room switch and or motion sensor. These modules are to be furnished and installed by the contractor installing the lighting fixtures.

2.26 Provide a single module located at the panelboard or low voltage control panel to control emergency lights controlled from a low voltage control system. These modules are to be furnished and installed by the contractor installing the lighting fixtures.

2.27 Where dimmable light fixtures are on emergency circuit, provide emergency relay control, which is dimming compatible, and will bring lights to full brightness in emergency mode.

2.28 The Module has a full 5-year replacement warranty.

PART 3 EXECUTION

3.1 Input and output conductors shall be enclosed in separate conduits. All load side wiring shall be sized as required for voltage drop conditions to assure proper operation of connected loads.

3.2 All free-standing electrical equipment or enclosures shall be anchored to the floor and braced at the top of the equipment 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 Contractors registered structural Engineer indicating method of compliance prior installation.

3.3 The system shall allow connection of both “normally on” and “normally off” (optional) loads. Connected loads shall receive utility power during normal operation, and ‘no break” system inverter power during utility interruptions.

3.4 In emergency mode, the inverter system shall supply true digitally-generated AC sinusoidal output. Refer to plans for type and location of loads served by the system.

3.5 A factory trained service representative shall be dispatched to perform the initial system start-up.

3.6 Documents supplied with each system shall include:

3.7 Shop drawings showing physical dimensions, mounting information and wiring diagrams.

3.7.1 Installation/Users manual(s) for locating, mounting, interconnecting, and wiring the system, with operating and preventive maintenance procedures.

3.7.2 The system shall be installed in accordance with all appropriate manufacturers’ instructions and in compliance with all appropriate codes.

3.8 The system shall be guaranteed, under normal and proper use, against defects in workmanship and materials for a period of two years from the date of shipment. Batteries supplied as part of the systems shall be covered under a separate pro-rata warranty as described below:

3.8.1 Sealed Lead Calcium, 10-year life expectancy – One-year full replacement warranty plus an additional nine years pro-rata.

3.8.1.1 Note: Within 90days from date of shipment, batteries shall be connected to an energized charging system to maintain the Warranty. Battery life and capacity is rated at an optimum operating temperature range of 68°F to 85°F. Operating temperatures outside this range will affect battery life and capacity. Batteries are rated at 100% capacity at 77°F.

3.9 Maintenance and service programs shall be made available by the supplier to assure long-term reliability of the system.

END OF SECTION 26 33 23

SECTION 26 51 14 LED LIGHTING FIXTURES AND LAMPS

PART 1 GENERAL

1.1 Furnish and install all lighting fixtures with lamps as specified and as shown on the drawings. Fixtures shall be complete including canopies, hanger, diffusers, ballasts, etc.

1.2 Submit manufacturer's data for each fixture type including the following:

1.2.1 Lighting fixture catalog data and photometry.
1.2.2 Lamp catalog data for each fixture type.
1.2.3 Driver catalog data for each fixture type.
1.2.4 Fixture warranty.

1.3 <u>Common submittal mistakes which will result in the submittal being rejected:</u>

1.3.1 Not including lamp and driver information for each fixture type.

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.

PRODUCT SUBSTITUTION

1.4 All substitutions or alternate fixtures to those indicated on the project fixture schedule shall be submitted for approval (7) business days prior to the project bid date. Approvals <u>when</u> accepted will be issued in the form of an addendum. No consideration for substitutions will be provided after the award of the contract.

1.4.1 The substitution request must include a statement indicating the difference in price of both the specified and alternate product, both contractor and list price. The substitution request must include a comparison of the total fixture wattage, total fixture lumens, fixture efficiency and warranty comparison.

1.4.2 When proposing to substitute lighting fixture and/or fixture retrofit, a point by point photometric calculation of a typical application as used in this project shall be included. A calculation of the specified and the proposed alternate shall be included.

PART 2 PRODUCTS

2.1 All catalog numbers are given for manufacturer's identification and shall not relieve Contractor from responsibility of full conformance to all applicable written description requirements governing material and fabrication, either in the general or specific sections. Where catalog numbers are indicated as modified, no modification will be required if the

standard unit fully conforms to descriptive requirements in the Specifications and matches specified ceiling.

2.2 All fixtures of the same type shall be of one manufacturer and of identical finish and appearance. All fixtures and component parts shall bear the UL label.

2.3 All steel parts shall be phosphate treated in multistage power spray system for corrosion resistance and paint adhesion. Final finish shall be electrostatically applied baked white enamel of not less than 87 pct. reflectance on reflecting surfaces.

2.4 Each fixture shall have a continuous light-seal gasket seated in such manner as to prevent any light leak through any portion or around any edge of the trim frame.

2.5 Diffusers shall be framed in a hinged, continuous assembly. Diffuser frame latches shall be spring-loaded or cam-operated.

2.6 All recessed fixtures shall be provided with frames appropriate for the type of ceiling involved. No fixtures shall be ordered until the ceiling construction has been verified by the Contractor.

MINIMUM LUMINARY REQUIREMENTS

2.7 Electrical Components, Devices and Accessories: Listed and labeled as defined in CEC by a qualified testing agency, and marked for intended location and application.

2.8 Recessed Fixtures: Comply with NEMA LE 4.

2.9 CRI of **minimum 80 CCT of 4100 K**.

2.10 Rated lamp life of 50,000 hours minimum.

2.11 Lamps dimmable from 100 percent to 0 percent of maximum light output.

2.12 Nominal Operating Voltage: **120 V / 277 V ac**

PART 3 EXECUTION

3.1 All lighting fixtures shall be supported as follows:

3.1.1 From the outlet box by means of a metal strap where its weight is less than five pounds.

3.1.2 From its outlet box by means of a hickey or other threaded connection where its weight is from five to fifty pounds.

3.1.3 Directly from the structural slab or joists where its weight exceeds fifty pounds.

3.1.4 Lighting fixtures shall be supported independent of the ceiling system or additional ceiling support must be added to carry the weight of the lighting fixtures. Recessed lighting fixtures supported from ceiling grid tees shall be furnished with hold down clips in conformance with CEC 410 - 16, spring clips will not be permitted. All fixtures which the manufacturer has not provided UL approved clips, must be attached to the fixture and ceiling grid by metal screws.

3.2 Furnish and install supplementary blocking and support as required to support fixture from structural members. Contractor shall submit proposed blocking method for all suspended lighting fixtures for approval prior to rough in.

3.3 Suspended and/or pendant mounted fixtures shall be provided with four aircraft safety cables extending in opposite directions, attached to the fixture, and supported from a structural member. The contractor shall submit proposed fixture mounting and aircraft cable attachment methods for approval prior to fixture rough in.

3.4 Class 1 wiring to the fixture must be installed either conduit or type MC-PCS cabling no open wiring shall be permitted.

3.5 Chain suspension may be used only where specifically permitted on the drawings. Chain shall be heavy duty, nickel or cadmium plated, suitable for weight of specific fixture.

3.6 Shop drawings shall be furnished for each fixture type. Catalog cuts, illustrating conformance with specifications, will be acceptable for standard units. Shop drawings shall indicate materials, assembly, finish and dimensions.

3.7 Photometric data shall be furnished for any fixture substituted for those listed on the schedule.

3.8 Any driver which produces a greater than normal amount of noise shall be replaced by the contractor. Normal will be determined by the level of sound produced by other similar fixtures operating in the area.

END OF SECTION 26 51 14

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 26 90 90

SSECTION 27 01 00 COMMUNICATIONS GENERAL PROVISIONS

PART 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 27 01 00

SECTION 27 10 00 VOICE – DATA – IP 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 AMP Netconnect, Systimax, ADC/Krone 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 certifications that apply as well are AMP ND&I Premier Certification for products installed with the AMP Netconnect brand name. ADC Krone TrueNet Premium for products installed with the ADC Krone brand name and Systimax Premier Certification for products installed with the Systimax brand name.

1.4.2.3 Warranty provision and training must be for the Commscope (AMP Netconnect, 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.

1.4.5.3 Warranty provision and training must be for the Premium 6A Z-Max Certification – 20-Year Premium 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 and the Augmented Category-6 (6A) 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.**

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 and Augmented Catefory-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 **Phase I 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:

1.9.1.2 Description and quantity of each product.

1.9.1.3 Manufacturer's Name and Model Number.

1.9.1.4 Manufacturer's Specification Sheet or Cut Sheet.

1.9.1.5 Specification Item Number reference for each required product or if not shown in the specification, Drawing Detail Number being referenced (i.e. Spec 2710000 Item 2.1 or DWG E4.15/#1).

1.9.1.6 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 **Phase II Submittal** shall be provided with (20) working days after the approval of the Phase I submittals and prior to any fabrication of field conduit installations. All shop drawings shall be engineered in a CAD Software. Submission shall include electronic print copies to match the contract drawings, and 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 **(Enclosed Swing Wall Mount)** shall be manufactured by Middle Atlantic DWR Series or Cooper B-Line V-Line Dual Hinge. Reference drawing details and specifications for complete requirements.

2.2 **Enclosed Swing Wall Mount**

2.2.1 Enclosed swing wall mount cabinets quantity as shown in the MDF or IDF room layouts. Provide Middle Atlantic Model #DWR-24-32 “DWR” Series dual-swing equipment cabinet, 49” Overall Height by 23.5” Wide by 32” Deep (Usable 42” height and usable 30” depth), black color. (No known alternate.)

2.2.1.1 This is the Standard Height Wall Mount IDF Cabinet. Refer to the floor plans and drawing details for the requirement for a higher RU count

(taller) for this type of cabinet. Wall mounted IDF cabinets shall not be less than 45" in overall height unless specifically noted in the drawings.

2.2.2 Provide with Solid Front Door Model #FD-24 with keylock. All cabinets shall be provided with the same lock.

2.2.3 Provide cabinet with (2) 4-1/2" fans mounted in top of cabinet for ventilation, Middle Atlantic Model #QFAN with protective grilles, with power plug kit Model #FANCORD-2X1 and vent blocker kit Model #VBK-S32. Vent blockers shall be installed on the upper vents on the side and front of the cabinet. Plug power cord into the thermostatic controller.

2.2.4 Provide thermostatic controller Model #FC-2-215-1CA mounted in the backcan of the cabinet. Set the temperature threshold for the fan controller at 80-degrees for fan activation.

2.2.5 Provide full length vertical lacing bars in the rear of the cabinet for cable management Middle Atlantic Model #LACE-23-OP. Install lacing bars for cable entry and dressing in the cabinet.

2.2.6 Provide horizontal wire managers between each patch panel or (1) manager per patch panel. Provide (1) spare manager per rack. Provide 1RMU height managers only for wall mounted IDF cabinets. Middle Atlantic Part #PHCM-1-2 (1RU) or approved equal.

2.2.7 (1) Rack mounted surge arrest style power distribution unit per cabinet, 1 rack unit in height, TrippLite Model #PDUMH15NET2 with (8) NEMA 5-15R outlets, built-in SNMP Ethernet interface and NEMA l5-15P input with 5-20P adapter or approved equal by APC. Custom order PDU with shorter 6-foot power cord. Refer to drawing details for the PDU quantities.

2.2.7.1 Contractor shall be responsible for neatly routing, storing and connecting the power cords from the PDUs to the electrical outlet or UPS as directed by the District. Power cords shall be dressed separately from the UTP cables or any other low voltage cable and shall be secured to the back of the rack or cable runway with Velcro ties.

2.2.8 Furnish grounding to each IDF Cabinet as shown in the detail drawings. Each cabinet shall be provided with a ground bus bar, grounding terminal block, #6 Ground wire from the cabinet to the bus bar and a compression lug on the end of the ground wire at the bus bar. Provide grounding components as manufactured by CPI #13622-010 ground bus bar, #40167-001 terminal block and #40162-901 compression lug or approved equal.

MDF Room Requirements

2.3 The main Distribution Frame (MDF) Room is **Existing** and it shall be the central wiring and equipment location for the network infrastructure systems.

2.4 Provide Fiber Optic Feed Cable Patch Panels – Fiber optic termination equipment (rack mounted), including all associated installation hardware. The equipment must have a sufficient number of ports to connect all fibers in every cable terminated at this location. Provide 25% spare capacity for future wiring requirements, including bulkheads in the fiber patch panel. Provide blank fillers for all used portions of the panel. All fiber feed

cables shall be terminated in a single fiber optic patch panel up to 144 strands. Additional strands shall be terminated in the largest size required to continue the remaining fibers.

2.4.1 Contractor shall provide a minimum of 6-feet of slack on the fiber feed cable in the fiber optic patch panel. The first 48" of a tight buffered cable or the first 24" of a loose tube cable shall not be stripped back in the patch panel. Each type of cable shall have a minimum of 24" of stripped slack within the patch panel. Total slack within the patch panel shall not be less than 6-feet in length.

2.4.2 All fiber cables shall be secured to the patch panel with the Kevlar strength members at the manufacturer provided anchor point at the rear of the panel.

2.5 Provide Category-6 Modular Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each Voice/Data/IP Page outlet, or other devices 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.

2.6 Provide Augmented Category-6 Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each Voice/Data/IP Page 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.

2.7 If the project requires the installation of both Category-6 and Augmented Category-6 cabling and patch panel connections, the Augmented Category-6 patch panel shall be clearly labeled as "Augmented Category-6" and the RJ45 port connections shall be either a different color than the standard Category-6 patch panel ports, or the patch panel ports shall be provided with a colored icon to differentiate the Augmented Cat-6 connectors from the Category-6 connections.

IDF Location Requirements

2.8 The Intermediate Distribution Frame (IDF) Room shall be a secondary wiring and equipment location for the data networking system. The Contractor shall include the following items at this location:

2.8.1 Provide backboard 8'-0" high x ¾" thick, with a minimum 48" width. Refer to the floorplans for the actual layout of the backboard coverage. Plywood mounting backboard shall be flame resistant, painted with fire resistant paint "white" or color to match the room finish. Contractor shall provide minimum one side finish grade plywood. Backboard shall be mounted with finish side out, regardless of location of fire rating stamp. Show proof of fire rating stamp to IOR on Inspector prior to installation.

2.9 Provide Fiber Optic Feed Cable Patch Panels – Fiber optic termination equipment (rack mounted), including all associated installation hardware. The equipment must have a sufficient number of ports to connect all fibers in every cable terminated at this location. Provide 25% spare capacity for future wiring requirements. Provide blank fillers for all used portions of the panel. All fiber feed cables shall be terminated in a single fiber optic patch panel.

2.9.1 Each IDF location shall be furnished with a minimum 24-Port patch panel, fully loaded with bulkheads. Type of connectors in the bulkheads shall be determined by the type of connectors used for termination of the fiber feed cables.

2.9.2 Contractor shall provide a minimum of 6-feet of slack on the fiber feed cable in the fiber optic patch panel. The first 48" of a tight buffered cable or the first 24" of a loose tube cable shall not be stripped back in the patch panel. Each type of cable shall have a minimum of 24" of stripped slack within the patch panel. Total slack within the patch panel shall not be less than 6-feet in length.

2.9.3 All fiber cables shall be secured to the patch panel with Kevlar strength members at the manufacturer provided anchor point at the rear of the panel.

2.10 Category-6 Modular Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each Voice/Data/IP, or other5 devices, 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.

2.11 Augmented Category-6 Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each Voice/Data/IP 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.

2.12 The project requires the installation of both Category-6 and Augmented Category-6 cabling and patch panel connections, the Augmented Category-6 patch panel shall be clearly labeled as "Augmented Category-6" and the RJ45 port connections shall be either a different color than the standard Category-6 patch panel ports, or the patch panel ports shall be provided with a colored icon to differentiate the Augmented Cat-6 connectors from the Category-6 connections.

2.13 All fiber optic feed cables routed to the IDF locations shall be provided with 20-feet of slack for a service loop mounted on the backboard behind the racks, or stored in the back of the wall mounted cabinets. Contractor shall provide a 24" diameter wall mounted service loop manager for the fiber optic feed cables as manufactured by Leviton #48900-FR. Maximum of (3) fiber feed cables per manager as required to manage all service loops. Provide a 12" diameter service loop manager in the rear of wall mount IDF cabinets by Leviton #48900-FR.

IDF UPS Requirements

2.14 General UPS Requirements – The Contractor shall coordinate with the Division 26 Contractor to properly locate the power outlet connection for the UPS in the IDF Room or Cabinet. The location shown on the floor plans is diagrammatical and does not give the Division 26 Contractor an exact placement. In addition, all UPSs must be furnished with heavy duty mounting bracket kits. A UPS installed in a wall mounted IDF Cabinet must be furnished with a 2-Post kit that can support the full weight of the unit.

2.15 Final location for the UPS, within the equipment racks or IDF locations with multiple racks, must be verified by the District IT Director or District Construction Project Manager prior to the installation of the UPS or the electrical outlet for the UPS.

2.16 UPS Requirement for an IDF location with one (1) 4-Post equipment rack being installed at the IDF closet: UPS Requirement for an IDF location with a single 4-Post equipment rack and (1-2) network switches being installed at the IDF.

2.16.1 Provide with a minimum of (4) 20-amp, 120-volt, non-locking, NEMA 5-15/20R and (4) 15-amp, 120-volt NEMA 5-15R output receptacles.

2.16.2 Provide with an input of (1) 20-amp, 120-volt, non-locking, NEMA L5-20P plug installed on 10'-0" power cord.

2.16.3 Provide network interface card – Model SNMPWEBCARD option in UPS. Software shall be included with the UPS.

2.16.4 Provide (1) environmental sensor/monitor in each IDF cabinet location. Provide TrippLite Model #ENVIROSENSE monitor unit and connect it to the UPS.

2.16.5 Provide TrippLite Model # SMART2200RMXLN (or approved equal by APC).

Fiber Optic Patch Cords

2.17 Fiber optic patch cords shall be furnished and installed by the Contractor.

2.18 All fiber optic patch cords furnished by the Contractor shall match the grade and glass of the fiber optic feed cable installed for the network infrastructure cabling system. The Contractor shall confirm with the District IT Department the type of connector required at the network equipment prior to ordering or installing the patch cords.

2.19 Multimode Fiber Optic Patch Cords – Parch cords shall be duplex 50/125um, laser-optimized, OM4 (OM4+) grade multimode optical glass. Fiber optic patch cords shall be furnished with LC (SC) connectors at the network switch port end and LC (SC) connectors at the fiber optic patch panel end. Fiber patch cords shall be furnished with ceramic ferrules. All Multimode patch cords shall be Aqua (Lt. Blue) in color. Patch cords shall be 6-feet (2-meters) 3-feet (1 meter) in length. Provide adequate patch cords to patch all strands of the fiber cables.

2.20 Single Mode Fiber Optic Patch cords – Patch cords shall be duplex 8.3/125um, (OS2) grade single mode optical glass. Fiber optic patch cords shall be furnished with LC (SC) connectors at the network switch port end and LC (SC) connectors at the fiber optic patch panel end. All Single Mode patch cords shall be Yellow in color. Patch cords shall be 6-feet (2-meters) 3-feet (1 meter) in length. Provide adequate patch cords to patch all strands of the fiber cables.

2.21 Contractor shall be responsible for confirming the network switch connections with the District IT Director prior to ordering or installing the patch cords.

Copper Patch Cords

2.22 Copper patch cords shall be furnished and installed by the Contractor.

2.23 Provide Category-6 (Patch Panel End) patch cords with pre-molded boot, provide quantity equal to:

2.23.1 Provide 100% of the total Category-6 cable ports provided on the patch panels.

2.23.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (4) feet in length.

2.24 Provide Category-6 (Workstation End) patch cords with pre-molded boot provide quantity equal to:

2.24.1 Provide 100% of the total Category-6 cable ports provided on the patch panels.

2.24.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (10) feet in length, unless otherwise noted.

2.25 Provide **Augmented Category-6** (Patch Panel End) patch cords with pre-molded boot; provide quantity equal to:

2.25.1 Provide 100% of the total Category-6A cable ports provided on the patch panels.

2.25.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (4) feet in length.

2.25.3 Augmented Category-6 patch cords shall be differentiated from the Category-6 patch cords with a different color jacket.

2.26 Provide **Augmented Category-6** (Workstation End) patch cords with pre-molded boot, provide quantify equal to:

2.26.1 Provide 100% of the total Category-6A cable drops provided on the patch panels.

2.26.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (10) feet in length, unless otherwise noted.

2.26.3 Patch cords installed at WAP (Wireless Access Point) locations, IP Camera locations shall be (2) feet in length.

2.26.4 Augmented Category-6 patch cords shall be differentiated from the Category-6 patch cords with a different color jacket.

2.27 Requirements for all copper patch cords furnished:

2.27.1 Color of patch cords shall be determined by the color code shown in detail drawings.

2.27.2 Patch cords shall as manufactured by Leviton, Commscope, Panduit, Ortronics or Siemon based on the network infrastructure system furnished by the Contractor.

2.27.3 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.

2.27.4 Provide all other items as detailed on the drawings.

Campus Indoor/Outdoor Fiber Optic Feed Cable

2.28 Provide one continuous fiber optic cable routed from the Main Distribution Frame fiber patch panel to each intermediate Distribution Frame fiber patch panel, and/or other locations as shown on the drawings.

2.29 Outdoor Fiber Feed Cable Applications – Fiber optic cable shall be rated for indoor/outdoor riser rated applications. Construction shall consist of, all dielectric, tight buffer with central strength member, flame retardant PVC or PE jacket, rated OFNR, dry

water-blocking compound only, and blank fillers are required. Central tube type fiber will not be considered equal.

2.30 Fiber optic feed cables for the data infrastructure must be installed as follows:

2.30.1 Composite Fiber Optic feed cable runs – Fiber optic feed cable containing both Multimode and Single Mode strands shall be installed as a single composite feed cable. Provide a total of 18-strands of fiber, 12-strands of Multimode and 6-strands of Single Mode, as shown on the riser diagram, to the IDF locations.

2.30.2 Multimode Fiber Optic feed cable runs – Fiber optic feed cable containing only Multimode strands shall be installed as a single feed cable. Provide a 12-strand of multimode fiber optic feed cable in a single jacket, as shown on the riser diagram, to the IDF locations.

2.30.3 Single Mode Fiber Optic feed cable runs – Fiber optic feed cable containing only Single Mode strands shall be installed as a single feed cable. Provide a 12-strand of Single Mode fiber optic feed cable in a single jacket, as shown on the riser diagram, to the IDF locations.

2.30.4 Feed cables shall be clearly defined and labeled for each system. Provide color coding designations with a different color marker for the multimode and/or single mode fiber feed terminations in the fiber patch panels.

2.31 Cable shall contain one or all types of fibers listed below:

2.31.1 Provide Multimode 50/125-micron fiber optic glass, (minimum OM4+ laser-optimized grade, extended distance) for dual mode operation at 850 nm and 1300 nm wave lengths.

2.31.1.1 Maximum attenuation at 3.0dB/km @ 850nm and 1.0dB/km @ 1310nm. Minimum 1-gigabit Ethernet distance guarantee of 1110 meters @ 850nm and 600 meters @ 1300nm. Minimum 10-gigabit Ethernet distance guarantee of 550 meters @ 850nm/1300nm. Fiber shall be ISO-TIA OM4 plus rated.

2.31.2 Single mode 8.3/125-micron fiber optic glass, (minimum OS2) High Performance grade for dual mode operation at 1310 nm and 1550 nm wave lengths.

2.31.2.1 Maximum attenuation at 0.7dB/km @ 1310nm and 0-7dB/km @ 1550nm. Quantity of fibers as per detail drawings.

2.31.3 Single mode fibers shall be fully terminated and tested, unless otherwise noted in the drawings or in these specifications.

2.31.4 Refer to drawings for cable types required. Refer to acceptable cables section for additional information and approved manufacturers.

2.32 Each fiber optic cable shall contain the quantity of strands of optical fibers as detailed on the drawings.

2.33 All fibers in a multi-fiber cable shall be fully operational within the required performance characteristics. If any individual fiber does not meet the minimum standards, the entire

cable must be replaced, end to end, including connectors, without any additional expense to the customer.

2.34 Acceptable cables shall be:

Berk-Tek Multimode	–	GIGALITE 10-XB-OM4+
Berk-Tek Single Mode	–	Enhanced OS2 Single Mode –AB
Commscope Multimode	–	(All Brand Names) Systimax LazrSpeed 550 OM4
Commscope Single Mode	–	(All Brand Names) Systimax TeraSpeed OS2
Superior Essex Multimode	–	TeraFlex 10G-550-OM4+ (Type P)
Superior Essex Single Mode	–	TeraFlex G.657 Enhanced OS2 (Type K)
General Cable Multimode	–	Clear Curve OM4+ (Type BM)
General Cable Single Mode	–	SMF-28 Ultra Enhanced OS2 (Type Ax)
Siemon Multimode	–	XGLO 550 OM4 (Type T501)
Siemon Single Mode	–	XGLO Singlemode OS2 (Type E201)

Above glass types are an example of product names per manufacturer. Confirm requirements for indoor/outdoor, riser and plenum rated cable with riser drawings and site plans. Part numbers for composite style cable will vary greatly. Confirm part numbers with manufacturer.

Category-6 Station Cable

2.35 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.

2.36 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.

2.37 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.

2.38 The cable shall be UL or ETL rated and UL verified in compliance Category-6 EIA/TIA standards. Approved cables for Network Infrastructure System:

Commscope (Systimax)	–	GigaSpeed XL – 1071E Series
Commscope (AMP Netscope)	–	TE620R
Commscope (Uniprise/Krone)	–	UltraMedia 75N4

Superior Essex	–	NextGain Cat 6eX - #54-246-xA
Berk-Tek	–	LANMARK 2000 – 10167477
General Cable	–	GigaSpeed 6500 71339XX–
Siemon	–	9C6R4-E4-XX-RBA

2.39 On projects requiring plenum rated cabling, provide the plenum jacketed version of the type of cable shown in the specifications. Refer to the contract drawing for areas requiring plenum rated cabling.

2.40 Where data cables are indicated to run underground, Contractor shall use a Category-6 OSP-rated cable. Approved cables for Network Infrastructure System:

2.41 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.

Augmented Category-6 Station Cable

2.42 Contractor shall provide Category-6 UTP cable to each **Wireless Access Point** or any other location as indicated on the drawings and specifications. Provide quantify of cables as indicated on the drawings at each location.

2.43 Provide one Augmented 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 connections. 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.

2.44 Unless otherwise shown in drawing details, the color of the Augmented Category 6 UTP cables shall be blue, shall be cooper wire, individually insulated and color coded.

2.45 The cable shall be UL or ETL rated and UL verified in compliance with Augmented Category7-6 EIA/TIA standards. Approved cables for Network Infrastructure System:

Commscope (Systimax)	–	GigaSpeed XL10-D 1091B
Commscope (AMP Netconnect)	–	TE640R
Commscope (Uniprise/Krone)	–	Ultra 10 10GN4
Superior Essex	–	10 Gain XP - #6H-246-xA
Berk-Tek	–	LANMARK 10G2 – 10137700

(Part number for different color jackets for Berk-Tek cables varies)

General Cable	–	GenSpeed 10,000 71338XX
Siemon	–	Z-Max 6A 9A6R4-E4-XX-R1A

(Siemon does not offer a non-shielded cabling product.)

2.46 On projects requiring plenum rated cabling, provide the plenum jacketed version of the type of cable shown in the specifications. Refer to the contract drawing for areas requiring plenum rated cabling.

2.47 Where data cables are indicated to run underground, Contractor shall use an Augmented Category-6 OSP-rated cable. Approved cables for Network Infrastructure System:

Commscope – Category-6A OSP –1592A

2.48 Superior Essex, General Cable and Siemon do not offer an OSP Rated Augmented Cat-6 product. Contractor shall provide the Commscope/Systimax OSP shielded cable for a Siemon or Levitor Network infrastructure solution. Contractor shall provide shielded termination products for all drop locations and terminations panels and shall ground all products per manufacturer's instructions and warranty requirements.

2.49 Commscope Brand Names (Systimax, AMP NetConnect, Uniprise and Krone) – Cabling installed for Outside Plant applications is available in shielded type construction only for these structured cabling systems. Contractor shall provide shielded termination products for all drop locations and termination panels and shall ground all products per manufacturer's instructions and warranty requirements.

IDF to MDF Voice Feed Cables

2.50 Provide multi-pair UTP Category-5E cable from each IDF to the MDF, unless otherwise shown on the drawings. Cable must be 24 AWG, 22 AWG conductors will not be approved as an acceptable equal. Refer to the Riser Diagram for size of feed cables to be provided. Cables shall be 25-Pair to each of the IDF locations.

2.51 The outside plant cable shall have an aluminum shield, conductors surrounded by FLEXGEL III filling compound (or other water-blocking compound), and have a black polyethylene jacket.

2.52 For voice feed cables, terminate all pairs on both ends of the cable on building entrance protectors on the termination blocks. Follow standard voice color codes for termination. Building entrance protectors shall be furnished with a ground wire to the local ground bus in the MDF/IDF Room.

2.53 All voice feed cables will be tagged on the incoming cable with a typed permanent label with information as to its origin, house pair count, and cable destination. All termination blocks shall be labeled with type written labels that fit between the termination blocks (e.g. clear snap-on covers, adhesive labels and holders). Pairs shall be identified a minimum of every 5 pair on the block.

2.54 Provide distribution rings for the termination blocks and entrance protectors mounted at the MDF and IDF locations.

2.55 Ground and bond feed cables at one end of cable to aluminum shield with approved "bullet bond" type ground lug and #10 AWG green ground wire. Connect ground wire to closet ground buss bar.

2.56 Acceptable manufacturers shall be: Superior Essex or equal, for outdoor riser cable applications.

2.57 Data Contractor is responsible for providing the District with detailed feed cable documentation as well as identifying all of the physical cable in the MDF and IDF locations. Contractor shall have all installation, termination and documentation of voice feed cable completed and released to the telephone equipment vendor, a minimum of three weeks prior to the cut-over date set by the District.

2.58 Data Contractor is responsible for testing port connectivity from the punch blocks in the IDF closets to the main feed cable blocks in the MDF Room. Test all pairs for continuity and polarity. All testing must be completed a minimum of three weeks prior to the cut-over date set by the District.

Category-6 Outlets

2.59 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.

2.60 Provide Category-6 inserts, wired for EIA 568B. Provide installation kits for all locations furnished with Category-6 UTP cabling.

2.61 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.

2.62 Provide the following Category-6 UTP data connector per Network infrastructure warranty requirements:

2.62.1 Leviton eXtreme Cat6+ Quick Port Series 61110-R

2.62.2 Systimax (Commscope) GigaSpeed XL Series MGS400

2.62.3 AMP NetConnect (Commscope) SL 110 Series 1-1375055

2.62.4 Uniprise (Commscope) UNJ 600 Series UNJ600

2.62.5 Ortronics Clarity 6 Tracjack Series OR-TJ600

2.62.6 Panduit MiniCom TX6 Plus Series CJ688TG

2.62.7 Siemon MAX-6 Series MX6-F

2.63 Unshielded twisted pair Augmented Category-6 outlets shall be an RJ45 Enhanced performance type 8-position / 8 conductor modular jacks, and shall comply with Augmented 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.

2.64 Provide unshielded Augmented Category-6 inserts, wired for EIA 568B. Provide unshielded installation kits for all locations furnished with Augmented Category-6 UTP cabling.

2.65 For outlet locations cabled with OSP-rated Augmented Category-6 wire, provide shielded Augmented Category-6 inserts, wired for EIA 568B. Provide shielded installation kits for all locations furnished with OSP-rated Augmented Category-6 UTP cabling. Cable connections must be grounded at the patch panel location.

2.66 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.

2.67 Provide the following unshielded Augmented Category-6 UTP data connector per Network infrastructure warranty requirements:

2.67.1 Leviton Atlas-X1 Cat-6A Series 6AUJK-R

2.67.2 Systimax (Commscope) GigaSpeed X10D series MGS600

2.67.3 AMP NetConnect (Commscope) AMP Twist SL Series 1-1933476

2.67.4 Uniprise (Commscope) UNJ 600 Series UNJ600

2.67.5 Ortonics Clarity 6 Tracjact Series OR-TJ600

2.67.6 Panduit MiniCom TX6 Plus Series CJ688TG

2.67.7 Siemon (No unshielded version for Cat-6A available)

2.68 Provide the following shielded Augmented Category-6 UTP data connector for OSP-rated cable ports per Network Infrastructure warranty requirements.

2.68.1 Leviton Atlas-XI Cat-6A Shielded Series 6ASJK-R

2.68.2 Systimax (Commscope) GigaSpeed X10D Shielded Series HGS620

2.68.3 AMP NetConnect (Commscope) AMP Twist SL Shielded Series 2153000-1

2.68.4 Uniprise (Commscope) Ultra 10® Shielded Series HFTP-J10G

2.68.5 Ortronics Clarity 6A Tracjack Shielded Series OR-TJ6A

2.68.6 Panduit MiniCom TX6A 10Gig Shielded Series CJ6X88TG

2.68.7 Siemon ZMAX-6A Shielded Series Z6A-S

Outlet Faceplates

2.69 Provide a two-port faceplate for all one and two part outle locations. Provide blanks for all unused openings.

2.70 Provide a four-port faceplate for all three and four port outlet locations. Provide blanks for all unused openings.

2.71 Provide a six-port faceplate for all five and six port outlet locations. Provide blanks for all unused openings.

2.72 ll 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.

2.73 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.

2.74 Provide single port or dual port Surface mount 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. Provide Category-6 series insert, in surface box for IP Speaker data locations mounted in the backcan for the speaker as shown in the detail drawings.

2.75 Provide single port or dual port Surface mount small surface mounted outlet box for IP Camera data outlets in 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. The location shall also be furnished with a blank weather-tight faceplate to protect the data termination until the cameras are installed.

2.76 All faceplates and surface mount outlet boxes shall be furnished with label windows. All labeling shall be installed within the label window.

2.77 Confirm color of all faceplates prior to ordering. All data outlet faceplates shall have a unique sequential identification number applied to faceplate. Hand written labels are not permitted. All color schemes shall be approved by the customer prior to installation.

2.78 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.

2.79 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.

2.80 Reference the drawings for special outlet configurations or plate requirements.

PART 3 VIDEO SECURITY SYSTEMS

3.1 A single Category-6 UTP cable shall be provided from the IDF closet to each camera location. All cables installed in underground conduit shall be rated for Wet Location.

3.2 Provide (red) Category-6 patch cords with pre-molded boot, provide quantity equal to 100% of the total camera cable drops or ports provided. All patch cords to be installed by Contractor. Provide a total of 100% of the patch cords 36 inches in length. Patch cords shall be in compliance with the manufacturer's "Link" warranty requirements. Provide patch cords for both ends of the cable.

PART 4 WIRELESS ACCESS POINTS (WAP)

4.1 All wireless access point units and programming will be Owner furnished Owner installed by the District IT Department. Provide minimum 10' slack cable at each WAP location.

4.2 Refer to drawing details for installation requirements for WAP locations.

PART 5 INSTALLATION

5.1 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.

5.2 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.

5.3 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.

5.4 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.

5.5 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.

5.6 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 the correct style of connectors as directed by the District 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.

5.7 Labeling

5.7.1 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:

5.7.1.1 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 ACCEPTALE EQUAL).

5.7.1.2 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 ACCEPTALE EQUAL).

5.7.1.3 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 ACCEPTALE EQUAL).

5.7.1.4 On the face of the patch panel, provide a ¾” by ¾” 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.

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

5.7.2 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.

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

5.7.4 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.

5.7.5 All fiber optic and UTP feed cables shall be identified with permanent, water resistant, printed labels. Labeling information shall include closet identifications, quantity of conductors (UTP) or strands (fiber) and house pair designations (UTP). Cables shall be labeled in the IDF/MDF closets at the site conduit entrance point, riser conduit entrance point and prior to entering either punch blocks or patch panels. Labels for fiber and copper feeds shall include both the name of the origination point and the destination point, house pair or house fiber strand count, cable composition (i.e., 12-Strand MM 50/125 LO; 6-Stand SM). See details for additional requirements.

5.7.6 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.

5.7.7 All fiber optic cables and/or innerduct shall be tagged with fiber optic warning tags in every manhole or pullbox. Fiber warning tags shall also be placed at each end of the cable in the termination closets in clear view. A minimum of (3) tags are required at each end, with a label tag on each cable in the service loop. Fiber warning tags shall be placed on fiber optic cable and/or innerduct routed through open ceiling environments at increments no less than 15 feet apart.

5.7.8 Refer to detail drawings for additional labeling requirements.

5.8 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.

5.9 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.

5.10 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.

5.10.1 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.

5.10.2 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.

5.11 Fiber optic feed cables connecting to equipment racks from the MDF Room or from an adjacent IDF location, shall be installed with not less than a 20-foot service loop between the rack and mounted on the backboard. See drawings for fiber optic service loop requirements.

5.12 Provide 6 inches of cable slack at computer data system outlets inside conduit box.

5.13 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.

5.14 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.

5.15 The minimum bending radius for all cables and the maximum pulling tension shall not exceed manufacturer’s recommendations.

5.16 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.

5.17 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.

5.18 Cable pulling shall use a split mesh grip over the cable jacket. Connection directly to optical fibers and copper wire conductors shall not occur.

5.19 When pulled through conduits, cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the manufacturer.

5.20 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.

5.21 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.

5.22 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.

5.23 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.

5.24 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.

5.25 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.

5.26 All cables shall be new and extend continuous from each MDF or IDF backboard or rack to all outlet locations.

5.27 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.

5.28 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. Innderduct shall be supported minimum of every 3-feet to the structural members.

TESTING

5.29 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.

5.30 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).

5.30.1 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.

5.31 Contractor will repair or replace cable runs or connecting hardware that do not meet specified criteria.

5.32 Upon completion of submittal of original test results, and after review and approval of those results, the Contractor shall provide testing equipment and personnel to randomly re-test 10% or 20 drops minimum, whichever is greater, of all UTP cable locations on the campus in the presence of the designated District Representative and Project Engineer. The District Representative shall choose which cables are to be re-tested. If 10% of the re-tested cables fail to match the previously submitted original tests, the Contractor must hire an independent testing firm to re-test all UTP cable on the campus, at no cost the customer. All cables which do not meet the specifications criteria as determined by the independent test report, shall be replaced and re-tested by the Contractor at no cost the District. Final sign-off of the testing shall be approved after receipt of all other documentation.

5.33 Multimode fiber optic cables shall be tested bi-directionally at 850nm and 1300nm. Single mode fiber optic cable shall be tested bi-directionally at 1310nm and 1500nm. All fiber strands shall be tested with an OTDR (Optical Time Domain Reflectometer). All fiber test results shall contain final source and destination information that matches IDF or MDF labeling shown on the fiber optic patch panels and final documentation. OTDR tests results shall be included with the copper test results and submitted with the tester's software for review. Do not submit test results for review in Excel or PDF file formats, as the submittal will be rejected and not reviewed.

5.34 Test procedures shall comply with EIA/TIA 526-14 Method B. Test results shall meet the minimum following criteria:

5.34.1 Fiber optic test results shall not exceed 2db total attenuation loss in addition to inherent loss published by manufacturer tested at minimum 2000 Mhx for 805nm and 500 Mhz for 1300nm for the fiber optic cable.

5.35 End to end attenuation Fiber Optic feed cabling testing shall be performed with a temporary test jumper cable at each end of the installed fiber cable. The test jumper utilized shall be the same fiber core size and grade of glass as the installed cable. The measured attenuation of the test jumpers, test connectors, and test interconnection sleeve between the two test jumpers shall be less than 1dB as calibrated at the time of the test at indicated wave lengths and frequencies. Test jumpers shall be “zeroed out” before testing of fiber stands begins.

5.36 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-Builts 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 27 10 00

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 19 - Conductors
1.2.3 Section 26 05 33 - Conduit and Fitting
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 ensuring the integrity of the cables before and after installation.

1.6 Work Excluded:

1.6.1 Excluded from this work shall be any and all general construction services regarding masonry and general carpentry services. Those services are to be provided and installed by the General Contractor.

1.7 Conduit/raceways, sleeves, cable trays, electrical boxes, hand holes, pullboxes, etc. required for the system shall be furnished and installed by the Electrical Contractor. The conduit/raceways and electrical boxes furnished and installed under Electrical Contractor shall conform with the requirements of the drawings and specifications for the system.

1.8 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 10 premise wiring Contractor as defined in this specification. Subcontractors may not be utilized in the implementation of the plant wiring installation.

1.9 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.

1.10 Failure to provide a functional equivalent shall result in the removal of the alternate system at the Contractor's expense.

1.11 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.

1.12 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.

1.13 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

1.14 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.

1.15 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'.

1.16 Finish Space: Any space ordinarily visible, including exterior areas.

CONTRACTOR QUALIFICATIONS

1.17 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.

1.18 The successful bidder shall have current full-time employees with CTS, Extron XTP Systems Engineer, Extron TLP programming certifications, and Extron Global Configuration Certification. (include certifications with submittals).

1.19 The successful bidder shall have Installation Staff with CTS-I certification and Extron Advanced A/V Certifications. Contractor must have a minimum of (8) full time certified installation technicians with Extron Certifications (include certifications with submittals).

1.20 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.

1.21 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.

1.22 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 of 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

1.23 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.

1.24 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.

1.25 The system shall be installed in accordance with local and national electrical codes.

1.26 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

1.27 General Submittal Requirements

1.28 Phase I 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:

1.28.1 Complete Bill of Materials in Excel Spreadsheet format with bills of quantities, including all materials, components, devices, and equipment required for the project. 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:

1.28.1.1 Description and quantity of each product.

1.28.1.2 Manufacturer's Name and Model Number.

1.28.2 Manufacturer's Specification Sheet or Cut Sheet. Material Cut Sheets shall provide detailed product information and shall be original manufacturer product bulletins. Copies of material information from vendor websites shall not be considered equal and will not be excepted.

1.28.3 Material Cut Sheet part number provided shall be highlighted or provided with an arrow directed at the corresponding part number.

1.28.4 Specification Item Number referenced for each required product or if not shown in the specifications, Drawing Detail Number being referenced. (ie; Spec. 271000 Item 2.1 or DWG E4.15/#1)

1.28.5 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.

1.29 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 in a CAD Software. Submission shall include electronic print copies to match the contract drawings, and Phase II submittal drawings shall include the following:

1.29.1 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.

1.29.2 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.).

COMMON SUBMITTAL MISTAKES

1.30 Common submittal mistakes which will result in submittals being rejected:

1.30.1 Not including the qualifications of the installing Contractor Company and Contractor's Staff.

1.30.2 Not including all items listed in the above itemized description.

1.30.3 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 (provided for the project) or crossing out the items which are not applicable.

1.30.4 Not including actual manufacturer's cut sheets or catalog information of proposed products.

1.30.5 Do not provide website sales pages instead of Material Cut Sheets. Printing the entire web page with advertising and non-applicable items or information will not be acceptable.

1.30.6 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" or "to be determined later" statements. The products being submitted must be the products installed.

DOCUMENT REQUESTS

1.31 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:

1.31.1 Clearly indicate Project Name and Client, Johnson Consulting Job Number (located in bottom left corner of JCE Engineering Stamp) and each drawing Sheet Number required (i.e., E1.1, E2.1, E4.1 etc.).

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

1.31.3 Detail or Riser diagram sheets, System Schematic drawings or any other drawings other than floor plans or site plans, will not be made available to the Contractor.

1.31.4 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.

1.32 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.

WARRANTY

1.33 Contractor shall be responsible for the complete provision and installation of all components as specified herein. The Contractor shall provide all tools, equipment, fixtures, appliances, ancillary piece parts and hardware as necessary to complete the assembly and installation as requested. The Owner's Representative may conduct scheduled or unscheduled inspections of the Contractor's work at any time during construction. All work included in the scope assigned to the Contractor that is associated with this project shall be accomplished in a workmanlike manner, installed and assembled plumb, level and square. The product shall be delivered to the Owner finished complete, and ready to operate according to the manufacturer's specifications.

1.34 All installation work shall be completed to the standard of the samples approved by the Owner's Representative during the submittal process. Any products not installed to the quality detailed in these specifications and approved in the submittal process shall be reworked by the Installer to the satisfaction of the Owners Representative at no additional cost to the Owner.

1.35 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

1.36 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 Section1632A and Table 16-A0. The Contractor shall submit drawings signed by the Contractor's registered structural engineer indicating method of compliance prior installation.

CLEANUP

1.37 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.

1.38 Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.

1.39 During the progress of the work, keep the premises clean and free of debris.

GENERAL COORDINATION

1.40 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.

1.41 Contractor shall shall submit to the Project Engineer the proposed mounting heights of all LCD LED Flat Panel monitors, for the entire project, prior to the installation of any of the recessed backcans or surface mount brackets. The proposed mounting heights shall be presented in the form of an RFI with copies being submitted to the Project Architect, Construction Manager and Project Electrical Contractor. The exact mounting heights must be determined prior to the electrical rough-in stage of the project. No flat panel mounts or backcans may be roughed-in until the locations and heights are confirmed and accepted by both the Project Architect and the Project Engineer.

1.42 **Flat Panels are district furnished and installed**, unless otherwise noted.

1.43 Contractor shall provide a spreadsheet for the District provided asset tags for all newly installed A/V equipment. Contractor shall provide the populated tag list at the end of the projector as part of their turn-over documents.

1.44 Contractor shall coordinate assignment of ALL installed IP addressable equipment. The district will provide a list of available IP addresses based of Contractors device count. Contractor shall provide a spreadsheet containing the IP and MAC addresses as well as each particular device location. This list shall also contain the Switch Port Number, and Label Description.

1.45 See the example below:

Room #	Device	IP (Static)	MAC	WallJack Label	Switch #	Switch Port		IDF# Switch # - (From top to bottom - 1,2,3, ...- use A,B,C.. in label) Switch Port - (1 - 48)
2014	*Extron*	*10.63.155.159*	*0000.0322.a32b*	*A1-A04*	*1*	*4*	Example	IDF A1 -- Top Switch (A) -- Port 4
123	*Extron*	*10.63.155.152*	*0000.0322.aabb*	*C1-B24*	*2*	*24*	Example	IDF C1 -- 2nd Switch down In stack (B) -- Port 24
2201	*Cisco AP*	*dhcp*	*0012.aaaa.12ab*	*A2-C35*	*3*	*35*	Example	IDF A2 -- 3rd Switch down in stack (C) -- Port 35
2202	*<device>*	*dhcp*	*0012.aa4a.12ab*	*A2-C36*	*3*	*36*	Example	IDF A2 -- 3rd Switch down in stack (C) -- Port 36

PART 2 PRODUCTS

GYM AUDIO VISUAL General Requirements

2.1 GYM AV systems shall be all contractor furnished and installed. Contractor will provide a complete AV system with a large venue laser projector with custom lens, projector lift assembly with environmental housing, wall mounted electric tab tensioned projection

screen, a complete control system with iPad wireless interface, multi-speaker sound system, wired and wireless microphones with Blu-Ray and Wireless Streaming Preamplifier.

2.2 Contractor shall provide commissioning of the GYM Room sound system. Provide test equipment and an operator to perform system commissioning. Commissioning will include equalization of speaker system to compensate for room acoustics and setting, including but not limited to equalization, delay, level, limiting, and crossover frequencies. Test equipment must include a minimum of SmaartLive V8 or approved equivalent running on a software manufacturer approved computer, an Earthworks M30 calibrated measurement microphone or approved equivalent, and a Sound Devices USB Pre- microphone preamp or approved equivalent. Contractor's operator must have attended a factory training class for the DSP software used on the project. Operator must also have attended a minimum of one (1) factory training session in the use of SmaartLive software.

2.3 Laptops and Document Cameras shall be furnished and installed by the District. Confirm operation of the systems with the District furnished equipment.

2.4 Refer to the floor plans for the room type designations that define the type and extent of the Audio-Visual System that is to be furnished for this GYM space.

2.5 GYM Room shall incorporate a stand-alone sound system integrated with the Audio - Visual System components. Sound system will have different requirements and include different types of control systems or DSPs that will require programming by the Contractor.

2.6 The detail drawings show an Audio-Visual Diagram for the GYM Room requirements. The diagram does not represent all the requirements for the GYM Room AV System, but gives the Contractor a general system installation plan. Refer to the GYM Room requirements in the specifications and drawings.

2.7 Contractor shall meet with District and Johnson Consulting Engineers to provide Extron GUI configurator screen shots on TLP control systems for review prior to programming. This shall include (8) AV scenario presets to be programmed into the Extron control system. The Contractor shall meet to determine the individual requirements for the GYM Room.

2.8 Contractor shall allow a minimum of 6 hours of meeting time with School Staff and shall provide meeting minutes of the system requirements and events that transpired during meetings Contractor shall prepare 4-5 templates with written instructions that can be given to the school noting the settings and levels on the Digital Mixer for events such as; Assemblies, Dances, Presentations, Movie Nights, Background Music, etc. Meet with School Administrative staff to determine the types of templates required. Templates shall be a representation of the mixing board with markers showing the settings in a three-ring binder to be kept at the sound system cabinet. Pages shall be laminated.

2.9 Contractor shall provide Mixer presets from both the iPad Mixer App and the Extron TLP Control Panel. The School Personnel (User) shall have the ability to select and control the presets from both interactive devices. The presets shall also include the ability to integrate the projector and AV inputs when the need for both audio and video are required. For example, a Presentation preset would require the use of both the projector and the sound system with audio and video originating from one of the wallplate input locations.

2.10 Audio output frequency levels from the Mixer for each type of preset, shall use the baseline established from the SmaartLive testing. The baseline will establish a starting point for each level at the varying frequencies. The Contractor shall set the levels based on the application, ie; Assemblies Preset will focus on Voice applications; Pep Rally would focus on music as well as voice, leaning towards band music; Movie Night would focus on emulating a Cinema type of environment as much as possible; Dances would focus on the playback of modern Pop and Hip Hop music currently popular; etc. The DSP settings shall be set in conjunction with the preset applications on the mixer. The Contractor shall utilize the manufacturer's technical support staff to create equalization settings in the mixer for the presets.

2.11 The Contractor shall contact Extron for the control codes to enable the ability to activate the presets from the TLP Control Panel. The Control Panel shall be programmed with easy to follow, simple step-by-step pages that activate and disable the mixer and AV matrix switch page or event settings. Once the preset is selected from the Control Panel, the User shall not have access to the mixer controls from the TLP Control Panel, only the event presets and the standard control buttons used for every event

2.12 Contractor shall provide a minimum of 6 hours of meeting time with the District Personnel to build the requirements for the TLP Control panel. All programming shall be furnished and provided by the Contractor. The Contractor shall build all control panel pages and function buttons for approval by the District Project Manager and Project Engineer prior to the actual programming being completed. The control panel shall provide simple, easy to follow pages and flow functionality with the access to changes to the programming being limited to the Administrator Level password protection.

2.13 The Apple iPad shall be provided with an app to emulate the TLP Control Panel's pages and control buttons.

2.14 Extron GlobalViewer 3.0.1 or greater. The contractor shall include programming of all assets at each room and school site into the software. The programming shall include assigning IP address as required. Coordinate with the District IT Department for access to network for loading software and setting up programming parameters.

2.15 Provide design software plots of the speaker coverage and positioning using EASE software. Show dB sound level speaker coverages for each sound system application as required below. Separate designs must be submitted for each sound system. Contractor shall show coverage of audience areas on full size drawings, 30"x42" sheets and submit them to the Project Engineer for approval prior to the installation of the system. Provide elevations of speaker coverage and horizontal and vertical positioning of speakers.

2.16 Contractor shall submit proposed mounting details for each of the individual GYM Room's speaker, projection screen and projector mounting installations. The proposed mounting details shall be based on the structural details shown in the contract drawings. The speaker, projection screen and projector installation details in the project drawings show the minimum structural requirements and apply to general installation practices. The actual field conditions will dictate the actual speaker, projection screen and projector installation requirements and the submittals provided by the Contractor shall reflect the condition of the actual installation requirements. Contractor shall include structural calculations to meet with Zone 4 Seismic requirements for mounting of equipment that deviate from the details shown in the drawings.

Audio System

2.17 All system equipment shall be rack mounted in a floor mounted, roll-out, rotating system cabinet. Refer to detail drawings for cabinet requirements. Location of cabinet shall be as shown on the building floor plans. Sound system shall be provided with the following components:

2.17.1 Digital Mixer:

2.17.1.1 19" Rack Mountable

2.17.1.2 Inputs: 16 mic/line (XLR/TRS combo) + 1 stereo line (RCA pin)

2.17.1.3 Output? 16 (8 XLR + 8 TRS phone)

2.17.1.4 Expansion slots-1 (for NY64-D)

2.17.1.5 Aux Buses 20 (8 mono + 6 stereo)

2.17.1.6 iPad* and iPhone* apps for professional remote operation available free of charge—no host PC required

2.17.1.7 Networked remote control for show setups with on-screen software editor via Ethernet

2.17.1.8 Program Yamaha Remote App. With Apple iPad

2.17.1.9 Provide highest level of firmware upgrade available at time of installation of mixer

2.18 Contractor shall program mixer and iPad as a turn-key installation for control of the sound system.

2.19 Contractor shall allow for a minimum of 8 hours of additional programming time for changes made after the system has been installed and commissioned.

2.20 All Programming shall be set up to disallow any changes to the mixer levels and system pre-sets to be done by an Administrator Level password access only. Standard users may only access live application sound processing and not be able to alter the pre-sets.

2.21 Provide data and Dante connections at AV Rack for Mixer. Connect mixer to network and coordinate the IP address requirements with the District IT Department.

2.22 Provide Yamaha TF-Rack Mount Mixer with optional Audio Interface Card (NY-64D)

2.22.1 Provide (1) shelf-rack mounted MusicCast Wireless Streaming Preamplifier by Yamaha

2.22.2 Provide balanced left and right audio outputs to mixer with cabling.

2.22.3 Provide all programming of device for complete system control.

2.22.4 Provide Cat6 cabling to AV switch for ethernet connection.

2.23 Provide Yamaha WXC-50 Wireless Streaming Preamplifier connected as an audio input with lan cable and audio cables. Program this source into the control system and the iPad with the Yamaha app with full control.

2.24 The Amplified Loudspeaker Controller for the main speakers shall provide four channels of power amplification and digital signal processing with analog and Dante inputs. Provide (1) Multi- Channel Power Amplifier for the main AV Speakers.

2.25 The amplifier shall deliver a maximum output power per channel of; 400W at 8Ω; 400W at 4Ω; 400W at 2Ω; 800W at 8Ω bridged; 800W at 4Ω bridged; 400W at 100V and 400W at 70V.

2.26 Amplifier shall include a switch mode power supply with power factor correction, smart rail management and bridgeable switch mode fixed frequency Class D output circuit topology.

2.27 The amplifier shall operate from 100V - 240V, -10% / +10% 50/60 Hz, universal AC input power with minimum voltage for power up at 90V and shall draw 251W (1.4A @ 230V) or 227W (2.1A @ 115V) when driven with pink noise signal at 1/8 of rated power into 4 ohm loads.

2.28 Remote control and monitoring of the status of the amplifier shall be provided by an RJ45 port separated from the Dante port.

2.29 Provide (1) Biamp ALC-404D (4 channels x 400W @ 4 ohms)

2.30 The Amplified Loudspeaker Controller for the subwoofers shall provide four channels of power amplification and digital signal processing with analog and Dante inputs. Provide (1) Multi- Channel Power Amplifier for the Subwoofer AV Speakers.

2.30.1 The amplifier shall deliver a maximum output power per channel of; 400W at 8Ω; 400W at 4Ω; 400W at 2Ω; 800W at 8Ω bridged; 800W at 4Ω bridged; 400W at 100V and 400W at 70V.

2.30.2 Amplifier shall include a switch mode power supply with power factor correction, smart rail management and bridgeable switch mode fixed frequency Class D output circuit topology.

2.30.3 The amplifier shall operate from 100V - 240V, -10% / +10% 50/60 Hz, universal AC input power with minimum voltage for power up at 90V and shall draw 251W (1.4A @ 230V) or 227W (2.1A @ 115V) when driven with pink noise signal at 1/8 of rated power into 4 ohm loads

2.30.4 Remote control and monitoring of the status of the amplifier shall be provided by an RJ45 port separated from the Dante port.

2.30.5 Provide (1) Biamp ALC-404D Bridged outputs 800W @ 8 ohms for the single cabinet dual subwoofer.

2.31 Provide industry standard NL4-type locking connector. These two connectors are wired in parallel with each other, on all models. Terminations may be soldered, or made by means of their built-in screw and pressure clamp. If using the pressure clamp, it's important to tighten it fully, then to wait about ten minutes (longer is better), then to tighten it again. This is because copper wire flows under pressure. After initially tightening the screw

clamp, some minutes later the screw will no longer be as tight due to the effect of the coGYMession on the copper. Typically, only one cycle of “tighten – wait – re-tighten” is required for a secure connection.

2.32 Commissioning the System, Commissioning is the process of optimizing the performance of the system after it has been installed. There are several steps in commissioning. First is verifying the proper operation of every system component, and then adjusting system gains and levels. The last step in system commissioning is known as system equalization or “voicing.” Equalization is the process of adjusting the frequency response of the system to optimize voice intelligibility or musical sound quality (or both). Note that V SERIES loudspeakers are factory voiced to optimize their speech intelligibility and musical sound quality. For this reason, many designers find they can minimize overall system equalization and still achieve excellent voice intelligibility and musical sound quality without extensive EQ. However, in the end this is a function of the room acoustics. A large, highly reverberant room will require more attention than a small, dry acoustic space.

2.32.1 When equalizing a V2 loudspeaker system the following points should be kept in mind to achieve the best results and to avoid damaging the drivers.

2.32.1.1 Use only small amounts of equalization. In particular, do not boost frequencies by more than about 3 dB. Cutting frequencies by more than 3 dB of attenuation is acceptable, but bear in mind that extreme frequency cuts will usually result in less than optimum performance, unless carefully derived by use of a precision measurement system in a room that has excessive resonance. Rule of Thumb: less is usually more.

2.32.1.2 Do not attempt to boost any frequencies below 100 Hz with a graphic equalizer. Note that with the recommended high-pass filter, moderate amounts of boost from a simple bass control are acceptable.

2.33 HIGH-PASS FILTERS; Contractor must use an external, active high-pass filter to protect the cone drivers from excessive low-frequency excursion. A high-pass filter will eliminate the potential of low-frequency modulation from wind noise, turntable rumble, stage vibration, and other causes that result in a poorly defined and ‘muddy’ bass response. Additionally, a high-pass filter will avoid wasting amplifier power by keeping the amplifier from attempting to reproduce frequencies below the loudspeaker’s intended operating range. The recommended high pass filter settings are available on each model's "spec sheet" available on Community's website. The DSP settings for all V SERIES models are also available in the "downloads" section of the Community website.

2.34 Built-in DSP Processing Functions - Set DSP functions in the amplifier to match the speaker/subwoofer ratings to the amplifier channel. The DSP setting shall also be set to provide optimal performance for the GYM Room space speakers. All amplifier channels shall be hardwired and Dante enabled and shall be programmed to have the ability to control the channels in groups independently. This programming shall be also done in the control system with independent control pages for the main GYM system and the 2 outdoor speaker sets with mute, on/off and gain.

2.35 Speaker amplifiers shall be hard-wired directly from the mixer as well as Dante inputs(non-PoE) for failover. The Dante signal shall be the primary means of audio signal.

2.36 Confirm and coordinate the power receptacle requirements with the Division 26 Contractor.

2.37 Provide (1) Extron Priority Page Controller for the AV system to sense intercom paging signals. The Page Controller output shall be wired to the AV Switch to mute the audio output signals to the room when paging is sensed. Provide cabling and sensor to the nearest analog speaker for page detection.

Assistive Listening System

2.38 Assisted listening System shall be provided in accordance with CBC Section 11B, Dash 219 and shall comply with CBC Section 11B-706.

2.39 Per CBC section 11B-219.3, 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 a compatible in accordance with CBC section 11B-706.3.

2.40 If the system provided is limited to specific areas or seats, then such areas or seats shall be within a 50 foot viewing distance and have a complete view of the stage or playing area. BC Section 11B- 219.4.

2.41 Per April 2020 DS, a Code appeal interpretation, school facilities may use the following alternate provisions for each school. Will provide 2 portable assistive listening systems, each with a transmitter and a minimum of two receivers. Reuse in classrooms without audio amplification. The assistive listening receivers and transmitter shall be stored in the school site administration office until requested. In addition, provide an assistive listening system for assembly areas such as multi-purpose rooms, cafeterias, lecture halls, or other assembly areas if the room has no fixed seating. Backlight the number of seats using 7 SF per occupant. Provide 4%. Of assistive listening receivers for total number of seats in each assembly area, but no less than two. The assistive listening receiver shall be stored in or near the assembly area.

2.42 A complete Assistive Listening system furnished and installed to meet CBC Section 1104B-2 and the ADA requirements for hard-of-hearing. The system shall be integrated into the sound reinforcement system. Adjust as required for total coverage of seating area. Provide Listen Technologies Model Assistive Listening System Listen Everywhere 2 Channel Wi-Fi Audio Server (Dante) package with Wi-Fi Audio Receiver 1020 shall include:

2.42.1 2 channel Dante® input

2.42.2 Audio routing and management via Dante Controller® software

2.42.3 Uses existing wireless network (Wi-Fi)

2.42.4 Low latency (see demo video)

2.42.5 ADA compliant (with receivers and neck loops)

2.42.6 Stream audio to venue provided receivers and guest devices

2.42.7 2 channels per server (stackable)

2.42.8 Up to 1000 users

2.42.9 Provide (1) LW-150P-02-D

2.42.10 Provide (1) LA-326 Universal Mounting Kit

2.42.11 (4) Signage Kits – Model LA-304 Assistive Listening Notification Signage. Signs shall be installed near the entrance doors to the GYM Room.

2.42.12 (1) LE Venue Awareness Kit LW-202

2.42.13 (4) Listen EVERYWHERE Wi-Fi Audio Receiver 1020

2.42.14 (2) LA-438 Advanced Neck Loops (Adult)

2.42.15 (2) LA-164 Ear Speaker

2.43 Provide wireless microphone system consisting of the following:

2.43.1 Full featured ULXD Digital quad wireless receiver 1U Combo Systems; Four receivers in a rugged 1RU metal chassis with internal power supply; Individual gain controls, LED meters, and XLR outputs for each channel; RF cascade ports allow distribution of RF signal to another unit; Dante™ digital networked audio over Ethernet; Yamaha® device ID allows simplified channel patching on CL consoles; 72 MHz tuning range.

2.43.2 Provide (1) Shure # ULXD4Q system with rack mount kit

2.43.3 Match the frequency bands to ensure proper system operation with the receivers. Provide the following transmitters for the above digital receivers

2.43.3.1 (4) ULXD2/SM86 digital handheld transmitter with SM 86 capsule; Shure Lithium-Ion rechargeable battery pack

2.43.3.2 (4) MX153 Earset Headworn Microphone- (2) black and (2) tan

2.43.3.3 (4) ULXD1 Bodypack Transmitter with Mic clip, rack mount kit, ¼ wave antennas, power supply

2.43.3.4 (4) Optional Shure SB900A lithium-ion rechargeable batteries

2.43.3.5 (4) SBC200-US Dual Docking Recharging Station

2.44 Provide both A and B antenna cables to the quad antenna receiver. Provide antenna cable extensions with both systems to mount the antennas on the wall. Antenna kit shall be furnished with the length of coaxial cable required to reach the antenna j-box location in the GYM Room.

2.44.1 Provide (2) Shure Wall-Mounted Wideband Antenna model # UA864

2.45 Provide (2) cardioid microphones with minimum frequency response of 50Hz to 18kHz. Microphone shall have on-off switch with lock “on” feature and adjustable swivel adapter.

2.45.1 Provide wind screen for microphones

2.45.2 Shure Model # SM58S-LC Dynamic Microphone, Cardioid, dark grey, 3-Pin XLR, with On/Off switch.

2.46 Provide both floor and tabletop mic stands for the wired and wireless microphones:

2.46.1 (4) 'Ultimate' Pro-R-T-T with telescoping boom full height microphone stands with booms

2.46.2 (2) 'On-Stage' DS7200QRB Quik-Release Adjustable Desk Stand

2.47 Provide microphone input wallplates in the GYM Room where shown on the floor plans. Input wallplates shall be female XLR connections and wired directly to the mixer in the AV Cabinet. Wallplates shall be Decora style to match the color of the Audio-Visual input wallplates.

2.48 Mic Cables: Provide (4) 25'-0" and (2) 50'-0" long, constructed with Canare L4E6S cable, 95% braid, shielded cable assemblies. Provide Microphone cable assemblies as manufactured by Hosa Edge series.

2.49 Micorphone and Monitor Jacks: Provide PoE powered RDL Wall-Mounted Bi-Directional Mic/Line Dante Interface 2 x 2 jacks for monitor and microphone at each location shown as a microphone input and monitor output or the 'MM' symbol.

2.49.1 Microphone/Monitor Jacks: RDL DD-BN22 or (approved equal by Extron) with matching cover plate

2.49.2 Provide Cat6 patch pre-terminated patch cables between the plate and the PoE AV switch.

2.50 Provide a total of (2) full range speakers, positioned one on each side of the projection screen at the location shown on the floor plans as a type 'A" speaker in the GYM. The loudspeaker system shall be a two-way, full-range, trapezoidal vented bass design with one 15-inch low frequency cone driver and one 1-inch HF driver mounted to a 90° H x 60° V horn. There shall be an NL4-compatible locking connector with terminal strip in parallel. The loudspeaker enclosure shall be constructed of 18mm, 11-ply cross laminated birch with a perforated steel grille and shall be fitted with thirteen M10 flying/rigging inserts.

2.50.1 Point Source

2.50.2 The loudspeaker dimensions shall be 27.2 in. H x 18.4 in. W (front) x 12.4 in. W. (rearX 15.9 in. The loudspeaker shall weigh 47.8 lbs.

2.50.3 Input Connectors-Dual Neutrik NL4MP Connectors

2.50.4 Provide (2) Community V2-1596: 15 inch two way, full range loudspeakers in black (or approved equal by Bose Speakers).

2.50.5 Provide braided steel type safety cable attached to wall or to support bracket mounting plate behind speaker. Refer to drawing details for additional information.

2.51 Provide (1) community dual 8" large volume compact subwoofer, suspended from the structural ceiling members at the location shown on the floor plans for the GYM Room. There shall be (1) total and are shown on floor plans as TYPE "S".

2.51.1 Compact Low Frequency subwoofer system

2.51.2 Frequency Range :30 Hz to 1000 Hz/40 Hz to 200 Hz (±3 dB)

2.51.3 Frequency Response (+/-3dB) 44 Hz - 90 Hz 97dB 125dB

2.51.4 Maximum SPL Peak (1m) 131dB

2.51.5 Dimensions 21.75" W x 21.75" D x 10.2" H

2.51.6 Input Connectors-Dual Neutrik NL4MP Connectors

2.51.7 Provide subwoofer by Community Model # VLF208LV "BI" suffix Black paint finish version with 12 mounting points

2.52 Provide 2) portable stage monitor speakers with stands, 25' patch cables and XLR plugs. Speaker shall be connected to the monitor wallplate outputs shown on the floorplans. Cabling from the monitor wallplates shall be cabled to the monitor out channels of the DSP/Mixer.

2.52.1 Provide (2) Yamaha DBR12 1,000W 12 inch Powered Speaker

2.52.2 Provide (2) Ultimate Support TS-90B TeleLock Tripod Speaker Stands-Black

2.52.3 Provide (2) 25" Hosa Edge Microphone Cable Neutrik XLR3F to XLR3M

Video System

2.53 Provide Extron Digital AV matrix switch in the sound system cabinet. All video from the Interface wallplates in the GYM Room, and the Blu-Ray Player in the AV Cabinet, shall be routed to the matrix switch. The video and audio outputs from the matrix switch shall be routed to the Projector and Sound System Mixer respectively. Refer to the basic GYM Room AV Diagram for additional requirements.

2.54 Provide Laptop interface (LO) connections at the locations shown on the floor plans. Provide combination DisplayPort and HDMI input connections at the wallplate. Provide Extron Model #DTP series Decora wallplate for video and audio connections to the Digital matrix switch in the AV cabinet. Provide Extron Cat-X cable from the wallplates to the Matrix Switch in the AV Cabinet.

2.55 Contractor shall furnish and install the HDMI and DisplayPort patch cords for the Laptop Input (LO) wallplate locations. Provide (2) HDMI and (2) DisplayPort patch cables. All patch cables shall be 12 feet in length at the Input wallplate locations.

2.56 Provide HDMI and/or Stereo Audio connections for the equipment in the AV Cabinet, as shown in the AV Wiring Diagram, to the matrix switch in the rack. Provide Serial Control for all equipment from the Matrix Switch via the switcher processor.

2.57 Provide Control Panel (shown as the symbol "LC") at the location shown on the drawings.

2.58 Provide selection and complete control pages for all of the inputs and outputs including but not limited to; each of the (2) Laptop Input Wallplates (both HDMI and Display-Port video inputs), Music Cast audio, Blu-Ray Player, AUX panel input, GYM Room projector, wireless microphones, audio monitors and outdoor audio speakers on the control panel. Each of the input pages shall provide additional pages for full control of the device's features. Pages for the MusicCast, Blu-Ray Player and projector shall provide all control buttons such as play, stop, pause, search, etc.

2.59 Program the Laptop Computers to show a quick link on screen for emulation of the TLP's control buttons. Presenter shall be able to control input access from either the TLP panel or from a Laptop.

2.60 Provide recess-wall mount kit for the TLP Control Panel by Extron Model #RWM 2. The 27 20 00 Contractor shall furnish and install the custom backbox for the control panel. Refer to the manufacturer's recommendations for the size and depth of the junction box required and coordinate with the electrical contractor.

2.61 The "Main Projector" page on the control panel shall be furnished with full control of the inputs, focusing and zooming, and basic functions of the projector. Advanced control pages will not be required.

2.62 Provide a Category-6 UTP data cable to the TLP Control Panel from Ethernet Switch in the AV cabinet. Refer to the drawing diagram for additional requirements.

2.63 Provide Control Panel as manufactured by Extron Model #TLP Pro 1025M with custom backbox.

2.64 Connect the Ethernet Switch to all networked AV electronics as shown in the AV wiring diagram to the data outlets provided in the new rack enclosure. Coordinate with the District IT Department for assignment of IP Addresses for the equipment.

2.65 Provide Cat-6 patch cables to connect the active ports being used to the existing network switch at the IDF.

2.66 Provide an HDMI/HDBT Audio-Visual Matrix Switch for distribution of the digital video and audio signals for the GYM Room.

2.67 The switch shall be provided with HDMI, DTP video inputs and HDMI, HD Base-T and DTP video outputs, IP, IR and RS-232 controls and stereo amplifier.

2.68 The AV Switch shall be provided with an Ethernet LAN connection from the Ethernet switch in the Audio-Visual Cabinet. Provide Cat-6 patch cable from Ethernet Switch to AV Switch.

2.69 Provide an Extron Cat-X cable from the Matrix switch's DTP output to the projector HDMI DTP wallplate receiver location. The cable connection shall be used to provide the video and RS-232 control from the projector to the Matrix Switch.

2.69.1 Provide Extron DTP Receiver for HDMI - Decorator-Style Wallplate DTP R HWP 4K 231 D

2.70 Provide Extron Cat-X cables from the Matrix switch's DTP Input Ports to the DTP Laptop wallplate locations. The cable shall be terminated at the wallplate. Provide Extron

wallplates Model #DTP T DWP 4K 232 D at each of the (2) local origination (LO) locations shown on the floor plans.

2.71 Provide video from the Blu-Ray Player in the AV Cabinet to the Matrix Switch. The Matrix Switch shall serve as the main controller and router for the audio and video signals from the AV equipment.

2.72 Provide audio cabling from the Music Cast receiver to the digital mixer; provide network cable to this unit for control. Program full control functionality for this device into the GUI pages.

2.73 The main audio output from the DTP switch shall be routed to the Mixer in the AV Cabinet. Refer to the AV Diagram for additional requirements.

2.74 Connect the Matrix Switch to the IPL Controller via the AV LAN created for the audio-visual system.

2.75 Provide the HDMI/DTP Matrix Eight Input 4K/60 Seamless Presentation Switchers with integrated control processor and 70V amplifier in the AV Sound System Cabinet by Extron Model # IN1808 IPCP Q MA 70 Control Processor and 70 V mono Amplifier.

2.76 Provide Extron Catx cabling from the AV switcher in the sound rack to the wall mounted projector j-box location shown on plans. Provide (1) Extron DTP Receiver for HDMI - Decorator-Style Wallplate model# DTP R HWP 4K 231 D with a 6' Extron HDMI patch cable and an Extron Serial control cable to the projector for video and control.

2.77 Provide all audio cabling to AV switcher and digital audio mixer.

2.78 Provide Cat6 network connection to rack mounted data switch.

2.79 Program DSP into GUI control pages.

2.80 Provide a 1U rack mount accessory panel with knock outs for aux audio and video inputs.

2.81 Provide (1) Middle Atlantic 1RU Universal Connector Panel #UNI-1

2.82 Provide (1) Tecnec RE-MFSBL Recessed Mini Female Stereo Feed-Thru Chassis Mount part # RE-MFSBL for rack audio input

2.83 Provide 1) Connectronics HDMI Feed-Thru D Series Chassis Mount Connector Neutrik NAHDMI part# TN-HDMICM for rack mounted HDMI input

2.84 Provide (1) Professional-grade 4K UHD Blu-ray player Rack mount Blu-Ray, DVD and CD/SD/USB Player

2.84.1 Provide HDMI cabling to AV switcher

2.84.2 Provide control via RS-232 or IP from AV switcher.

2.84.3 Provide any additional cabling and programming for complete control of all function via the AV control system.

2.84.4 Provide Tascam BD-MP4K with rack mount kit or approved commercial quality equal by Denon)

Additional Components:

2.85 Provide (1) Storage drawer with DCDP insert and keyed lock by Middle Atlantic Model # D3LK

2.86 Provide (2) Equipment shelves by Middle Atlantic Model # U2V – For mounting of devices that do not have rack mount kits available or securing power supplies.

2.86.1 Blank panel – Middle Atlantic # SB1 – Fill in all open spaces with blank panels

2.86.2 Vented panel – Middle Atlantic # VT1 –Provide solid panels above and below amplifier.

2.87 Provide (1) Apple iPad Model “iPad Pro for remote mixing capabilities (color per customer preference). Software shall include all software updates up-to and including the date of final sign-off from the client.

2.87.1 11” Screen

2.87.2 Wi-Fi only

2.87.3 256-GB

2.87.4 Provide protective case

2.87.5 Provide Smart Keyboard Folio

2.87.6 All charging and power adapters

2.87.7 Asset Tag with District ID and engrave “Property of Pioneer Union Elementary School District” on the back of the iPad.

2.88 Provide (1) Roll-out Rotating AV equipment cabinet with fixed base and pivoting equipment area:

2.88.1 Height 89" x 33" overall depth (26"usable depth) x 24 width

2.88.2 Provide solid front locking solid door

2.88.3 (1) cabinet fan and control system, Model QBP-2A fan panel (120V, 100CFM, 32dB, Anodized)

2.88.4 Automatic thermostatic fan control, Model #FC-2-215-1CA

2.88.5 Provide side vent blockers for the vents on the top portion of the cabinet

2.88.6 Blank panel – Middle Atlantic # SB1 – Fill in all open spaces with blank panels

2.88.7 Middle Atlantic # WR-44-32 series

2.89 Rack Mounted Sequenced Power Control System in AV Cabinet

2.89.1 Power Switched/Sequenced outlets for complete activation and shut down control via the rack mounted controller.

2.89.2 Connect the rack mounted PDU/Controller to the sequenced power control "Pods" mounted in the rear of the AV Cabinet. See detail drawings for additional information. The Contractor shall be responsible for setting the proper sequencing for all Pods connected to the PDU/Controller and for all of the devices connected to the "Pods".

2.89.3 The "Pods" shall be connected to the PDU/Controller with an Eight-wire, RJ45 low voltage patch cable. The patch cable connections do not follow standard EIA/TIA or BICSI standards for the wiring configuration. DO NOT USE CAT-5E or CAT-6 type data patch cables for the connections from the "Pods" to the PDU/Controller. Refer to the manufacturer's installation practices and manual to insure the proper wiring configuration to used.

2.89.4 Rack Mounted PDU/Controllers; Provide (2) 19" rack mounted 120V 20-Amp PDU/Controllers with (3) sequenced duplex receptacles and (1) unswitched single receptacle on the rear of the PDU. PDU/Controller shall have a built-in circuit breaker, AC line surge protection, a multi-stage AC line filter and three event sequencing ability. PDU/Controllers shall be furnished with a 120V, 20-Amp, L5-20P input plug with 10-foot single phase power cord connection. Provide PDU/Controllers as manufactured by Juice Goose Model #CQ-1520. Plug PDU/Controllers, one each into the (2) duplex receptacles in the rear of the cabinet.

2.89.5 Power Strip; Provide a power strip for power to plug in the low powered equipment. The power strip shall be plugged into one of the PDU/Controllers so that the equipment connected to it may be brought up in the proper sequence. Mount in the rear of the cabinet. Power strip shall be provided with a 3-year warranty. Provide (1) Juice Goose Model #JG11.20. Refer to the detail drawings for additional requirements.

2.89.6 Provide (2) 120V, 20-Amp duplex receptacles in the rear of the AV Cabinet for sound system power connections. Contractor shall coordinate with the 260000 Electrical Contractor for location of duplex receptacle and hard wired connections to the "Pods" in the rear of the AV cabinet.

2.89.7 (1) PDU/Controller shall be mounted in the cabinet, just above the amplifiers. (1) PDU/Controller shall be mounted in the cabinet, just above the Mixer and the power strip shall be mounted in the rear of the cabinet on the rear rack rails in a convenient location for plugging in the low powered equipment.

2.89.8 Amplifiers shall be connected to the Sequenced Power Control, FIRST, then Mixer and other equipment shall be connected to the PDUs and power strip. Contractor shall evenly distribute the power requirements across the PDU circuits. The small, low powered equipment such as the ADA Transmitter, Microphone Receivers, fan controller, etc. shall be connected to the power strip outlets mounted in the rear of the cabinet one the rear rack rails.

2.89.9 Contractor shall furnish the Project Engineer with a detailed summary of the electrical connections to the PDU/Controller and sequencing Pods and the proposed outlet sequence to show proper delay for system start-up and shut down.

2.89.10 The Ethernet Switch in the AV Cabinet must not be plugged into the power sequencer or any outlet controlled by the sequencers. The Ethernet Switch shall be plugged directly into one of the duplex outlets in the back of the AV cabinet.

Provide an extension cord as required to allow the Ethernet Switch to be plugged into the duplex outlet and still be able to pull out and rotate the rack.

2.90 Provide (1) rack mount 18-Port Gigabit PoE+ L2/L3 Managed Switch with US Power Cord in the Audio-Visual Rack exclusively for the AV system component connections. The audio-visual system components shall all be connected to the same switch unless otherwise noted on the drawings and wiring diagrams. Provide programming for PoE power only for devices requiring this.

2.90.1 PoE Self-Healing with auto-recovery and power scheduling

2.90.2 16 Gigabit 802.3af/at PoE+ ports (185W power budget) rear facing ports

2.90.3 Two Gigabit SFP ports

2.90.4 Full layer 2/3 support

2.90.5 802.1Q VLAN (with trunking) and QoS support

2.90.6 User selected green and blue front facing LEDs

2.90.7 Variable speed fans for quiet operation

2.90.8 Plug-and-play installation with intuitive management

2.90.9 Simple power management of PoE enabled devices

2.90.10 Compact design in standard 19"" rack-mount enclosure

2.90.11 Three-year limited warranty

2.90.12 (1) Luxul AMS-1816P Series

2.91 Provide Category-6 UTP patch cables as required to provide a full turn-key installation for the audio-visual system. See AV Wiring Diagram for additional requirements.

2.92 Provide (2) a low-profile spare equipment shelfs in the AV Cabinet. Provide shelf as manufactured by Middle Atlantic Model #UMS1-11.5 or approved equal.

2.93 All wall plates shall be the Extron Decora style for Audio/Video input locations. Provide a Decora trim ring as required at each location. Color of plates is to be confirmed by the Contractor prior to installation. Refer to the AV wiring diagram for input locations and wallplate requirements.

2.94 Contractor shall test all equipment for each system to insure proper operation with Laptop Computer Wallplates and all other input devices from the AV cabinet.

2.95 Tie the audio from all sources into the sound system rack and provide control for the audio inputs to work in conjunction with the video from the projector. Provide level control at the mixing board for the sources. Label clearly on mixing board and set up all programming for the iPad Mixer controls.

2.96 Motorized Projector lift with environmental protective housing and bottom trin ring and panel will be provided in the GYM where indicated on the floorplans. The contractor will

be responsible for installing the lift, housing, and projector with lens. Layout coordination must be done with all trades for proper location for conduits, backboxes, cabling and all seismic bracing.

2.96.1 110-120V Electrically Operated, Scissor Lift: Electrically operated, tight stacking scissor type, projector lift for lowering and retracting projector from ceiling storage location to position for show or service

2.96.2 Deliver motorized projector lifts in manufacturer's original, unopened, undamaged containers with identification labels intact.

2.96.3 Projector Attachment: Mounted to operating pan with universal projector mount. powder coated white color.

2.96.4 Draper model SLX14; Max lowering distance 14'2",retracted height-16 3/8" part# 100V-300251.

2.96.5 Provide (1) Optional Environmental Air Space Housing powder coated white color.

2.96.6 Provide (1) Optional ceiling closure panel-lipless

2.96.7 Provide (1) Optional key operated power supply key switch

2.96.8 Provide (1) Optional R2D7 RS232 interface for Serial Communication (Controls the "Show" position only)

2.96.9 Provide projector mount installed to upper lift plate

2.96.10 Provide lipless ceiling closure option

2.96.11 Provide the following inputs to projector and outputs at top of lift

2.96.11.1 (1) HDMI

2.96.11.2 (1) RS232(DB9)

2.96.11.3 (2) Cat6

2.97 Projector shall be Contractor Furnished and installed. Provide (1) projector and lens for the rear projection system in the GYM. The projector shall be as manufactured by Epson model # EB-PQ222OB 20,000 Lumens WU4K with appropriate custom short-throw lens 0.34 (based on actual throw length required in field). The projector shall be provided with all mounting systems and control systems. This projector shall be affixed to the shelf in the lift as shown to allow for the projector to be properly aligned with the screen. The image must fill the screen entirely with native resolution.

2.97.1 Contractor shall field verify lens required for the application prior to ordering the projector and lens. The installation throw distance is required to be confirmed and may require moving up to the next lens model.

2.97.2 Contractor shall install the projector with at least 500mm gap from surrounding wall or objects in order to ensure that the air intake/exhaust ports of the projector will not be blocked.

2.97.3 Contractor shall refer to the drawing details for the installation requirements for the projector. The projector mount shall be anchored to the lift structure. The Contractor shall be responsible for final design and installation of the projector structural support.

2.97.4 Provide (1) Peerless Mounts Heavy Duty Universal Projector Mount for Projectors up to 125 lb. This will be through-bolted directly to the underside of the top of the lift platform.

2.98 Detail drawings are intended to provide a minimum requirement for structural support and are to be used as a guideline. The Contractor shall be responsible for final design and installation of the projector structural support that shall meet at least the minimum requirements shown in the details. Contractor shall submit the installation details to the Project Engineer for approval prior to installation.

2.99 If the specified projector has been discontinued or out-of-production at the time of installation, the Contractor shall submit a viable alternative for approval by the Project Engineer, with a copy of the projector product cut sheets, image calculator and recommended lenses. Associated cost or change order requests shall be approved by the Project Engineer prior to ordering the proposed replacement.

2.100 Projector shall be furnished with a minimum (5) year warranty from the manufacturer

2.100.1 Provide Optoma 5 Year Limited Projector Extended Warranty

2.101 Provide tab-tensioned electric front projection screen where shown on the drawings. Contractor shall provide all hardware including, but not limited to, sliding wall mount brackets, all hardware, support systems and brackets and design drawings of proposed mounting configuration. Detail drawings are intended to provide a minimum requirement for structural support and are to be used as a guideline. Contractor shall submit the installation details to the Project Engineer for approval prior to installation.

2.102 Coordinate the screen location with the installation of the projector. Screen shall be mounted to allow for the projector to be installed 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.

2.103 Mount screen brackets to the in-wall backing and wall studs. Additional structural support shall be furnished and installed by the Contractor. The support of the screen may require a unistrut support system to be constructed or additional bracing members to be installed between the joists or framed members. Contractor to field verify the exact conditions prior to installation of the screen.

2.104 Draper Acumen XL V Electric Projection Screen electric tab-tensioned projection screen, 120" High by 192" Wide by 226" Diagonal at 16:10 aspect ratio loaded with projection screen surface by Draper TecVision XT1300X White 1.3 Gain. Screen will be recessed inside the ceiling. Contractor must coordinate the layout for backing, conduits and backboxes.

2.104.1 Standard black drop

2.104.2 Standard 100-120V (60Hz)

2.104.3 Standard Internal low voltage control

2.104.4 Key-operated on/off switch-installed where shown on the plans

2.105 Provide quantity of black out drop at the top of the screen as required to allow for the proper image size and locations. Field verify dimensions and black-out requirements prior to ordering the new screen. Image area shall begin below the front valance curtain at the top of the screen.

2.106 Provide RS-232 control option for remote control of the screens from the matrix switch. Provide cabling from the screen control module to the matrix switch in the AV Cabinet via the conduits/raceway located at the projector. See the floor plans for further information. Provide the low voltage wall switch for control of the screen manually. Provide cabling from the control module to the manual screen control switch. The screen shall also be controlled from the TLP Control Panel. Provide programming and wiring connections to allow for screen up/down, on/off controls and pages from the TLP Control Panel.

2.107 Provide keyed lock switch for screen control adjacent to the LC

2.108 Provide any additional items as shown on the A/V wiring details and diagrams.

PART 3 TRAINING

3.1 **Contractor will provide a minimum of 30 clock hours of on-site training for site Technical and Administrative/Teaching Staff on the Classroom A/V systems**. Training for personnel shall be provided by certified technology specialists. The scope of training shall encompass system operation and procedures. Technician training should include an integrated information overview, media retrieval procedures as well as operation 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. Contractor shall submit at training schedule to the District to coordinate which District Technical staff shall be trained.

3.1.1 Training for Teaching and Administrative Staff shall include basic system concepts. Faculty and staff shall be taught how to power on/off the system, control volume, access inputs, attach microphones, replace batteries, and test system for basic operations and all other operational requirements for daily use of the systems. Training shall include use and operation of audio devices, techniques and troubleshooting tips. Trainers shall incorporate hands-on techniques to maximize staff opportunity to incorporate into their curriculum that is both meaningful and targeted for their student needs. Clearly written *laminated* support materials should be provided to all training participants. Manual describing operation and use of the system shall also be provided.

3.1.2 Contractor shall provide on-site AV training from Extron by an Extron Trainer for the Technical Staff covering all the Extron components in the systems. All System Types - Contractor shall videotape at least (1) training session per each type of Classroom Audio-Visual System, in High Definition Video (minimum1080p format), and save to a flash drive to turn over to the District. Training video shall be retained as property of the District.

3.2 Trainers shall provide Site or District Technicians with an in-depth technical overview of sound system equipment. Training should include basic overview of all equipment manuals and troubleshooting concepts. Site and District Technicians will be trained to provide setup, operation and application of sound systems. Technicians shall be instructed in the proper operation to replace all components of the sound systems. Clearly written documentation and support materials must be provided for each system. Provide support materials in a three-ring binder clearly for each system. A training manual describing operation and use of the system shall also be provided.

PART 4 INSTALLATION AND EXECUTION

4.1 Verify that all electrical requirements including junction boxes, empty conduit and power circuits and receptacles are in place as shown on the drawings.

4.2 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 expressly defined herein.

4.3 Installation practices shall follow “standard broadcast wiring” and installation practices, as excerpted from “Recommended Wiring Practices, “Sound System Engineering”, (2nd Edition) D. Davis, and Performed to the highest standards of acknowledged industry practices. Upon request the Integrated Audio-Visual system Contractor shall furnish all equipment and labor to verify the compliance with the following:

Optical:

4.3.1 Center to corner light fall off shall be less than 50% for video/data projectors.

4.3.2 Center to corner light fall off shall be less than 35% for optical projectors.

4.3.3 Images shall be level and square with the appropriate aspect ratio.

4.3.4 Image shall be free from visible vibration.

Audio System:

4.3.5 Signal-to-noise ratio (including crosstalk): 55-dB minimum.

4.3.6 Total harmonic distortion: 0.1% maximum from 30 Hz to 15,000 Hz.

4.3.7 System frequency response: ±1.0 dB, 20 Hz to 20,000 Hz.

4.3.8 Program reproduction system with point-source loudspeakers: Flat response from 63 Hz to 2.5 kHz ± 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.

4.3.9 Sound output capability: Program levels of not less than 100 dB without objectionable distortion, rattles, or buzzes.

4.3.10 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:

4.3.11 Signal-to-noise ratio (peak to RMS, unweighted DC to 4.2 MHz): 55-dB minimum.

4.3.12 Crosstalk (unweighted DC to 4.2 MHz): 45-dB minimum.

4.3.13 Frequency response: ± 0.5 dB to 4.2 Mhz.

4.3.14 Line and field tilt: 2% minimum.

4.3.15 Differential gain: 3% maximum.

4.3.16 Differential phase: 2% maximum.

4.3.17 System timing sync coincidence: within 50 nanoseconds.

4.3.18 Color timing: ± 2% at 3.58 Mhz.

Radio Frequency (RF) System:

4.3.19 Visual Carrier level: +0 dBmV minimum and +16 dBmV maximum at system outlets for utilized channels.

4.3.20 Adjacent Channel Visual Carrier: 3-dB maximum differential at system outlets.

4.3.21 Non-adjacent Channel Visual Carrier: 0-dB maximum differential at system outlets.

4.3.22 Carrier-to-Noise Ratio: 42-dB minimum

4.3.23 Amplitude Response: Flat ± 1.0 Db

4.3.24 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.

4.3.25 Outlet-to-Outlet Isolation: 25-dB minimum.

4.4 Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.

4.5 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.

4.6 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.

4.7 Provide lacing bars for cable management in all of the sound systems cabinets. Contractor shall be responsible for providing neatly dressed cable bundles within the sound cabinet. Cables shall be dressed separately for Microphone and line level cables, speaker and monitor cables, control cables and power cables and video cables. All cables shall be neatly labeled with wrap around type written labels.

4.7.1 On the cable at the rear of the patch panel or termination 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).

4.8 All faceplates shall be labeled with type-written permanent labels securely attached to the faceplates identifying all A/V connections. (ie; Doc Cam, PC, DVD, etc.) Cables at the projector and A/V switch shall be also be labeled to match the faceplates.

4.9 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.

4.10 Group cables according to signals being carried. To reduce signal contamination, form separate groups for the following:

4.10.1 Power cables.
4.10.2 Control cables.
4.10.3 Video cables.
4.10.4 Camera cables.
4.10.5 Audio cables for signals less than minus 20 dBm.
4.10.6 Audio cables for signals between minus 20 dBm and plus 30 dBm.
4.10.7 Audio cables for signals above plus 30 dBm.
4.10.8 Broadband RF cables.

4.11 Run power cables, control cables, and high-level cables on the left side of an equipment rack as viewed from the back. Run other cables on the right side of an equipment rack.

4.12 Cut cables (except video, camera and RGBS cables, which must be cut to electrical length) to the length required by the run. 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.

4.13 Install no cable with a bend radius less than that recommended by the manufacturer.

4.14 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.

4.15 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.

4.16 Land all field loudspeaker wiring entering each rack at terminal devices prior to connection to equipment or devices. Land loudspeaker level control cables at screw or tubular clamp type barrier blocks on the left side of the equipment rack as viewed from the rear. Make all connections to screw-type barrier blocks with insulated crimp-on spade lugs. Size all lugs properly to assure low-resistance connections.

4.17 Separately dress, route and land microphone and line level cables directly to equipment.

4.18 Use only rosin core 60/40 tin/lead solder for all solder connections.

4.19 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 wire or cable shall be supported by a connection point. Provide service loops where harness of different classes cross or where hinged panels is to be interconnected.

4.20 Patch Panel Assignments: Wire patch panels so that signal “sources” (outputs from) appear on the upper row or a row pair and “loads” (input to) appear on the lower row of a row pair.

4.21 Patch Panel Designation Strips: Use alphanumeric identifications and descriptive information on patch panel designation strips. Number the jack positions in each horizontal row sequentially from left to right. Letter the horizontal jack rows sequentially from top to bottom. Include the alphanumeric identification of each jack on the functional block drawings, and on reproductions of these drawings that shall be mounted in an appropriate location near the patch bays.

4.22 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.

4.23 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.

4.24 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.

4.25 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 Testing upon Completion

4.26 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.

4.27 System field wiring diagrams shall be provided to the owner by the system Installer (Contractor) prior to completion of the installation.

4.28 All materials and installation shall be guaranteed to be free of defects in material and workmanship for two years after final acceptance of installation and test.

4.29 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.

4.30 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.

4.31 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

4.32 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.

4.33 Equipment Lists and Maintenance Manuals:

4.33.1 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:

4.33.1.1 Name, model, and manufacturer.

4.33.1.2 Complete parts drawings and lists.

4.33.1.3 Local supply for parts and replacement and telephone number.

4.33.1.4 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.

4.34 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

4.35 The Contractor shall maintain record drawings as specified in accordance with these specifications, and as noted below.

4.36 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.

4.37 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-Builts shall include copies of the floor plan drawings of each building, detailed As-built AV Diagrams including wire and connection type, elevations of all AV Cabinets, quantities of mic outlets and speaker locations, locations of all final cable routes, including conduits. In addition, the drawings shall include all outlet locations with cable identification label information.

END OF SECTION 27 20 00

SECTION 27 51 16 INTERCOM PAGING SYSTEM

PART 1 GENERAL

1.1 The contractor shall augment the existing public address, loud-speaking intercom, and class change signaling system. The system shall be a modular plug-in printed circuit board type. System shall provide DTMF signaling, dial tone, ringing and busy signals to allow full integration with the telephone system.

1.2 The contractor shall provide, loudspeakers, as shown on the drawings, or as noted in these specifications and provide and connect all conductors and terminal strips in cabinets and backboards necessary to provide for the functions and the requirements specified herein.

1.3 Related Specification Sections:

1.3.1 Section 26 01 00 - General Provisions
1.3.2 Section 26 05 33 - Conduit and Fittings
1.3.3 Section 26 05 19 - Conductors
1.3.4 Section 26 05 34 - Outlet and Junction Boxes

1.4 **Acceptable Intercom manufacturers shall be Bogen "Multicom 2000" to match the existing headend paging system.**

Quality Assurance

1.5 All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections. The distributor must also provide complete installation of all wiring and devices or equipment. All conduit and standard backboxes will be furnished and installed by the Division 26 Contractor. Supervised installation of the wiring and intercom/clock devices shall be permitted with the following conditions:

1.5.1 A letter will be required from the intercom/clock system manufacturer's representative certifying that the cable installation was completed in compliance with the manufacturer's recommended installation requirements.

1.5.2 The cables shall be tested in the presence of the manufacturer's representative. These tests will then be submitted to the electrical engineer.

1.5.3 The intercom/clock system shall be warranted by the manufacturer's representative per the contract agreement.

1.5.4 Installation of the telephone switch and or handset devices and all programming shall be provided by a manufacturer's certified installer.

1.6 The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least five years. The contractor shall utilize a duly authorized distributor of the equipment supplied for this project location with full manufacturer's warranty privileges.

1.7 The contractor shall show satisfactory evidence, upon request, that the supplier maintains a fully equipped service organization capable of furnishing adequate inspection

and service to the system. The supplier shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

1.8 Electrical Component Standard: Provide work complying with applicable requirements of CEC with state amendments including, but not limited to:

1.8.1 Article 250, Grounding.
1.8.2 Article 300, Part A. Wiring Method.
1.8.3 Article 310, Conductors for General Wiring.
1.8.4 Article 725, Remote Control, Signaling Circuits.
1.8.5 Article 800, Communication Systems.

1.9 EIA Compliance: Comply with the following Electronics Industries Association Standards:

1.9.1 Sound Systems, EIA-160.
1.9.2 Loudspeakers, Dynamic Magnetic Structures, and Impedance, EIA-299-A.
1.9.3 Racks, Panels, and Associated Equipment, EIA-310-A.
1.9.4 Amplifiers for Sound Equipment, SE-101-A.
1.9.5 Speakers for Sound Equipment, SE-103

1.10 UL Compliance: Comply with requirements of UL 50. The communication system supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal. The system shall also comply with PCC Part 68 Regulations.

1.11 Installation and start up of all systems shall be under the direct supervision of a local agency regularly engaged in installation, repair, and maintenance of such systems. The supplier shall be accredited by the proposed equipment manufacturers and be prepared to offer a service contract for system maintenance on completion of the guarantee period.

1.12 The agency providing equipment shall be responsible for providing all specified equipment and mentioned services for all equipment as specified herein. The agency must be a local authorized distributor of all specified equipment for single source of responsibility and shall provide documents proving such. The agency must provide written proof that the agency is adequately staffed with factory-trained technicians for all of the specified equipment.

1.13 The contractor shall guarantee availability of local service by factory- trained personnel of all specified equipment from an authorized distributor of all equipment specified under this section. On-the-premise maintenance shall be provided at no cost to the purchaser for a period of one (1) year from date of installation unless damage or failure is caused by misuse, abuse, neglect, or accident.

1.14 Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

Support

1.15 Telephone Support: Free telephone support must be provided during normal business hours from the manufacturer.

1.16 Remote Updates: All application software must be upgradable by modem without site visits and without interrupting normal operations of other applications.

1.17 Remote Maintenance and Diagnostics: The vendor must have full access to the system via modem to do all of the following without shutting down the system to users.

1.17.1 Direct access to data base.
1.17.2 Direct access to error logs.
1.17.3 Direct access to removable stoppage.
1.17.4 Defragment files and drives.
1.17.5 Start up and shut down any or all voice processes.
1.17.6 Run a program to check the disk.

Submittals

1.18 Phase I Submittal shall be made **within (20) working days** after the award of the contract by the District. This submittal shall include the following:

1.18.1 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:

1.18.1.1 Quantity of each type of equipment item.
1.18.1.2 Description of each item.
1.18.1.3 Manufacturer's Name and Model Number.
1.18.1.4 Manufacturer's Specification Sheet.
1.18.1.5 Equipment items which have individual components, will require that all component parts be listed individually.

1.18.1.6 Description of any specialty backbox requirements.
1.18.1.7 All wiring types required for installation of this system.

1.19 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 (1) data disk copy with files in a 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. Phase II submittals drawings shall include the following:

1.19.1 **Provide complete shop drawings to include:**

1.19.1.1 Complete floor plans showing the locations throughout the project of all receptacles, conduits, wireways, tray, pullboxes, junction boxes, equipment locations, and other devices.

1.19.1.2 Typical system riser diagrams, specialty equipment or rack revelations will be required to be provided, including equipment designations, punch block arrangements, and all intercom and other associated equipment.

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

1.20.1 Not including the qualifications of the installing contractor.

1.20.2 Not including all items listed in the above itemized description.

1.20.3 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.

1.20.4 Not including actual manufacturer's catalog information for proposed products.

1.20.5 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

Intercom

The intercom system shall interface directly to the specified phone switch. Providing two (2) consoles or telephones at the attendant position shall be considered in direct conflict with the intent of this specification and therefore shall be deemed not acceptable.

2.1 The intercom system shall be capable of expansion to accommodate 8 links of telephone communication including access to the Public Switched Telephone Network.

2.2 The central switch shall be a microprocessor controlled unit utilizing NMOS technology for memory, sensing, and logic control. The system shall lend itself to modular expansion to a total capacity of 240 stations.

2.3 The central switch shall utilize standard dual tone multi- frequency (DTMF) signaling for conformance with standard telephone practices. Those systems which utilize "smart" instruments which do not generate tones shall not be considered equal.

2.4 The central switch shall provide an RS232C serial data port for connection to a modem for off-site diagnostic functions by a distributor or manufacturer personnel. It shall be possible to determine circuit and software faults via these diagnostics and facilitate remote software changes.

2.5 Each classroom shall be equipped with a speaker.

2.6 The central switch shall be supplied with a **one-way** amplified communication path to locations equipped with speakers. The intercom amplifier shall be capable of delivering at least twelve (12) watts RMS and shall contain an automatic level control.

2.7 The system shall **not be** required to provide automatic switching of the talk path to a telephone mode, during the course of a call, should the telephone associated with the speaker be lifted from its cradle.

2.8 The system shall **not be** required to provide facilities for calling a staff (classroom) station by dialing the station number.

2.9 The system shall provide the capability of assigning speaker locations to any one or more of the eight (8) software programmable zones for zone paging or time tone signal

reception. Systems using a mechanical means (such as dip switches or jumpers) to assign zones shall not be acceptable.

2.10 Separate paging zones, each of which may be programmed in software to belong to any combination of zones. Initially zones shall be provided and programmed as follows:

2.10.1 One zone for all exterior speakers.
2.10.2 One zone for all interior speakers in all Classroom buildings.
2.10.3 One zone for all interior speakers in Administration buildings.
2.10.4 One zone for all interior speakers in Multipurpose buildings.
2.10.5 One zone for all interior speakers in Gym buildings.
2.10.6 One zone for district selected group of speakers.

2.11 Provide for the distribution of emergency announcements and for the distribution of manually activated tones to all locations with speakers from any authorized telephone.

2.12 The system shall provide a "priority line" for administrators. All system functions shall be accessible through the priority line. The "priority line" shall have override control of the "normal line".

2.13 The system shall be equipped with power amplifiers to facilitate the distribution of All-Call Announcements, Zone Paging, Emergency Evacuation Tones and Program Material.

Intercom System Components

2.14 **Interior recessed ceiling or wall speaker** - 8" loudspeaker unit with 25 volt multi-tap transformer and 6 oz. magnet. Provide square 2-piece ceiling baffle for mounting speaker unit, baffle shall have concealed speaker mounting studs. Utilize in all areas, classrooms, hallways, etc., Unit shall be flush mounted and shall be finished in white epoxy paint. See drawings for locations and quantities required.

2.15 **Exterior horn** - 15 watt paging talk back speaker-horn (weatherproof) with adjustable transformer tap (25 volt). See drawings for locations and quantities required.

2.16 **Exterior speaker** - provided recessed, waterproof sand color 8" square plastic faceplate. Atlas #SQLK-8 series with recessed enclosure or equal. Provide with 15watt loudspeaker Atlas # APF-15 or equal. See drawings for locations and quantities required.

2.17 **Surface mounted interior speaker** - 8" loudspeaker with 25 volt multi-tap transformer and 6 oz. magnet. The speaker/transformer shall be mounted in a wall mount enclosure. See drawings for locations and quantities required.

2.18 **Surface mounted exterior speaker** - 8" loudspeaker unit with 25 volt multi-tap transformer and 6 oz. magnet. Unit shall be surface mounted and shall be finished in white epoxy paint with tamper proof, weather proof grill, Provide with 15watt loudspeaker Atlas # APF-15 or equal. See drawings for locations and quantities required.

2.19 **Combination analog clock/speaker** - Provide single combination assembly to house one analog clock and one 8" loudspeaker with multitap transformer and 6 oz. magnet. Provide recessed backbox with white painted one-piece faceplate. See drawings for locations and quantities required.

2.20 **Combination digital clock/speaker** - Provide single combination assembly to house one digital clock and one 8" loudspeaker with multitap transformer and 5 oz. magnet.

Provide recessed backbox with white painted one-piece faceplate. See drawings for locations and quantities required.

2.21 Include 200'-0" of wiring for each spare speaker, include installation for each device an wiring to be added during construction. The contractor shall provide 10% spare speakers for each type indicated on the drawings, or 2 each which ever is greater. All devices not required for installation during construction shall be delivered to the district as spares.

Program Distribution Operation

2.22 The system shall provide facilities to distribute program material (i.e. music or radio broadcasts) all equipment shall be remote mounted from the telephone equipment. Provide with the following components.

2.22.1 To direct or select room(s) or areas to send the program, provide an easy-to-use color guided 8 position switch bank panel.

2.22.2 All equipment shall be housed in a “Middle Atlantic Products # MR-14S 23 1/2" deep x 29 1/8" high x 29 ½" wide “multirack” , complete with one #D3 5 1/2" high rack mount storage drawer, and rack mounted power strip located in the rear of the rack. Rack shall be located in the administration building, verify exact location at time of submittal. Include in bid all required wiring to connect this remote rack to the main Intercom equipment location, and a 100'-0" of 1" EMT conduit allowance for extension to this rack from the administration

PART 3 EXECUTION

3.1 Wiring enclosures, terminal cabinets, outlets, frames of cabinet racks and other enclosures shall be grounded. Furnish and install #8 type THWN, green grounding wire from main public address terminal cabinet to console equipment rack main terminal. Frame of console and all circuit wiring requiring grounding shall be grounded to ground system at equipment rack main terminal. All loudspeaker circuits and communication circuits shall operate balanced to ground. Bonding shall be provided to assure equal potential measurement between the chassis of all amplifiers, power supplies, etc. Bond to the control cabinet and the green grounding conductor of the power circuit serving the equipment.

3.2 Circuits shall be grounded as recommended by manufacturer or equipment to which they are connected unless otherwise specified.

3.3 All wiring shall test free of grounds and shorts.

3.4 All wiring for the complete system shall be new wire. Any wires pulled through in underground junction boxes shall be continuous with no splices in these boxes. The wiring shall be intact without cuts in the protective outer jacket. All splices shall be made at building communication cabinets or main backboard, using terminal strips in all cases.

3.5 All buildings which can not comply with NEC 800 -30 (FPN) #4 shall be properly protected for lightning and static electrical discharge. Provide all conductors entering or leaving the building with in line fuses, or 188 type blocks with gas tube protectors.

3.6 All telephone wires and cables installed shall contain all necessary conductors and/or cables to all devices shown on the Drawings and the contractor shall make all necessary conductor terminations to all devices for a complete system. All telephone wiring between

buildings shall be with multi-pair 25, 50, 100 , 200 or 300 count cables, provide 50% spare pair count within each cable to each building. **All Cables routed underground shall be suitable for wet location provided with UL listed wet location insulation or flooded type cable construction**.

3.6.1 Telephone cable shall be Lucent Technologies #ANMW series or approved equal with **maximum** cable OD as follows:

25 Pair cable	.61 in.
50 Pair cable	.77 in.
100 Pair cable	.99 in.
200 Pair cable	1.29 in.
300 Pair cable	1.48 in.

3.6.2 Unless where specifically noted otherwise on the drawings, provide individual multi-pair cables from the main equipment source to each building, do not breakout pairs from one building to another or daisy chain feeder pairs between buildings.

3.7 All intercom/ clock wires and cables installed shall contain all necessary conductors and/or cables to all devices shown on the Drawings and the contractor shall make all necessary conductor terminations to all devices for a complete system. All intercom/clock wiring between buildings shall be individual shielded cables to each speaker, provide 25% spare additional cables to each building. **All Cables routed underground shall be suitable for wet location provided with UL listed wet location insulation or flooded type cable construction**.

3.8 All cables shall be installed within conduits, boxes, and cabinets unless where otherwise indicated approved on the drawings. Where open cable is approved all cables shall be neatly bundled and supported from the structure.

3.9 Where cables not approved for open wire interior applications, are routed more than 50 '-0" through the building, install cables in interduct or EMT conduit.

3.10 All cables provided shall be UL listed.

3.11 All cables shall be delivered to the site in unbroken packages. Packages shall be inspected and approved by the District Inspector before opening.

3.12 All cabling shall be identified in each terminal cabinet and junction box. Where cables are routed through underground handholes each building and each system shall be identified with wet location ID tags.

3.13 Console and Cabinet Rack Equipment Installation: All equipment within each console and cabinet rack shall be logically arranged for accessibility of convenient maintenance. Equipment shall be mounted on shelves or panels and shall be securely attached. All cabinets and/or racks shall be seismically anchored to comply with T24 regulations.

3.14 Amplifiers, power supplies and other heavy devices shall be mounted on steel shelves made by manufacturer of console and cabinet racks. Cabinet, console, and panel faces, including drawers shall be same color.

3.15 Wiring within console and cabinets shall be installed to conform to standard engineering practice, and shall be terminated on terminal strips having a terminal for each required

external connection. Wiring shall be cabled, laced and securely fastened in place so that no weight is imposed on any equipment, control switches or terminals. Wires carrying audio power shall be shielded. Input and output circuits and terminal strips shall be installed to provide separation necessary for proper operation. Wires shall be identified by number and chart.

3.16 Conductor shields for each system shall be grounded at one location only. Grounding shall be done within console and cabinet racks. There shall be no metallic connection between systems. Conduits for system and 120 volt AC system shall be bonded together at console and all cabinet racks.

3.17 120 Volt AC supply shall be connected from each piece of equipment directly to power strips provided by system supplier. The power strip shall be provided with a “SO” type power cord to connect to the building power receptacle.

3.18 Lines and cables within cabinets and on main terminal backboards shall be carefully cable-strapped. Cables shall be formed in rectangular configuration. Each cable shall be properly numbered in numerical order and shall maintain same number throughout site.

3.19 Conductors shall be color-coded and individual cables shall be rung out, and tagged with code wire markers. Each cable index strip shall be typed and installed on terminal cabinet door.

3.20 Terminations and connections throughout system shall be on terminal blocks, except at equipment which requires removal for servicing. Connections to such equipment and cables shall be screw-terminal type or plug-in type. Cables shall be identified as to buildings and rooms served, and terminated in all terminal cabinets and backboards.

3.21 Blocks shall be mounted in vertical rows only. Cable with lowest number shall be terminated on upper left side, with next cable in numerical order just below first cable and so on. When left side of first row of blocks is full, next cable in numerical order shall be terminated on the upper right side of first row of blocks, and so on.

3.22 Do not pass grouped cables in area that is to be used for jumpering. Cables shall enter blocks from top or bottom only, and shall not be in same area as jumper wires.

3.23 Contractor shall submit shop drawings to the Architect, for approval, indicating proposed wire tag designations for cables and terminal block layout for all terminal cabinets and backboard locations.

3.24 For all wall mounted handset locations the contractor shall furnish and install wall plates to allow for flush mounting of the handset. Where infrastructure cabling in installed by other contractors the supplier of the handset devices shall furnish required plates to the cabling contractor or replace the plates at the time of handset installation.

3.25 Where any digital phone location is located more than 1000 cable feet from the telephone switching equipment, the contractor shall provide a remote switch node or other equipment to properly amplify the signal to those locations.

General Performance Requirements

3.26 Contractor shall compile all data needed (room names, room numbers, drawings with station locations, etc.) to program the complete system. System programming shall be limited to features specified in this Specification.

3.27 Reproduction of speech shall be clear, high fidelity, and with all frequencies within range of system faithfully reproduced with no detectable noise, hum, or distortion.

3.28 Reproduction shall be attained at sound levels sufficient to override noise levels typical for schools, to provide a thoroughly satisfactory and serviceable system.

3.29 Audio level of telephone intercommunication system shall be attained at sound levels sufficient to override noise levels typical for schools, to provide a thoroughly satisfactory and serviceable system with a minimum of 70 dB isolation between public address and intercommunication signals. The contractor shall adjust the individual speaker taps at any location the district requires lower or higher sound levels.

Inspection and Test upon Completion

3.30 Check out and final connections to the system shall be made by a factory-trained technician in the employ of a manufacturer of the products installed. In addition, factory-trained technicians shall demonstrate operation of the complete system and each major component to the Owner.

3.31 System field wiring diagrams shall be provided to the owner by the system manufacturer prior to completion of the installation.

3.32 All materials and installation shall be guaranteed to be free of defects in material and workmanship for two years after final acceptance of installation and test.

3.33 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.

3.34 Upon completion of the installation of the equipment, contractor shall provide to the owner a signed statement from the equipment manufacturer that the system has been tested and functions properly according to the specifications.

Operation and Training

3.35 Develop and conduct station user and operator training programs and provide user guidebooks specifically designed for the system being installed. The contractor will be responsible for training every employee of the District at each school site on the PABX, call processing, and voice mail systems functionality. Contractor shall properly instruct the School Principal and all other school site staff members in small groups of 6-10 person sessions. The office administration staff (maximum of 10 persons) shall be provided with two separate training sessions one at the beginning of the training period and an additional training session one month later or at the end of all other training groups. In general, training must be able to start a minimum of five (10) working days prior to a system's completion date. Project training periods shall be scheduled to occur during the normal school day.

3.36 The contractor shall provide (2) training sessions for two to four employees from the School District Maintenance group. The training shall be for all equipment and devices furnished in this section of the specifications. In general, training must be able complete to allow the district to perform all typically required day-to-day "Move, Add and Change" software programming and management tasks on all proposed products. Bidders MUST include in the total cost all such training, required books and support materials.

3.37 The training shall be provided by the manufacturer of the equipment or authorized dealer, and shall include all instruction, tools, and equipment necessary for installation service maintenance and programming of the equipment and devices.

3.38 Manuals: One copy of an operation manual must be supplied with each telephone instrument, with 10 spare copies delivered to the district.

3.39 Three (3) separate visits shall be conducted by the Contractor, at four (4) month intervals during the warranty period, in order to verify that each system component and the complete system is functioning correctly. The inspection visits shall be conducted at times which shall be during the normal school day. The contractor shall be required to reprogram any stations or functions at any telephone (not to exceed 10 % of the originally installed stations) requested by the district or school site staff.

3.40 Warranty service calls made by telephone to this Contractor or his designated representative shall hereby be defined as proper notification that warranty service is required.

END OF SECTION 27 20 00

SECTION 28 01 00 ELECTRONIC SAFETY AND SECURITY GENERAL PROVISIONS

PART 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 28 01 00

SECTION 28 13 00 SECURITY SYSTEM

PART 1 GENERAL

1.1 Furnish all materials, equipment and labor, and perform all operations in connection with systems work as indicated on the drawing, as specified herein and required to complete the work.

1.2 Related Specification Sections:

1.2.1 Division 26 05 33 – Conduit and Fittings
1.2.2 Division 26 05 19 or 26 05 13 – Conductors
1.2.3 Division 26 05 34 – Outlet and Junction Boxes

1.3 All security system components shall be manufactured by and wiring shall be furnished and installed by a factory authorized contractor and distributor. The Contractor shall hold a license from the State of California for the purpose of installing security systems.

1.4 The contractor shall be regularly engaged in the installation and repair of the type of equipment to be installed.

1.5 The conduit, outlets, terminal cabinets, device backboxes, etc., which form a part of the rough-in work, shall be furnished and installed complete by the Contractor. Security system components as listed under products shall be furnished and installed by the authorized subcontractor.

1.6 The subcontractor shall furnish all equipment, accessories and material required for the complete installation of a security system in accordance with specifications and as shown on the drawings. Any material and/or equipment necessary for the proper operation of the system not specified or described herein shall be deemed part of this specification. The distributor must also provide complete installation of all wiring and devices or equipment. Supervised installation for the wiring and devices shall be permitted with the following conditions:

1.6.1 A letter will be required from the security system manufacturer's representative certifying that the cable installation was completed in compliance with the manufacturer's recommended installation requirements.

1.6.2 The cables shall be tested in the presence of the manufacturer's representative. These tests will then be submitted to the electrical engineer.

1.6.3 The security system shall be warranted by the manufacturer's representative per the contract agreement.

1.7 Phase I Submittal shall be made **within (20) working days** after the award of the contract by the District. This submittal shall include the following:

1.7.1 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:

1.7.1.1 Description and quantity of each item.
1.7.1.2 Manufacturer's Name and Model Number.
1.7.1.3 Manufacturer's Specification Sheet.
1.7.1.4 Description of any specialty backbox requirements.

1.8 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 (1) data disc copy with files in a AutoCAD 2000i or 2004 format. Building floor plan CAD files on disc 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 lesser. 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. Phase II submittals drawings shall include the following.

1.8.1 Provide complete shop drawings to include:

1.8.1.1 Complete floor plans showing the locations throughout the project of all receptacles, conduits, wireways, tray, pullboxes, junction boxes, equipment locations, and other devices.

1.8.1.2 Typical system riser diagrams, specialty equipment or rack elevations will be required to be provided.

1.9 The contractor shall provide as part of this contract additional ceiling motion sensors, wall motion sensors, glass-break sensors, security door and roof hatch contacts 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 conduit, boxes and wiring of these devices shall be included, and required locations coordinated with final approved shop drawings. Any deices 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 1 submittals.

1.10 Common submittal mistakes which will result in submittals being rejected:

1.10.1 Not including the qualifications of the installing contractor.

1.10.2 Not including all items listed in the above itemized description.

1.10.3 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, r crossing out the items which are not applicable.

1.10.4 Not including actual manufacturer's catalog information of proposed products.

1.10.5 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 **Building Security System**

2.2 Control Panel

2.2.1 The Control/Communicator panel is existing and is a multiplex micro processed based system as manufactured by **Tyco DSC Maxsys PC4020. Contractor must be a certified installer/ distributor for DSC.**

Systems or components as manufactured by Moose, Napco, Radionics or any other manufacturer's which are not specifically listed in 2.2.1, are **not** approved for use on this project.

2.3 Provide a complete and operable supervised intrusion detection system as shown on the plans including, but not limited to, master control panel, key pad stations, motion detectors, door switches, and a digital communicator.

2.3.1 Upon detection of an intruder by initiation of any device in the system, the system shall cause alarm information to be sent by digital dialer to central station alarm monitoring agency.

2.3.2 System detectors located in areas provided with keypad control shall be programmed to have a 30 second entry delay.

2.3.3 The Gym area shall be provided with a keypad able to arm or disarm as a separate zone for all detectors. Provide with locking cover.

2.3.4 Each remote building shall be wired as a separate zone with all detectors within that zone controlled separately.

2.3.5 The Control/Communicator panel shall be with an integral digital communicator and shall be Underwriters Laboratories listed. All external circuit connections shall be UL listed as power limited in accordance with the provisions of Article 725 of the National Electrical Code (NFPA Standard #70).

2.3.6 System shall include the following features:

2.3.6.1 128 individual multiplex zones.
2.3.6.2 Battery charging circuit.
2.3.6.3 Accepts 90 personal ID numbers.
2.3.6.4 (15) keypad capacity.
2.3.6.5 (8) system partitioning.
2.3.6.6 Multiplex bus driver.
2.3.6.7 Lightening and RFI protection.
2.3.6.8 Central Station reporting.
2.3.6.9 Two telephone numbers with selective signaling options.

2.3.6.10 Automatic test reports.
2.3.6.11 400 event history buffer.
2.3.6.12 Remote or keypad programmable.
2.3.6.13 Audible alarm output, steady or pulsed.
2.3.6.14 Automatic silencing.
2.3.6.15 Battery backup.
2.3.6.16 Dual phone line module.
2.3.6.17 WDSRP software.

2.4 Alarm information shall be sent by digital dialer to a central station alarm monitoring agency.

2.5 Systems shall detect the entry and/or the motion of a body taking not more than four steps in an area secured with motion detection equipment where entry doors or windows are possible access.

2.6 System shall be zoned with each building controlled separately so that portions of the facility may be secured while others remain unsecured. All zones shall be able to be armed or disarmed from the master keypad in the administration building.

2.7 Keypads shall be DSC LCD 4500 display series capable of displaying system status and controlling the alarm system. Unit shall receive its operating power from the main control panel. Keypad shall be surface-mounted on a wall where shown on the plans.

2.8 DSC 8-Zone expander PC4108

2.9 Provide Combus four conductor cable to which all modules are connected in parallel.

2.10 Provide a DSC PC4204 power module is required if additional current is needed either for powering detection devices or operating bells and sirens

2.11 Motion sensors shall be dual passive infrared with microprocessor controlled self test. Sensor coverage patterns shall be as required for optimum coverage at each individual location. Sensor shall be ceiling or wall mounted as shown on the drawings.

2.11.1 Ceiling Sensor – Detection Systems # DS936 Motion detector 360° ceiling 24ft

2.11.2 Wall Sensor – DS778 Motion detector, long range, 200ft (60m)

2.11.3 Exact Sensor location in each room shall be field determined, per manufacturer's instructions. Occupancy sensor manufacturer shall provide 1/8" scale drawings indicating the required location and quantities for each room or area where sensors are indicated. Drawings shall be included with the Phase II submittals.

2.12 Cabling shall be as required for system operation.

PART 3 EXECUTION

3.1 Determine the current draw on the main panel and each system component used to ensure the system requirements can be met (see 2.4 ”Current Ratings – Alarm Control Panel and Modules’). Calculate each wire run using the Combus wiring guidelines. Determine which wire gauge should be used and where to place PC4204/PC4204CX modules to re-power the Combus.

3.1.1 For Addressable devices, determine where each device is to be located and consult the Addressable Loop wiring guidelines to determine wire guage and wiring lengths.

3.2 All connections throughout the system shall be soldered, crimped by means of AMP lugs, fastened with screw type terminals, made by spring tension clip "punch block" terminals or made by standard plugs and receptacles. Each wire twisted pair or cable shall be tagged throughout the site with EZ markers with the room number it serves. All conductors in terminal cabinets shall be carefully formed and harnessed in a workmanlike manner.

3.3 All security system cabling shall be installed in conduit where indicated on the drawings or where routed exposed and shall be open wiring where routed above accessible ceilings or in walls.

3.4 Locate motion sensors on walls to provide optimum coverage of the space and to not conflict with the architectural aesthetics of the building. Locations of motion sensors as shown on the electrical plans are diagrammatic only.

3.5 Keypads shall be wired not to exceed 1000 ft cable run from the main control panel and no more than two (2) keypads per 1000-foot cable run. Provide #18AWG minimum. **All Cables routed underground shall be suitable for wet location provided with UL listed wet location insulation or flooded type cable construction.**

3.6 Final System Acceptance

3.6.1 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.

3.6.2 Once the system has been tested, 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 two 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, than another time shall be provided. The training shall consist of the following:

3.6.2.1 Provide a minimum of one (1) two-to-four-hour training period located at the project site, to instruct District personnel in proper operation of all systems.

3.6.2.2 Provide a minimum of three (3) complete owner operation manuals for the district records.

3.6.2.3 Provide a minimum of two (2) complete as built sets of drawings for the district records.

3.6.2.4 Provide all spare parts as described in Part 1 of these specifications

3.6.2.5 Provide written confirmation and proposed scheduled dates for follow up training and one-year complete system test.

3.6.2.6 Provide a proposed cost to the owner to provide additional complete system testing on an annual basis, in addition to the one-year test required as a part of this contract.

3.7 Follow-up Training

3.7.1 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 (1) two-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.

3.8 One Year Complete System Test

3.8.1 Provide as a part of this contract after a period of one (1) year from the final acceptance of the system the contractor shall return to provide a 100% test of all devices and the operation of the system including battery tests. All test results shall be documented and results provided to the owner. All defective parts shall be replaced at no cost to the owner.

END OF SECTION 28 13 00

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 72-2022. . . . . National Fire Alarm Code with California Amendments.
CBC - 2022. . . . . California Building Code (CBC), Part 2, Title 24, CCR.
CEC - 2022. . . . . California Electrical Code, (CEC), Part 3, Title 24, CCR.
CFC - 2022. . . . . 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.

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 Fire Alarm system and installation shall meet all of the following DSA Requirements:

1.6.1 Applicable Standard NFPA 72, as adopted and amended in CBC Chapter 35

1.6.2 A stamped set of approved fire alarm design documents shall be on the job site and used for installation.

1.6.3 Any discrepancies between the drawings and the code or recognized standards shall be brought to the attention of DSA and the architect/engineer of the project.

1.6.4 Wall mounted visible notification devices shall have their bottoms mounted at 80” minimum and 96” maximum from finished floor.

1.6.5 Wall mounted Audible devices shall have their tops mounted at 90” minimum and 100” maximum from finished floor and no closer then 6” to a horizontal structure.

1.6.6 Audible devices shall provide a sound pressure level of 15 decibels (dBA) above the average ambient sound level or five dBA above the maximum sound level having a duration of at least 60 seconds, whichever is greater, in every occupiable space within the building.

1.6.7 Audible devices shall be synchronized temporal code 3 pattern.

1.6.8 The contractor shall adjust/install all devices to maximize performance and minimize false alarms.

1.6.9 Visible devices shall not exceed two flashes per second and should not be slower than one flash every second. The device shall have a pulsing light source not less than 15 candela. Visible devices within 55’ from each other shall be synchronized.

1.6.10 Underground and exterior conduits to have watertight fittings and wire to be approved for wet locations.

1.6.11 All fire alarm wiring shall be FPLOR FPLP (fire power limited or fire power limited plenum) as required for application. Wiring in conduit above grade may be type THHN or THWN.

1.6.12 Smoke detectors shall not be any closer than 1’ from fire sprinklers or 3’ from any supply diffuser. In area of construction or possible damage/contamination on newly installed fire alarm, devices shall be covered until that area is ready to be turned over to owner.

1.6.13 Fire alarm panel, remotes, and components shall be secured to mounting surfaces per manufacturers specifications. No single device shall exceed 20 lbs without special mounting details.

1.6.14 A dedicated branch circuit shall be provided for fire alarm equipment. This circuit shall be energized from the common use area panel and shall have no other outlets. The breaker shall have a red locking device to block the handle in the “on” position. The circuit breaker shall be labeled “Fire Alarm Circuit Control” Circuit ID to be labeled at fire alarm panel/extenders.

1.6.15 The installing contractor shall provide a completed “System Record of Completion” per NFPA 72, figure 17.8.2.

1.6.16 Fire alarm control panels and remote annunciators shall be installed with their bottoms mounted at 48” above the finished floor.

1.6.17 Provide Microphones associated with emergency voice alarm communication systems (EVAC). It shall be accessible for use. Installed in compliance with CBC sections 11B-305 and 11B-308.

1.6.18 The installing contractor shall provide system programming for supervisory monitoring per CBC section 901.6.2.

1.6.19 Supervisory monitoring shall be tested and verified as sending correct signals in conjunction with final acceptance test.

1.6.20 Owner shall be responsible for establishing a fire system monitoring contract or provisions.

1.7 Submittal shall be made **in accordance with Division 26 01 00 – Shop Drawings and Submittals.** This submittal shall include the following:

1.7.1 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:

1.7.1.1 Quantity of each type of equipment item.
1.7.1.2 Quantities of 10% spare devices as per 1.16.
1.7.1.3 Description of each item.
1.7.1.4 Manufacturer's Name and Model Number.
1.7.1.5 Manufacturer's Specification Sheet.
1.7.1.6 Back box type and dimensions per device type.
1.7.1.7 California State Fire Marshall Listing Sheets for all components.
1.7.1.8 Equipment items which have individual components, will require that all component parts be listed individually.

1.7.2 **Provide complete shop drawings to include the following:**

1.7.2.1 Complete floor plans, at scale of contract documents, showing the locations throughout the project of all receptacles, conduits, wireways, tray, pullboxes, junction boxes, equipment racks, and other devices.

1.7.2.2 Point to point wiring diagrams showing wiring from panel terminals to each device.

1.7.2.3 Scaled floor plans indicating the location of devices, conduit runs, types, and number of conductors.

1.7.2.4 Riser diagram indicating all wiring and circuits.

1.7.2.5 Current State Fire Marshal listing sheets for all components and devices.

1.7.2.6 Provide battery power supply calculations, indicate point of power supply connection, means of disconnect, over-current protection, etc. for each panel.

1.7.2.7 Provide detailed information on conductors to be used-manufacturer, type, size, insulation, etc.

1.7.2.8 Provide voltage drop calculations for all conductor run is from each panel (i.e., main FACP, remotes, power extenders, etc.) for each panel.

1.7.2.9 Provide written sequence of system operation matrix.

1.7.2.10 Provide list of zones. (Every device that is addressable.)

1.7.2.11 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.

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.

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 **EDWARDS.**

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 is existing Edwards EST2 in existing Building A.

2.2 Provide new fire alarm control panel in new building:

2.2.1 Fire alarm control panel shall be Edwards EST3 and provide Voice Evacuation.

2.2.2 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.

2.2.3 The fire alarm control panel shall be housed in a lockable, code gauge steel cabinet with 80character LCD display, master controller operators 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.

2.2.4 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.

2.2.5 Provide a minimum 100 watts of amplification in each FACP with a minimum of 25% spare capacity.

2.2.6 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.

2.2.7 The unit shall also provide a minimum of (2) class B strobe circuits with additional circuits as indicated on the drawings.

2.2.8 The fire alarm control panel shall be capable of providing a walk test.

2.3 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.

2.4 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.

2.4.1 Provide external battery cabinet to house DC batteries directly below fire alarm panel when fire alarm panel cabinet cannot accommodate the battery size required.

2.5 The master fire alarm panel shall be equipped with a manual pull lever type, supervised report station.

2.6 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.

2.7 REMOTE POWER SUPPLIES shall provide a minimum of (4) Class B NAC circuits.

2.7.1 Remote Power Supplies shall be provided adjacent to each Fire Alarm Control Panel that is incapable of supporting NAC strobe circuit(s). Refer to Fire Alarm Riser Diagram for quantity of strobe circuits required at each of these Fire Alarm Control Panels and provide additional Remote Power Supplies as required.

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-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 California Amendments (2022).

2.9.2 Speakers/strobe devices used for Carbon Monoxide alarm must not reflect the word FIRE or have any fire symbol thereon.

2.10 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.

2.10.1 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 (2022).

2.10.2 Maximum pulse duration to be 0.20 of a second with an ADAAG 4.28.3(3). Visual alarms maximum duty cycle of 40%.

2.10.3 Capable of providing minimum candela. Intensity as shown on plans (effective strength measured at the source).

2.10.4 The flash rate to be a minimum of 1 Hz and a maximum of 2 Hz per NFPA 18.5.3.1.

2.10.5 Fire Alarm Strobes used for Carbon Monoxide alarm must not reflect the word FIRE or have any fire symbol thereon.

2.11 SMOKE DETECTOR DEVICES shall be analog addressable, photo-electric.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER. The control panel shall meet the requirements of UL 864 for central station connections, and shall be UL listed for use with the fire alarm control panel. The communicator shall be connected to supervise two telephone lines, all wiring required for this connection shall be provided by the fire alarm contractor Coordinate interface with District monitoring company as required.

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.

3.2.1 Relays initiating HVAC unit automatic shutdown and controlling fire/smoke dampers, door holders, fire curtains, fire/smoke vents and other systems that require connection and control from fire alarm system shall be located within three feet of the fire alarm control panel where the relays are connected. The drawings indicate diagrammatic locations for these devices.

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/fire alarm panel 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.

3.4.1 Provide external battery cabinet to house DC batteries directly below terminal cabinet/fire alarm panel when cabinet cannot accommodate the battery size required.

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 The Fire Alarm Control Panel shall be programmed to produce both 3-pulse temporal pattern and 4-pulse temporal pattern where Carbon Monoxide audible and visual notification devices are installed as part of the Fire Alarm System.

3.15 Final System Acceptance

3.15.1 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 sound-tested for audibility in all spaces requiring voice evacuation. This testing shall be performed in the presence of the project electrical engineer. Adjust speaker taps or provide additional speakers as required to provide correct audibility.

3.15.2 Beam detectors shall be tested by two methods:

3.15.2.1 Manual slow cover test to confirm reflector alignment is correct.

3.15.2.2 Software fire test per UL268.5 to demonstrate when signal level is reduced simulating obstruction the detector will go into alarm.

3.15.3 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.

3.15.4 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.

3.15.4.1 DOCUMENTATION CABINET shall be provided at the control panel and prominently labeled, “SYSTEM RECORD DOCUMENTS”. All record and testing documentation shall be stored in this cabinet. Contents shall be accessible by authorized personnel only.

3.15.5 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:

3.15.5.1 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.

3.15.5.2 Provide a minimum of three (3) complete owner operation manuals for the District records.

3.15.5.3 Provide a minimum of two (2) complete as built sets of drawings for the District records.

3.15.5.4 Provide all spare parts as described in part 1 of these specifications

3.15.5.5 Provide written confirmation and proposed scheduled dates for follow up training and 1-year complete system test.

3.16 Follow up Training

3.16.1 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.

3.16.2 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.

END OF SECTION 28 30 01

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Remove surface debris.

B. Remove paving, curbs, foundations and surface improvements.

C. Clear site of plant life and grass.

D. Remove trees and shrubs.

E. Remove root system of trees and shrubs.

1.02 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris. Burning debris on site not permitted.

B. Coordinate clearing work with utility companies.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earthwork."
   1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that existing plant life and features designated to remain are tagged or identified.

3.02 PROTECTION

A. Protect utilities that are designated to remain from damage.

B. Protect trees, plant growth and features designated to remain as final landscaping.

C. Protect bench marks and designated existing structures from damage or displacement.

D. Erect barricades in accordance with Title 8, Subchapter 4, Construction Safety Orders, California Code of Regulations.

E. Protect existing items not indicated to be altered.

3.03 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove paving, curbs, foundations and surface improvements. Patch and repair surfaces not indicated to be removed.

C. Remove trees and shrubs indicated. Remove stumps, main root ball, root system to full depth.

D. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

E. Clear undergrowth, grass and deadwood. Protect plant material not scheduled for removal.

F. Keep site free of dust by sprinkling with water. Maintain adequate water trucks, hoses and water supply.

G. The limits of clearing and grubbing shall be the area of new construction

H. Remove all trash, rubbish and all other material not suitable for construction operations.

I. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

J. Use only hand methods for grubbing within tree protection zone.

K. Chip removed tree branches and dispose of off-site.

L. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground or compact to 90 percent of maximum dry density per ASTM D1557. Bring grade to match surrounding surfaces.

3.04 REMOVAL

A. Remove debris, rock and extracted plant life from site as work progresses. Dispose legally.

B. Burial of removed materials not permitted.

C. Use of Owner's disposal system not permitted. Do not use disposal system belonging to any other property Owner.

D. Loose fill material, buried trash, abandoned underground structures or deleterious materials of any kind encountered shall be identified and removed to expose natural earth.

END OF SECTION 31 10 00

SECTION 31 23 15 - SITE EARTHWORK AND BUILDING EXCAVATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Site earthwork preparation.

B. Excavation for building foundations within building area.
   1. Building Area: Areas indicated on Drawings, plus 5 feet minimum beyond footing lines, including covered walks.

C. Excavation for site structures.

1.02 REFERENCES

A. ASTM D 1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort.

B. AQMD – South Coast Air Quality Management District, Local Regulations, Rule 403 for Fugitive Dust.

1.03 GENERAL REQUIREMENTS

A. Existing Conditions: Contractor shall examine site of Work and verify existing conditions under which work will be performed, including known subsurface conditions.

B. Drainage and Pumping: Maintain excavations and site free from water throughout work. Run surface water or seepage to sumps with float-switch controlled pumps. Pump to drainage system as approved by Architect.

C. Protection: Provide and maintain protection to retain earthbanks, and protect adjoining existing monuments, grades and structures from caving, sliding, erosions or other damage and provide suitable forms of protection against bodily injury or property damage.

D. Provide barricades and berms at top of slopes to prevent water from flowing over top

E. Borrow. Fill, backfill, aggregate base, and other soil materials obtained from off-site sources shall be sampled and tested in compliance with CA EPA Department of Toxic Substances Control recommendations to prevent the importation of contaminated materials to the Site.
   1. Testing Frequency
      a. For borrow up to 1,000-cu.yrd, conduct 1 test for each 250-cu.yrds.
      b. For borrow between 1,001- and 5,000-cu.yrd; conduct 4 tests for first 1,000- cu.yrd, if material tests acceptable, conduct 1 test for each additional 500-cu.yrds.
      c. For borrow over 5,000-cu.yrds, conduct 12 tests during import of first 5,000-cu.yrd, if material tests acceptable, conduct 1 test for each additional 1,000-cu.yrds.
   2. Owner's Testing Laboratory shall take samples at source, conduct testing and evaluate test results prior to delivery.
   3. Conduct tests for lead and other heavy metals, asbestos, PCB's, pesticides, herbicides, VOCs, and semi-VOCs.
   4. When detectable quantities of hazardous materials are found, determine the risk to human health, the environment, or both using the DTSC Preliminary Endangerment Assessment Guidance Manual.
   5. Do not import soils that exhibit a known risk to human health, the environment, or both.

1.04 SUBMITTALS

A. Compaction Report indicating requirements per ASTM D1556.

B. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.05 FIELD CONDITIONS

A. Geotechnical Investigation Report has been prepared under direction of Owner. Geotechnical Investigation Report is hereby referenced as information for Work of this Section. Architect assumes no responsibility for conclusions Contractor may draw, from information provided. Contract Documents take precedence over recommendations that may be contained in Geotechnical Investigation Report and Contractor must obtain approval for deviations from Contract Documents. Copy of the Geotechnical Investigation Report is available at Architect's office.

B. Verify that survey benchmark and intended elevations for Work are as indicated.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine entire site including subsurface conditions.

B. Identify required lines, levels, contours and datum.

C. Identify known underground, above ground and aerial utilities. Stake and flag locations. Replace as necessary throughout construction operations.

D. Notify utility company to remove and relocate utilities where required for construction operations.

E. Protect above and below grade utilities that are to remain.

F. Protect plant life, lawns and other features remaining as portion of final landscaping.

G. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

H. Repair or replace property damaged by Work of this Section.

I. Commencement of Work means acceptance of existing conditions.

3.02 SITE EARTHWORK

A. Conform to Section 31 10 00 for clearing requirements.

B. Sub-excavate and remove loose existing soils to depths recommended by Geotechnical Engineer.

C. Loose fill and natural on-site soils acceptable to Geotechnical Engineer may be stockpiled for subsequent use as fill material.

D. After clearing and removal of loose fill, Geotechnical Engineer will inspect exposed surfaces, before commencing further earthwork operations.

E. After sub-excavating existing soils, Geotechnical Engineer will inspect exposed surfaces. Before commencing further earthwork operations, verify elevations and line. Elevations shall be within 0.2 foot of required.

F. Correct unauthorized over excavation at no cost to Owner.

G. Notify Geotechnical Engineer of unexpected subsurface conditions and discontinue affected work until notified to resume work.

H. Unless otherwise recommended in Geotechnical Report scarify exposed surface to depth of 6 inches. Bring to optimum moisture content and recompact to minimum 90 percent of maximum dry density per ASTM D1557.

I. Place approved fill in 8 inch or less lifts, each lift with optimum moisture content and compacted to minimum 90 percent of maximum dry density per ASTM D 1557.

J. Bring fill to elevations indicated on structural drawings or to those indicated on grading plans. Elevations shall be within 0.1 foot of required.

K. Backfill holes, voids or depressions caused by earthwork operations with identical fill and compaction standards.

L. Completed earthwork to determine suitability of exposed soils, will be inspected by Geotechnical Engineer, including cuts, fills and earth bank slopes (cut or fill).

3.03 BUILDING AREA PREPARATION

A. Within building area and to distance of 5 feet beyond exterior footings or covered walks, remove existing fill or loose natural soils (sub excavate) to a depth recommended by Geotechnical Engineer.

B. Geotechnical Engineer will inspect exposed surfaces. Additional unsuitable soil, as approved by Geotechnical Engineer shall be removed.

C. Scarify exposed surface to depth of 6 inches. Bring to optimum moisture content and recompact to 90 percent of maximum dry density per ASTM D 1557.

D. Add approved fill to required subgrade elevation in 8 inch maximum lifts. Bring to optimum moisture content and compact to 90 percent of maximum dry density per ASTM D1557.

E. Fill: As specified in Section 31 23 23 and as approved by Geotechnical Engineer.

3.04 EXCAVATION FOR FOUNDATIONS

A. Underpin adjacent structures that may be damaged by excavation work, including utilities, pipes and electrical undergrounding. Protect existing monuments, grades and improvements of any kind. Remove all obstructions to Work.

B. Excavate subsoil to elevations required to accommodate building foundations, slabs-on-grade, construction operations, forms, forms removal and inspection. Subexcavate existing soils to depths recommended by Geotechnical Engineer.
   1. Side forms in foundation excavations may be omitted where earth remains firm with no cave-in providing one inch is added to footing width for each form removed.
   2. Finish subgrade to a tolerance of 0.05 foot within required elevations for subgrade.

C. Machine slope banks. Earth banks shall be sloped to 1-1/2 (horizontal) to 1 (vertical). Tops of earth banks shall be level to distance of 5 feet minimum from existing structures and 5 feet minimum behind construction barricades adjacent to driveways.

D. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Hand trim excavation. Remove loose matter. Machine tamp bottom of excavation.

G. Remove lumped subsoil, boulders and rock up to any size encountered. Totally remove abandoned pipes and utilities found in excavations. Cap or plug both ends of pipes and conduits to provide complete seal with concrete plugs, threaded caps or other approved methods.

H. Notify Geotechnical Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.

I. Correct over-excavation as recommended by Geotechnical Engineer.

J. Correct areas over-excavated by error by filling with specified concrete.

K. Stockpile approved excavated material in area designated on site and remove excess material not being reused from site.

L. Bulkheads and shoring shall conform to Title 8, California Code of Regulations, Construction Safety Orders.

M. Maintain excavations free of water throughout operations. Run surface water or seepage to sumps or drainage system.

3.05 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent Geotechnical Engineer to perform field quality-control testing and inspections. Do not proceed with concrete placement without approval of John R Byerly Inc.

B. Testing agency will test compaction of soils in place according to ASTM D1556, and ASTM D2937 as applicable. Tests will be performed at the following locations and frequencies:
   1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of building slab, but in no case fewer than 3 tests.
   2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.

C. Frequency of Tests: Geotechnical Engineer may make as many tests as are necessary to ensure specified results.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.06 SEASONAL LIMITS

A. No fill material shall be placed, spread or rolled while it is frozen or thawing or during unfavorable weather conditions. When Work is interrupted by heavy rain, fill operations shall not be resumed until field tests by Geotechnical Engineer indicate that moisture content and density of fill are as previously specified.

3.07 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing or excessive water inundation.

END OF SECTION 31 23 15

SECTION 31 23 17 - TRENCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Excavate trenches for utilities.

B. Compacted bedding.

C. Backfilling and compaction to required elevations.

D. Slurry concrete.

E. Thrust blocks.

1.02 REFERENCES

A. ASTM C150 - Portland Cement.

B. ASTM C494 - Chemical Admixtures for Concrete.

C. ASTM D1557 - Laboratory compaction characteristics of soil using modified effort.

D. SSPWC - Standard Specifications for Public Works Construction, Latest Edition.

E. California Code of Regulations, Title 8, Industrial Relations, Construction Safety Orders, Division 01, Chapter 4, Sub-Chapter 4, Article 6 Excavations.

F. California Public Contract Code, Section 7104 - Public Works Contracts for Digging Trenches or Excavations; Notice on Discovery of Hazardous Waste or Other Unusual Conditions; Investigations; Change Orders; Effect on Contract.

G. California Labor Code, Section 6705 - Public Works Contracts requiring detailed plans for shoring, bracing, sloping, indicating protection from caving ground for trenching work in excess of 5’ deep and contract amounts stipulated therein.

1.03 SUBMITTALS

A. The Contractor shall submit in advance of excavation, for acceptance by the Owner’s civil or structural engineer, detailed plan(s) showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of trenches more than 5 feet in depth. If such plan(s) varies from the shoring system standards, the plan shall be prepared by a registered civil or structural engineer.

1.04 QUALITY ASSURANCE

A. Verify survey benchmark and intended elevations for Work.

B. Borrow. Fill, backfill, aggregate base, and other soil materials obtained from off-site sources shall be sampled and tested in compliance with CA EPA Department of Toxic Substances Control recommendations to prevent the importation of contaminated materials to the Site.
   1. Testing Frequency
      a. For borrow up to 1,000-cu.yd, conduct 1 test for each 250-cu.yrds.

b. For borrow between 1,001- and 5,000-cu.yrd; conduct 4 tests for first 1,000- cu.yrd, if material tests acceptable, conduct 1 test for each additional 500-cu.yrds.
c. For borrow over 5,000-cu.yrds, conduct 12 tests during import of first 5,000-cu.yrd, if material tests acceptable, conduct 1 test for each additional 1,000-cu.yrds.

2. Owner's Testing Laboratory shall take samples at source, conduct testing and evaluate test results prior to delivery.
3. Conduct tests for lead and other heavy metals, asbestos, PCB's, pesticides, herbicides, VOCs, and semi-VOCs.
4. When detectable quantities of hazardous materials are found, determine the risk to human health, the environment, or both using the DTSC Preliminary Endangerment Assessment Guidance Manual.
5. Do not import soils, that exhibit a known risk to human health, the environment, or both.

1.05 SOILS INFORMATION

A. Geotechnical Investigation has been prepared under direction of Owner. Investigation is hereby referenced as information for Work of this Section. Architect assumes no responsibility for conclusions Contractor may draw from information provided. The Contract Documents take precedence over recommendations that may be contained in the Investigation and the contractor must obtain approval for any and all deviations from the Contract Documents. Copy of investigation is available at Architect's office.

PART 2 - PRODUCTS

2.01 FILL AND BEDDING MATERIALS

A. Sand: Sand shall consist of natural or manufactured granular material, or a combination thereof, free of deleterious amounts of organic material, mica, loam, clay and other substances not suitable for the purpose intended. Conform to Subsection 200-1.5.5, SSPWC, for gradation as required for Portland Cement Concrete, sand must achieve compaction of a minimum 90 percent.

B. Imported Fill: Granular, free of debris, no gravel larger than 3 inches in any dimension, non-expansive, approved by the Architect prior to placement on the site.

C. Slurry Concrete:
1. Slump: Between 4 inches and 6 inches.
2. Aggregate: 40 percent sand by weight, 60 percent pea gravel, minimum 1/4 inch, maximum 5/8 inch.
3. Portland Cement: ASTM C150, 2-sack mix (2 sacks of cement per cubic yard).
4. Admixture: Calcium Chloride free, in proportions not to exceed the manufacturer's recommendations.
5. Artificial Coloring: ASTM C494. Mix in Mapico Red pigment, proportions as recommended by the manufacturer, L.M. Scofield or equal.
6. Sufficient water shall be added to produce a fluid, workable mix that will flow and can be pumped without segregation of aggregate. Material shall be mechanically mixed until the cement and water are thoroughly dispersed.

D. Stockpiled Fill: Onsite soils, stored separately on the site, approved for re-use by the Architect.

2.02 ACCESSORIES

A. Underground Warning Tape: Metallic Detection Tape, aluminum core, 6 inches wide AASHTO specification colors, by Safety Sign Company, Cleveland, OH, or equal.

B. Color Coding and Lettering: as required for type of underground utility.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify fill material to be reused is acceptable to the Geotechnical Engineer.

3.02 PREPARATION

A. Identify required lines, levels, contours and datum.

B. Backfill with approved fill and compact to density equal to or greater than requirements for subsequent backfill material.

C. Prior to commencement of trenching operations, notify Underground Service Alert of Southern California (800) 422-4133, Monday through Friday, 7:00 A.M. to 5:00 P.M.

3.03 EXCAVATION

A. Conform to Construction Safety Orders, Title 8, CCR, For Sloping, Benching, Shoring, Bracing, Protective Systems, and Shafts.

B. Conform to Section 7104, Public Contract Code. Promptly notify Owner of any contact with hazardous materials or differing conditions.

C. Conform to Section 6705, Labor Code. Provide detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of trenches.

D. Excavate subsoil required for utilities. Trenches shall be level or parallel to finish grade unless designated on drawings to be installed to specific gradient.

E. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.

F. Water, storm drainage piping located in the same trench shall be separated by 12 inches horizontally and vertically, and water line shall be placed on a solid shelf excavated on one side of the common trench. Cross-over water lines shall also be separated 12 inches vertically from storm drainage pipe.

G. Water and sewer piping shall not be located in the same trench and they shall be separated by 12 inches horizontally and 12 inches vertically.

H. Excavation shall not interfere with normal 45 degree bearing splay of foundations. Parallel trenches, no closer than 18 inches from building foundations.

I. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

J. Remove lumped subsoil, boulders and rock.

K. Correct unauthorized excavation.

L. Stockpile approved excavated material in area designated on site and remove excess material not being used from site.

3.04 BEDDING

A. Support pipe and conduit during placement and compaction of bedding fill. Provide uniform bearing along entire length. Conform to Section 306, SSPWC.

B. Bedding: Place and compact materials in continuous layers not exceeding 6 inches compacted depth, ASTM D1557.

3.05 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen materials.

B. Fill areas will be inspected, tested and approved by Geotechnical Engineer.

C. Soil Fill over Bedding: Place and compact material in continuous layers as scheduled, compacted to ASTM D1557.

D. Employ placement method that does not disturb or damage conduit, ducts or piping in trench.

E. Maintain optimum moisture content of backfill materials to attain required compaction density. When operations are interrupted by rain, do not resume Work until field tests indicate that moisture content and density of fill are as previously specified.

F. Remove surplus backfill materials from site and dispose legally.

G. Leave fill material stockpile areas completely free of excess fill materials.

H. Minimum Cover over Piping, Conduits or Duct Banks: 24 inches typical; 36 inches at Fire Lines.

I. Lay out and install or otherwise confirm invert elevations of all gravity flow systems to avoid conflict with other sub-surface structures or utilities of any kind. Adjust elevations or layout of pipes, conduits or duct banks to permit the required gravity flow.

J. Jetting for utility trenching compaction may be used outside building perimeter and only when recommended by Geotechnical Engineer, in accordance with Section 306 SSPWC.

K. Pressurized piping shall be installed level or shall be installed parallel to finish grades unless designated on the Drawings to be installed to specific gradients.

3.06 THRUST BLOCKS

A. Install at turns of water lines and as indicated in drawings.

3.07 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: 0.2 ft from required elevations.

B. Top Surface of General Backfilling: Plus or minus 0.2 ft from required elevations.

3.08 FIELD QUALITY CONTROL

A. Backfill materials and operations will be inspected and approved by Geotechnical Engineer including earth bank slopes (cut or fill).

B. Tests, analysis and compaction of fill material will be performed in accordance with ASTM D1557.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

D. Frequency of Tests: Geotechnical Engineer may make as many tests as are necessary to ensure specified results.

3.09 PROTECTION OF FINISHED WORK

A. Protect finished Work.

B. Recompact fills subjected to vehicular traffic.

3.010 TEMPORARY PROTECTION OF UNFINISHED WORK

A. Trenching for placement of underground utilities shall be covered and protected with steel trench plates during non-work hours. Adequate warnings and protection indication of open trenches during work hours must be provided for project safety.

3.011 SCHEDULE

A. Storm and Sanitary Piping:
1. Bedding Fill: Sand, minimum thickness below piping 0.4 times outside diameter of pipe but no less than 4 inches. Minimum thickness above top of piping, 12 inches, compacted to 90 percent.
2. Cover with stockpiled fill in 8-inch lifts to specified subgrade elevations, compact to 90 percent or to 95 percent under vehicle traffic-supporting paved areas.
3. Fill: Slurry concrete, 6” cover at top, bottom and sides of pipes at exterior paved areas (at vehicle traffic) where minimum fill cover is less than 12” below finished elevation of paving.
4. Bury warning tape marked “Caution Sewer Line” 12 inches above all concrete-encased piping. Align tape parallel to and within 3 inches of the centerline of the piping.

B. Power Ducts: Concrete Encased
1. Fill: Slurry concrete, 3 inches cover at top, bottom, between conduits and sides of duct bank.
2. Fill: Slurry concrete, 6 inches cover at top, bottom and sides of duct bank conduit at exterior paved areas where minimum fill cover is less than 24” below finished elevation of paving, and less than 12” below finished elevations of interior floor slabs and at building footings where conduit is in the footing structural splay.
3. Install two No. 4 bars in slurry concrete at top of bank under paved areas, minimum 3 inch concrete cover.
4. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or to 95 percent under traffic-supporting paved areas.
5. Bury warning tape marked “Caution Buried High Voltage Line” 12 inches above all concrete-encased duct banks. Align tape parallel to and within 3 inches of the centerline of the duct bank.

C. Water Piping and Gas Piping:
1. Bedding Fill: Sand, minimum thickness below piping 0.4 times outside diameter of pipe but not less than 4”. Minimum thickness above top of piping, 6 inches, compacted to 90 percent.
2. Fill: Slurry concrete, 6 inches cover at top, bottom and sides of pipes at exterior paved areas where minimum fill cover is less than 24” below finished elevation of paving, and less than 12” below finished elevations of interior floor slabs and at building footings where piping is in the footing structural splay.

3. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
4. Observe joints at pressure tests.
5. Bury warning tape marked “Caution Buried Gas (or “Pipeline”) Line” 12 inches above all trenching. Align tape parallel to and within 3 inches of the centerline of trench.

D. Fire Lines:
1. Bedding Fill: Manufactured Sand, minimum 6” thickness under piping, minimum thickness above top of piping and sides, 6”, compact to 90 percent.
2. Fill: Minimum depth of 30 inches from top of pipe to finished grade (36 inches at traffic-supporting paved areas).
3. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
4. Bury warning tape marked “Caution Buried Pipeline” 12 inches above all trenching. Align tape parallel to and within 3 inches of the centerline of trench.

E. Low Voltage Conduits and Communications: Direct Burial Minimum trench depth 36 inches.
1. Bedding Fill: Sand, 6 inches at bottom, sides and 12 inches on top, compacted to 95 percent.
2. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
3. Bury warning tape marked “Caution Buried Communication Line Below” 12 inches above conduits. Align tape parallel to and within 3 inches of the centerline of conduits.

END OF SECTION 31 23 17

SECTION 31 23 23 - BACKFILLING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Authorized types of fill.

B. Building area backfilling to subgrade elevations.

1.02 **REFERENCE**S

A. ASTM D1557 - Laboratory compaction characteristics of soil using modified effort.

B. SSPWC - Standard Specifications for Public Works Construction, Latest Edition.

C. Chapters 18A and 33, California Building Code, 2022.

D. CSS - Caltrans Standard Specifications, Latest Edition.

1.03 SUBMITTALS

A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.

B. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.04 QUALITY ASSURANCE

A. Borrow. Fill, backfill, aggregate base, and other soil materials obtained from off-site sources shall be sampled and tested in compliance with CA EPA Department of Toxic Substances Control recommendations to prevent the importation of contaminated materials to the Site.
   1. Testing Frequency
      a. For borrow up to 1,000-cu.yrd, conduct 1 test for each 250-cu.yrds.
      b. For borrow between 1,001- and 5,000-cu.yrd; conduct 4 tests for first 1,000- cu.yrd, if material tests acceptable, conduct 1 test for each additional 500-cu.yrds.
      c. For borrow over 5,000-cu.yrds, conduct 12 tests during import of first 5,000-cu.yrd, if material tests acceptable, conduct 1 test for each additional 1,000-cu.yrds.
   2. Owner's Testing Laboratory shall take samples at source, conduct testing and evaluate test results prior to delivery.
   3. Conduct tests for lead and other heavy metals, asbestos, PCB's, pesticides, herbicides, VOCs, and semi-VOCs.
   4. When detectable quantities of hazardous materials are found, determine the risk to human health, the environment, or both using the DTSC Preliminary Endangerment Assessment Guidance Manual.
   5. Do not import soils, that exhibit a known risk to human health, the environment, or both.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

A. This Section establishes standards of quality for backfill materials to be used as approved by Geotechnical Engineer in accordance with Chapter 18A CBC, Section 1803A.2 and Appendix J Section J107, California Building Code, and as scheduled in other Sections of this specification.

B. Crushed Rock and Rock Dust: Crushed rock and rock dust shall be product of crushing rock or gravel. Portion of material that is retained on a 3/8 inch sieve shall contain at least 50 percent of particles having three or more fractured faces. Not over 5 percent shall be pieces that show no such faces resulting from crushing. Of that portion which passes 3/8 inch sieve but is retained on No. 4 sieve, not more than 10 percent shall be gravel particles. Crushed rock shall conform to 3/4 inch sieve size in accordance with Subsection 200-1.2, SSPWC, Crushed Rock Gradation Table.

C. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded to the following:
   1. Minimum Size: 1/4 inch.
   2. Maximum Size: 5/8 inch.

D. Sand: Sand shall consist of manufactured granular material, or combination thereof, free of deleterious amounts of organic material, mica, loam, clay and other substances not suitable for purpose intended. Conform to Section 200-1.5.5, SSPWC, for gradation as required for Portland Cement Concrete, sand must achieve compaction of a minimum 90 percent.

E. Crushed Aggregate Base: Crushed rock and rock dust conforming to requirements of Section 200-1.2, SSPWC, with 3/8 inch sieve requirement waived, or Class 2 aggregate base as defined in Section 26, CSS.

F. Imported Fill: Clean granular, free of debris, no rock larger than 3 inches in any dimension, non-expansive, approved by Geotechnical Engineer prior to placement on site.

G. Concrete: As specified in Section 32 13 13.

H. Concrete Slurry: as specified in Section 31 23 17.

I. Stockpiled Fill: On-site soils, stored separately on site, approved for re-use by Geotechnical Engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify fill materials to be reused or imported are acceptable to Architect.

B. Verify foundation perimeter drainage installation has been inspected and approved.

3.02 BACKFILLING

A. Backfill and compact areas to contours and elevations with unfrozen materials. Remove debris from areas to receive backfills.
   1. Compaction: ASTM D1557, Compact to 90 percent of maximum dry density.
   2. Floor slabs shall be in place a minimum of 7 days before backfill is placed against walls.

B. Fill areas and types of fill shall be inspected, tested and approved by Geotechnical Engineer.

C. Employ placement method that does not disturb or damage foundation perimeter drainage, foundation waterproofing and protective cover or utilities in trenches. Do not commence backfill until such work is in place, inspected and approved.

D. Maintain optimum moisture content of backfill materials to attain required compaction density. When operations are interrupted by rain, do not resume work until field tests indicate that moisture content and density of the fill are as previously specified.

E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.

F. Make grade changes gradual. Blend slope into level areas.

G. Remove surplus backfill materials from site.

H. Leave fill material stockpile areas completely free of excess fill materials.

I. Compaction Equipment: Wherever feasible, perform compaction with approved power-driven equipment such as rollers and sheeps-foot compactors. Compact areas inaccessible to rollers with pneumatic tampers or other approved compactors.

J. Flooding and jetting is not permitted.

3.03 TOLERANCES

A. Top Surface of Backfilling Subgrade: Within 0.05 feet from required elevations.

3.04 FIELD QUALITY CONTROL

A. No fill shall be placed on any prepared surface until that surface has been inspected and approved by Geotechnical Engineer.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest. Cost of retests shall be paid by Owner and deducted from contract sum by Change Order.

C. Frequency of Tests: Architect may require as many tests as are necessary to ensure specified results.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work.

B. Recompact fills subjected to and damaged by vehicular traffic.

END OF SECTION 31 23 23

SECTION 32 12 16 - ASPHALTIC CONCRETE PAVING

PART 1 -GENERAL

1.01 SUMMARY

A. Section Includes
   1. Asphaltic concrete paving and surface sealer
   2. Sub-base preparation
   3. Aggregate base course
   4. Concrete parking bumpers
   5. Slurry sealing

B. Related Section
   1. Section 32 17 23, Pavement Marking

1.02 REFERENCES

A. ASTM - American Society for Testing and Materials
   1. ASTM D977 - Standard Specification for Emulsified Asphalt
   2. ASTM D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort
   3. ASTM D2026 - Standard Specification for Cutback Asphalt
   4. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt
   5. ASTM D3910 - Design, Testing, and Construction of Slurry Seal

B. AASHTO - American Association of State Highways and Transportation Officials
   1. AASHTO MP 1 – Performance Graded Asphalt Binders

C. CSS - Caltrans Standard Specifications

D. ISSA - International Slurry Seal Association
   1. ISSA A105 - Recommended Performance Guidelines for Emulsified Asphalt Slurry Seal

E. SCAQMD – South Coast Air Quality Management District
   1. SCAQMD-1108 – SCAQMD Rule 1108, Cutback Asphalt

F. SSPWC - Standard Specifications for Public Works Construction

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with Sections 200, 203 and 302, SSPWC.

B. Obtain materials from same source throughout, using batch plant method for proportioning and mixing.

1.04 SUBMITTALS

A. Product data, mix design per Section 01 30 00, Administrative Requirements.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when base surface temperature is less than 40 degrees F or surface is wet or frozen.

B. Conform to AQMD, Local Regulations.

1.06 SOILS INFORMATION

A. Geotechnical Investigation has been prepared under direction of Owner. Investigation is hereby referenced as information for Work of this Section. Architect assumes no responsibility for conclusions Contractor may draw, from information provided. Contract Documents take precedence over recommendations that may be contained in investigation and Contractor must obtain approval for deviations from Contract Documents. Copy of investigation is available at Architect's office.

PART 2 -PRODUCTS

2.01 MATERIALS

A. Asphalt Binder: SSPWC 203-1 or AASHTO MP1, Performance Grade 64-10 South and Central Coast, Inland Valleys regions, and shall conform to the testing requirements of Table 203-1.2 (B), Section 203 SSPWC.

B. Asphalt Aggregate: Uniformly graded in accordance with Section 203-6.4, SSPWC.

C. Crushed Aggregate Base (CAB): 3/4 inch maximum grading, crushed rock and rock dust conforming to requirements of Section 200-1.2, SSPWC, with 3/8 inch sieve requirement waived, or Class 2 Aggregate Base as defined in Section 26, CSS.

2.02 ACCESSORIES

A. Primer: ASTM D2026, cutback type, slow curing, Grade SC 250.

B. Tack Coat: ASTM D977, slow setting emulsified asphalt SS-1h. ASTM D2397 for CQS-1H, slurry Seal.

C. Seal Coat: Conform to Section 203-9, SSPWC.
   1. GUARDTOP by Industrial Asphalt/Vulcan Material Co,, Inc., Irwindale, CA.
   2. SATIN SEAL by Blue Diamond Co., Long Beach, CA.
   3. Or equal, as approved in accordance with Division 01, General Requirements for Substitutions.

D. Soil Sterilizer: Spike 80DF. Non-selective weed and grass killer, by Dow-AgroSciences, Indianapolis, IN, EPA Reg. No. 62719-107, or equal, as approved in accordance with Division 01, General Requirements for Substitutions.
   1. Active Ingredients:

a.	Tebuthiuron	80 percent
b.	Inert Ingredients	20 percent
	Total	100 Percent

E. Headers: Foundation grade redwood, minimum 2 x 4 inch. Stakes shall be minimum 2 x 3 inch in accordance with Section 302-5.5 SSPWC.

2.03 ASPHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.

B. Mix: Section 203-6.4 SSPWC, 1/2 inch maximum aggregate size, medium gradation curve, as required by outside temperatures at time of laying.
   1. Single Course: C2 (Dense Medium) aggregate, Performance Grade 64-10 asphalt.
      a. Areas where hand spreading is required: Use 3/8 inch mix.

C. Slurry Mix Design: ISSA Type II (General), 1/4" thick.

PART 3 -EXECUTION

3.01 SUB-GRADE

A. Bring areas to be surfaced to required subgrades by cutting and filling with suitable equipment.

B. Scarify subgrade to minimum depth of 6 inches. Bring to optimum moisture content and compact to minimum 90 percent density in accordance with ASTM D1557 by rolling with power roller. Provide hard, even surface to receive subsequent base and paving.

C. Finish subgrade to required grades with allowance for compression and for thickness of base course and finish paving thickness.

3.02 SOIL STERILIZATION

A. After subgrade has been compacted and approved by Geotechnical Engineer, treat areas to be paved with specified soil sterilizer. Conform to following:
   1. Apply 7.5 lbs. of solution per acre for each 15 gallons of water, spray apply per manufacturer's instructions.

B. Exercise caution during storage of material and during application. Prevent injury to humans, animal life, adjacent plant life and property. Keep soil sterilization materials minimum three feet from tree wells or any plant life.

C. Legally dispose of containers.

3.03 BASE COURSE

A. Place and compact aggregate base upon finished subgrade in conformance with Section 301-2 SSPWC. Compaction: 95 percent.

B. Thickness of Base After Compaction: As indicated on Drawings but not less than 4 inches if not indicated.

3.04 PREPARATION - PRIMER AND TACK COATS

A. Apply primer coat on base course surfaces in conformance with Section 302-5.3, SSPWC, at rate of 0.10 to 0.25 gallons per sq. yd. Allow to cure prior to application of asphalt course.

B. Apply tack coat to contact surfaces of cold joints, curbs, gutters, manholes and adjacent materials, in conformance with Section 302-5.4, SSPWC.

C. Coat surfaces of catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 PLACING ASPHALT PAVEMENT

A. Install redwood headers.

B. Place asphalt in conformance with Section 302-5, SSPWC. Conform to temperature maximums and minimums specified therein. Materials shall not be applied which have cooled below lower limit allowable.
   1. Install 3/8" mix for single course asphalt payment.

C. Place to thickness as indicated on drawings but not less than 3 inches if not indicated.

D. Install drainage grilles and frames in correct position and elevation.

E. Compact pavement by rolling with equipment specified in Section 302-5.6, SSPWC. Do not displace or extrude pavement from position.

F. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks, rock pockets, ridges or depressions.

3.06 SEAL COAT

A. Apply seal coat 30 days or more after surface course application, in accordance with manufacturer's recommendations.

B. Apply seal coat to surface course in accordance with Section 302-8.2, SSPWC.

C. Add water to specified seal coat material. When air temperatures of 90 degrees F or more are encountered during application, consult manufacturer for recommendations.

D. If pavement surface exhibits imperfections noted Placing Asphalt Pavement above, as determined by the Architect, the addition of sand aggregate to seal coat, and amounts thereof, shall be as recommended by the manufacturer.

E. A second application shall be made after first coat has dried to the touch. When sand is added to the first seal coat, two additional coats without extra sand shall be applied.

F. Allow seal coat to dry before permitting traffic or striping.

3.07 SLURRY SEALING

A. Prior to slurry application, repair areas and major depressions, wide cracks filled, remove dust, dirt and other foreign material from the surface.

B. Apply a tack coat of diluted emulsified asphalt of same type and grade specified for the slurry.

C. Apply slurry in accordance with ASTM D-3910, the Asphalt Institute Standards and the International Slurry Seal Association. Minimum thickness of 1/4”.

3.08 PARKING BUMPERS

A. Securely attach precast concrete parking bumpers into pavement with two 5/8 inch diameter galvanized solid rod anchors. Extend anchors 24 inches into ground. Apply adhesive to underside of concrete bumpers, as recommended by the manufacturer.

3.09 TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch.
   2. Surface Course: 1/8 inch.

C. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.10 PROTECTION

A. Protect asphalt paving against vehicular traffic before and for 48 hours following seal coating.

END OF SECTION 32 12 16

SECTION 32 13 13 - SITEWORK CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes
1. Cast-In-Place concrete pedestrian paving and sidewalks.
2. Curbs and gutters.
3. Concrete stairs, ramps and landings.
4. Light standard bases, railing footings and similar site structures.
5. Utility concrete pads.
6. Perimeter concrete curbing, mow strips, concrete drainage structures, swales.
7. Stamped concrete.
8. Slurry Concrete.
9. Detectable Warnings

B. Related Sections:
1. Section 31 23 15 - Earthwork and Building Excavation.

1.02 REFERENCES

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and

B. Materials.

C. ACI 224.3R-95 - Joints in Concrete Construction

D. ACI 318 - Building Code Requirements for Structural Concrete and Commentary, 2008 Edition.

E. ACI 301 - Structural Concrete for Buildings.

F. ASTM - American Society for Testing and Materials
1. ASTM A185 - Steel Welded Wire Reinforcement, Plain, for Concrete
2. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
3. ASTM C33 - Concrete Aggregates
4. ASTM C94 - Ready-Mixed Concrete
5. ASTM C150 - Portland Cement
6. ASTM C171 - Sheet Materials for Curing Concrete
7. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete
8. ASTM C920 - Elastomeric Joint Sealants
9. ASTM C979 - Pigments for Integrally Colored Concrete
10. ASTM C1107 - Packaged Dry, Hydraulic - Cement Grout (Non-Shrink)
11. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete, Paving and Structural Construction

G. CBC - 2013 California Building Code and Supplements
1. CBC-11 – CBC Chapter 11B, Accessibility to Public Buildings, Public Accommodations, Commercial Facilities and Publicly Funded Housing
2. CBC-17 – CBC Chapter 17A, Structural Tests and Special Inspections
3. CBC-19 – CBC Chapter 19[A], Concrete [DSA]

1.03 SUBMITTALS

A. Placement Schedule for approval: Provide details or sketches showing location of each placement of concrete Work. Do not deviate from location of expansion joints or scorelines.

B. Design mix for each concrete mix.

C. Steel reinforcement shop drawings, including materials, grade, bar schedules, spacing, bent bar diagrams, arrangement and supports.

D. Submit contraction (crack control) joint, expansion, isolation and construction joint layout to Architect for approval.

E. Product data on joint filler, sealants, curing compounds and reinforcing.

F. Project Record Documents
   1. Accurately record actual locations of embedded sleeves, utilities and components that are concealed from view.

G. Submit Certification of experience for Color finisher.

1.04 REGULATORY REQUIREMENTS

A. Pedestrian walks, plazas and paving shall comply with CBC Chapter 11B. Portland Cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.

1.05 QUALITY ASSURANCE

A. Maintain one copy of all records on site.

B. Acquire cement and aggregate from same source for all Work.

C. Conform to ACI 318-11 Chapter 5.13, California Building Code, when placing concrete during hot weather.

D. Conform to ACI 318-11 Chapter 5.12, California Building Code, when placing concrete during cold weather. No placement of concrete permitted below 50 degrees Fahrenheit.

E. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

F. Mock-up
   1. Install minimum 5 feet by 5 feet mock-up of concrete sidewalk for each surface treatment specified.
   2. Install mock-up one month prior to installation.
   3. Locate as approved by the Architect.
   4. Use identical forming system, sub-grade type, reinforcing, expansion joints, score joints, finishing and edge trim as specified for installation.
   5. Architect approval required.
   6. Mock-up may not be used in final installation.
   7. Remove mock-up materials from site and dispose legally.

1.06 EXTENDED WARRANTY

A. Manufacturer shall warrant prefabricated detectable warning texture products against failure in materials or workmanship for at least the specified warranty periods. Upon written notice from Owner manufacturer shall promptly, without cost, and with least practicable inconvenience to Owner correct such defects.
   1. Failures include, but are not limited to, significant degradation in color fastness, conformation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly.
      a. Significant degradation means that product loses 10 percent or more of its approved design characteristics, as determined by the authority having jurisdiction.
   2. Minimum Warranty Period: 5 years from date of Certified Completion.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150 - Type I - Normal or Type II - Moderate, Portland Cement type, from one manufacturing plant only.

B. Aggregates: ASTM C33, single source for all materials. Maximum size aggregate: 1 inch.

C. Non-Shrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 4,000 psi in 24 hours and 7,500 psi in 7 days unless otherwise indicated on Drawings; of consistency suitable for application and a 30 minute working time.

D. Threshold and landing mortar: Wheelchair lift ramp mortar: Ardex K301, Mapei Quickcem Top 101 or equal. Finish with manufacturer’s cement dressing products for smooth surface.

E. Crushed Aggregate Base: Crushed rock and rock dust conforming to requirements of Section 200-1.2, SSPWC, with 3/8 inch sieve requirement waived, or Class 2 aggregate base as defined in Section 26, CSS.

2.02 ACCESSORIES

A. Expansion Joints:
   1. Expansion Joint Filler - ASTM D1751: Closed cell, 1/2 inch thick; DECK-O-FOAM by W. R. Meadows, Dayton Superior or equal.
   2. Joint Devices: Integral extruded polystyrene plastic; 1/2-inch max. thick, with removable top strip exposing sealant trough; Snap Cap Expansion Joint Cap by W. R. Meadows or equal.
   3. Sealant: Polyurethane two-component type, self-leveling, for level surface application, UREXPAN NR-200 or DYNATRED for sloped surfaces, manufactured by Pecora Corp., Harleysville PA, or equal. Color shall be selected by Architect from manufacturer's standard list of colors.
   4. Primer: As recommended by sealant manufacturer.
   5. Joint Backing: ASTM C1330, Cylindrical, Type C, closed cell, polyethylene backer rod; oversized 30 to 50 percent larger than joint width. Green Rod by Nomaco Inc. or equal.

B. Slip Resistant Finish: Dry shake type aluminum oxide abrasive grains, hardness No. 9 on Mohr's scale; Emery Non-slip, manufactured by Dayton Superior, Kansas City, KS, Emery Aggregate manufactured by Oregon Emery Co., Halsey OR, or equal as approved in accordance with Division 01, General Requirements for Substitutions.

C. Detectable Warning Texture: Division of the State Architect (DSA/Access Compliance) approved products shall be used, compliance with CBC Sections 11B-705, IRs 11B-3 and 11B-4 and the California Accessibility Reference Manual.
   1. Truncated Domes: provide raised Detectable Warnings with diameter of 0.90” min. to 0.92” max. at base tapering to 0.45” min. to 0.47” max. at top, height of 0.18” - 0.22” and base-to-to base spacing of 0.65” min. measured between the most adjacent domes on a square grid (in-line pattern).
      a. Truncated Dome: shall contrast visually with adjoining surfaces, light-on-dark or dark-on-light per section 11B-705.1.1.3. Material used to provide contrast shall be integral part of walking surface. Warning surface shall differ from adjoining surface in resiliency or sound to cane contact.
   2. Detectable Warning Texture (Truncated Domes): Paver Tiles: 12 by 12 inches unless noted otherwise on drawings, with pre-formed fastener locations.

D. Safety Stair Nosings: Style B-41A, 4 inches wide manufactured by Barrycraft Pattern and Foundry, Inc., Birmingham, AL, or equal as approved in accordance with Division 01, General Requirements for Substitutions. Provide nosings (strips) at all treads.
   1. Install 2” wide nosings (Strips) (2” min. – 4” max.) in contrasting color (70% contrasting), 1” maximum from edge of nosing of each exterior stairs, CBC Section 1133B.4.4. Colors to be selected by Architect.
   2. Install in fresh concrete, cast in place.

E. Anti-Slip Floor Tape: Coarse grit tape, OSHA 1910.265, 2 inches wide x the length of the stair nosing, Setonwalk Anti-slip Tape by Seton Name Plate Co. Branford, CT, Tred-Sure by Garon Products, Inc., New Brunswick, NJ or equal. Color: in contrasting color to be selected by Architect.

2.03 CONCRETE MIX

A. Mix and deliver concrete in accordance with Section 1905A, California Building Code. Deliver concrete in transit mixers only. Mix concrete for 10 minutes minimum at a peripheral drum speed of approximately 200 feet per minute. Mix at jobsite minimum 3 minutes. Discharge loads in less than 1-1/2 hours or under 300 revolutions of the drum, whichever comes first, after water is first added.
   1. Design Mix:
      a. Conform to ACI 318-11 Chapter 5.8 for Proportioning on the basis if field experience or trial mixtures method.
      b. Conform to ACI 318-11 Chapter 5.8 for Selection of concrete proportions method. Selection of concrete proportions and ingredients for design mix by a DSA-approved Testing Laboratory and certified by a registered civil engineer licensed in California.
   2. Do not exceed 0.50 water-cement ratio by weight for slabs and for other concrete.
   3. Quantities of Materials: Weighmaster's records not required for sitework concrete.
   4. Required Strength: Minimum 3,000 psi for sitework concrete.

B. Slurry Concrete:
   1. Slump: Between 4 inches and 6 inches.
   2. Aggregate: 40 percent sand by weight, 60 percent pea gravel, minimum 1/4 inch, maximum 5/8 inch.
   3. Portland Cement: ASTM C150, 2-sack mix (2 sacks of cement per cubic yard).
   4. Sufficient water shall be added to produce a fluid, workable mix that will flow and can be pumped without segregation of aggregate. Material shall be mechanically mixed until the cement and water are thoroughly dispersed.

2.04 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; deformed billet steel bars, in grades as follows, and conforming to CBC-19, Section 1903A.
   1. For No. 4 and larger bars, use 60 ksi yield grade.
   2. For ties and stirrups, and No. 3 and smaller bars, use 40 ksi yield grade.
   3. For welded bars, use ASTM A706 60 ksi yield grade.

B. Welded Wire Reinforcement: Plain type, ASTM A185; in flat sheets; uncoated finish, 6 x 6 - W4.0 x W4.0 unless otherwise note on drawings.

C. Tie Wire: Annealed steel, minimum 16 gage size.

D. Dowels: ASTM A615; 60 ksi yield grade, plain steel, uncoated finish.

2.05 FORMS

A. Conform to ACI 318-11 Chapter 6.

B. Plywood Forms: APA - Medium density overlay, Group 1, Exterior, PS-1, for exposed surfaces. APA Plyform B-B, Class 1, Exterior, PS-1 for unexposed surfaces.
   1. Use flexible or curved forms for curves with a radius 100 feet or less.

C. Lumber: Douglas Fir species, construction grade, Surfaced Lumber, with grade stamp clearly visible for smooth and straight exposed surface.

D. Form Release Agent; commercially formulated form-release agent that will not bond with, stain or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.06 CURING MATERIALS

A. Polyethylene Film ASTM C171; 10 mil thick, clear, manufactured from virgin resin with no scrap or additives, manufactured by Burke-Edoco, Long Beach, CA, or equal as approved in accordance with Division 01, General Requirements for Substitutions.

B. Water: Potable and not detrimental to concrete.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify site conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely and will not cause hardship in placing concrete.

3.02 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

B. In locations where new concrete is doweled to existing Work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Ensure sub-base or base materials have been compacted or otherwise treated.
   1. Sub-base and base preparation per Section 31 23 15 - Earthwork and Building Excavation and Section 31 23 23 - Backfilling.

3.03 PLACING CONCRETE (GENERAL)

A. Convey and deposit concrete in accordance with ACI 318-11 Chapter 5.9 and 5.10. Remove loose dirt from excavations.

B. Notify Job Inspector minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed joint fillers, joint devices and accessories are not disturbed during concrete placement.

D. Install joint fillers, primer and sealant in accordance with manufacturer's instructions.

E. Place concrete continuously between predetermined expansion joints.
   1. Install expansion joints at vertical concrete walls at 24 feet on center unless noted otherwise on drawings.

F. Do not interrupt successive placement; do not permit cold joints to occur. Avoid segregation of materials. Perform tamping and vibrating so as to produce a dense, smooth application free of rock pockets and voids. Do not use vibrators to move concrete horizontally.

G. Do not allow concrete to fall free from any height which will cause materials to segregate. Maximum height of free fall permitted in any case: 5 feet.

H. Defective Installation: Repair and clean at Contractor's expense all concrete damaged or discolored during construction. Where concrete requires repair before acceptance, the repair shall be made by removing and replacing entire section between joints and not by refinishing the damaged portion.

I. Proper curing of concrete surfaces is the responsibility of the Contractor. Concrete failing to meet specified strength shall be removed and replaced.

3.04 ON-SITE CONCRETE SIDEWALKS, PEDESTRIAN PAVED AREAS AND RAMPS

A. Forms, Wood: Free from warp, with smooth and straight upper edges, surfaced one side, minimum thickness 1-1/2 inches adequate to resist springing or deflection from placing concrete.

B. Forms, Metal: Gauge thickness sufficient to provide rigidity and strength equivalent to wood.

C. Reinforcing Steel: #4 bars, place bars at 12 inches on center each way for sidewalks and paved areas and #4 bars for edges unless otherwise indicated on Drawings.

D. Concrete Placement: Dampen subgrade to retain moisture in concrete mix. Tamp and spade to consolidate concrete for entire length of pour. Strike off upper surface to specified grades.

E. Isolation Joints: Locate at slabs abutting vertical concrete surfaces and as patterned on drawings. Install vertically, full depth of concrete with preformed joint filler recessed for plastic cap at 1/2 inch depth at top for sealant application.

1. Doweled Isolation Joints at Heavy Vehicle Driveways and Parking: At abutting building foundations; provide 1/2-inch diameter smooth steel dowels 14 inches long, one end of dowel lubricated and set in capped sleeve to allow for longitudinal movement, spaced at 24 inches on center maximum, 6 inches from edges.
2. Monolithic Curb and Gutter: No expansion joints required between gutter and curb face.

F. Expansion Joints: Locate maximum 24 feet centers and as patterned on drawings. Install vertically full depth of concrete, install preformed joint filler recessed for plastic cap at 1/2 inch depth at top for sealant application.
1. Monolithic Curb and Gutter: No expansion joints required between gutter and curb face.

G. Contraction/Crack Control Joints: At 8 feet each way at concrete paved areas, and 5 feet at sidewalks, tool joint with 1/2 inch radius, depth 1/4 the thickness of slab but not less than 1 inch deep. Refer to drawings for required design patterns.

H. Curb Ramps: Form grooves, flush to finished surfaces, 12" wide border. Grooves at 1/4" deep, 1/4" wide and at 3/4" on centers at 3 sides on level surface of the sidewalk. Provide patterns as indicated in drawings. Detectable Warnings at Curb Ramps per IR 11B-2 and 11B-3, 11B-4 CBC 1127B.5.7.
1. Detectable warning (Truncated Domes) required at curb ramps less than 1:15 (6.7% slope), DSA IR 11B-3
2. Detectable Warnings (Truncated Domes) required at all Curb Ramps, American with Disabilities Act Standards for Accessibility Design Section 4.7.7.
   a. Plastics/Composites: Cast in place plastic tiles per manufacturer's instructions and in accordance with CBC.

I. Finish:
1. Portland cement paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.
2. Screed concrete to required grade, float to a smooth, flat, uniform surface. Edge all headers to 1/2 inch radius. Edge expansion joints to 1/4 inch radius. Steel trowel to hard surface.
3. Medium Broom Finish: After final troweling, apply a medium broom finish transverse to centerline or direction of traffic.
4. Heavy Broom Finish At Ramps: After final troweling, apply a heavy broom finish transverse to centerline or direction of traffic.
5. Surface Cross slopes: surface cross slopes shall not exceed one unit vertical in 50 units horizontal (2-percent).

J. Curing: Cure surfaces utilizing one of the following methods:
1. Spraying: Spray water over slab areas and maintain wet for 7 days, use burlap mats.
2. Spread polyethylene film over slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
3. Apply liquid curing compound at rate of 200 sf per gallon, using power sprayer equipped with agitator. Do not apply liquid curing compound to surfaces scheduled to receive paving units of any kind.

K. Remove expansion joint plastic caps. Prime both sides of joint and apply self-leveling sealant per Section 07 92 00. Provide smooth concave surface.

3.05 LIGHT STANDARD BASES, FENCE POST BASES, RAILING FOOTINGS, MISCELLANUOUS SURFACES, UTILITY PADS, AND SIMILAR SITE STRUCTURES

A. Forms: Suitable material and type, size, shape, quality and strength to insure construction as designed, true to line and sufficiently rigid to resist deflection during placing of concrete. Clean forms of all dirt, mortar and foreign matter before use.

B. Reinforcement: Place accurately and hold in position, using metal chairs, spacers, metal hangers, supporting wires and other devices of sufficient strength to resist crushing under full load. Clean reinforcing steel of mortar, oil, dirt, loose mill scale loose or thick rust and coatings.

C. Coordinate installation of conduits, cast in place items and other inserts.

D. Finish: Grind or sack as required as determined by the Architect to produce a smooth, straight, plumb and acceptable finish without burrs or form marks. For horizontal surfaces: provide float finish.

E. Curing: Cure surfaces utilizing one of the following methods:
   1. Spraying: Spray water over slab areas and maintain wet for 7 days.
   2. Spread polyethylene film over slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
   3. Apply liquid curing compound at rate of 200 square feet per gallon, using power sprayer equipped with agitator. Do not apply liquid curing compound to surfaces scheduled to receive paving units or finish of any kind.

3.06 FORMED CONCRETE STAIRS AND LANDINGS

A. Subgrade Preparation: As approved by the Geotechnical Engineer.

B. Forms: Suitable material and type, size, shape, quality and strength to ensure construction as designed, true to line and sufficiently rigid to resist deflection during placing of concrete. Clean forms of all dirt, mortar and foreign matter before use.

C. Reinforcement: Place accurately and hold in position, using metal chairs, spacers, metal hangers, supporting wires and other devices of sufficient strength to resist crushing under full load. Clean reinforcing steel of mortar, oil, dirt, loose mill scale, loose or thick rust and coatings.

D. Form grooved nosing flush to finished surface, 3” wide. Grooves at 1/4” deep, 1/4” wide and at 3/4” on centers full length of stair at all treads. Apply contrasting color paint at all treads per Section 09 90 00.

E. Finish: Hard steel trowel at monolithic risers. Steel trowel surfaces treated with Slip Resistant Finish sufficiently to allow particles to extend slightly above finish surface.
   1. Slip Resistant Finish: Apply in accordance with manufacturer's instructions on surfaces at a minimum rate of 50 lbs. per 100 square feet.
   2. Owner's Option in lieu of Slip Resistant Finish:
      a. Apply Medium Broom Finish.

F. Curing: Cure surfaces utilizing one of the following methods:
   1. Spraying: Spray water over slab areas and maintain wet for 7 days.
   2. Contractor's Option
      a. Spread polyethylene film over slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.

b. Apply liquid curing compound at rate of 200 square feet per gallon, using power sprayer equipped with agitator.

3.07 CURB AND GUTTER, MOW STRIPS, CONCRETE DRAINAGE STRUCTURES, SWALES

A. Subgrade Preparation: Subgrade material, base material and compaction requirements as approved by the Geotechnical Engineer.

B. Forms: Single face type required, cut to conform exactly with face batter and radius, sufficiently rigid to resist springing or deflection from concrete placement. Clean forms of all loose dirt, mortar or similar materials and apply a light coating of oil or other suitable material prior to concrete placement.
1. Slip Forms: Contractor's option upon approval of the Architect.

C. Reinforcement: Refer to drawings for size and spacing. Interrupt reinforcement at expansion joints.

D. Concrete Placement: Dampen subgrade to retain moisture in concrete mix. Tamp and spade to consolidate concrete to entire length of pour. Strike off upper surface to specified grades. Cut drain pipes to conform to curb batter.

E. Expansion Joints: Locate joint filler at maximum 20 foot centers. Trim off excess filler material flush to finish surface. No sealant application required.

F. Control Joints: at 8 feet on center, tooled joints, 1/2 inch radius.

G. Finish: Apply thin layer of mortar of 1 part Portland cement to 1-1/2 parts sand to exposed faces. Trowel to a smooth and even finish with a fine hair broom applied parallel with the line of the work. Round all edges to 1/2 inch radius. No Contractor identification permitted.

H. Curing: Cure surfaces utilizing one of the following methods:
1. Spraying: Spray water over curb and gutter and maintain wet for 7 days.
2. Spread polyethylene film over areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
3. Apply liquid-curing compound at rate of 200 sf per gallon, using power sprayer equipped with agitator.

3.08 TOLERANCES

A. Construction tolerances shall not violate dimensions, grades, slopes required by CBC for accessibility requirements. Adjust work accordingly to comply with requirements.

B. Comply with tolerances of ACI 117 and as follows (tolerances may not exceed CBC maximum or minimum):
1. Maximum deviation of 1/8 inch in 10 feet.
2. Elevation: 1/4 inch (6 mm).
3. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
4. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/8 inch (3 mm).
5. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
6. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
7. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).

8. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
9. Joint Spacing: 3 inches (75 mm).
10. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
11. Joint Width: Plus 1/8 inch (3 mm), no minus.

END OF SECTION 32 13 13

SECTION 32 17 13 PARKING BUMPERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Precast concrete parking bumpers and anchorage.

B. Reference Standards:
1. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
2. ASTM C150/C150M - Standard Specification for Portland Cement.
3. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
4. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.

1.3 SUBMITTALS

A. Product Data Sheet

PART 2 PRODUCTS

2.1 MATERIALS

A. Parking Bumpers - Precast concrete, conforming to the following:
1. Basis of Design: Model S-72 by Jensen Precast, or approved equal.
2. Nominal Size: 5 inches high, 7 inches wide, 6 feet long.
3. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
4. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
5. Air Entrainment Admixture: ASTM C260/C260M.
6. Concrete Mix: Minimum 4000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
7. Use rigid molds, constructed to maintain precast units, uniform in shape, size and finish. Maintain consistent quality during manufacture.
8. Reinforcing Steel: ASTM A615/A615M, deformed #3 steel bars; unfinished, strength and size commensurate with precast unit design.
9. Embed reinforcing steel, and drill or sleeve for two dowels.
10. Dowels: Provide two (2) #4 rebar x 14 inches long.
11. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
12. Minor patching in plant is acceptable, providing appearance of units is not impaired.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

END OF SECTION

SECTION 32 17 23 PAVEMENT MARKINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Parking lot markings, including parking bays, arrows, handicapped symbols, and curb markings.

B. Reference Standards:
   1. CBC Chapter 11B - California Building Code - Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
   2. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

1.3 DEFINITIONS

A. Pavement Stripe: Includes traffic control, materials, and all appurtenances not otherwise specified.

B. Pavement Markings: Includes traffic control, setup, materials, and all appurtenances not otherwise specified in the bid schedule.

1.4 QUALITY ASSURANCE

A. Accessible Parking:
   1. Accessible parking spaces and access aisles shall comply with CBC Section 11B-502 and shall be dimensioned to the centerline of the marked lines as follows:
      a. Parking spaces and access aisles shall be marked according to CBC Figures 11B-502.2, 11B-502.3, and 11B-502.3.3. Their surfaces shall comply with CBC Section 11B-302 and shall be at the same level with slopes not steeper than 1:48 in any direction. See CBC Section 11B-502.4:
      b. Parking spaces shall be 9 feet x 18 feet minimum, and van parking spaces shall be 12 feet by 18 feet minimum with an adjacent access aisle of 5 feet by 19 feet minimum. Access aisles shall be placed on either side of the parking spaces except be located on the passenger side for van parking spaces.
      c. Access aisles shall be marked by a blue painted borderline around their perimeters. The area within the blue borderlines shall be marked with hatched lines a maximum of 36 inches on center in a color contrasting with that of the aisle surface, preferably blue or white. Access aisle markings ay extend beyond the minimum required length. See CBC Section 11B-502.3.3.
      d. Access aisles (accessible parking spaces as well – similar application) shall not overlap the vehicular way. See CBC Section 11B-502.3.4.
      e. A vertical clearance of 8 feet 2 inches minimum shall be provided for accessible parking spaces, access aisles, and vehicular routes serving them. See CBC Section 11B-502.5.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Traffic Paint:
   1. Type: Water base, roadway traffic lane marking type; colors as selected.
   2. Acceptable Manufacturers:
      a. Dunn-Edwards, Vin-L-Stripe No. W-801, vinyl-epoxy as a standard of quality.
      b. J. E. Bauer latex base Formula No. 1030A9 White, No. 1056A9 Yellow, No. 1865A9 Blue, No. 1118A9 Green, and No. 1854A9 Red.
      c. Sinclair No. 160 Vinyl Traffic Line Paint, water base.
      d. Ennis Traffic Safety Solutions, product 6000 white & 6006 blue.

B. Line and Zone Marking Paint - MPI (APL) No. 97 Latex Traffic Marking Paint; white:
   1. Roadway Markings: As required by authorities having jurisdiction.
   2. Handicapped Symbols: Blue.

C. Striping: Thermoplastic Stripe, In accordance with State of California, Department of Transportation (CALTRANS), Standard Specifications, Section 84.

D. Pavement Markings: Thermoplastic Markings, In accordance with State of California, Department of Transportation (CALTRANS), Standard Specifications, Section 84.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

3.2 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.3 JOB CONDITIONS

A. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

B. Sequencing, Scheduling: Coordinate with paving work. Verify that paint type is compatible with asphalt paving surfaces seal coats.

C. Protection: Do not apply pavement markings for seven days after application of asphalt surface seal coat. After application, protect from traffic until thoroughly dry.

3.4 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation:
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

3.5 INSTALLATION

A. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

B. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

C. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends:
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Width Tolerance: Plus or minus 1/8 inch.

D. Parking Lots - Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings:
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

3.6 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other

approved method.

F. Replace removed markings at no additional cost to District.

END OF SECTION

SECTION 32 17 26 – TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Truncated dome tactile warning surfacing.

1.2 REFERENCE STANDARDS

A. Accessibility Requirements:
   1. Comply with applicable requirements.
      a. Americans with Disabilities Act of 1990, as amended.
         1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
      b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
         1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

1.3 SUBMITTALS

A. Samples: Submit samples of tactile warning surfacing, 6 x 6 inches minimum, in pattern and color specified.

B. Product Literature: Submit manufacturer's installation instructions and warranty form.

C. Installer Qualifications: Submit evidence that installer meets specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Warranty: Submit executed warranty.

B. Extra Stock Materials: Submit extra pigmented sealer and clear finish sealer in sufficient quantities to recoat tactile warning surfacing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver components in manufacturer's original packaging. Protect adhesives and coatings from freezing and temperatures in excess of 120 degrees F.

1.6 FIELD CONDITIONS

A. Do not install on damp substrates or when ambient or substrate temperatures are below 55 degrees F or above 95 degrees F.

1.7 WARRANTY

A. Submit manufacturer's executed five-year limited material warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide SafetyStepTD Tactile Warning Surfacing System manufactured by SafetyStepTD,

1. Colton, CA; www.SafetyStepTD.com; phone 866-723-3883; email rob@safetysteptd.com.

B. Substitutions: Or Equal.

2.2 COMPONENTS

A. Mats:
1. Model: SSTD-Mat.
2. Fabrication: Pre-molded sheet manufactured from flexible, polymer concrete with glass fiber mesh reinforcing; color shall be compatible with pigmented sealer color.
3. Truncated Domes: 0.9 inch diameter base and 0.45 inch diameter top, 0.2 inch high, and with beveled edges. Product Characteristics: Curbing, gutters, related drainage components.
   a. Pattern:
      1) Wide Inline (Square) Pattern: 2.35 inches on center each way.

B. Adhesive:
1. Model: SSTD-589.
2. Type: Water-based acrylic adhesive.
3. In cold weather, use manufacturer's accelerated curing adhesive.

C. Sand:
1. Model: SSTD-30.
2. Type: Clean, silver silica sand.
3. Size: Medium, #20 mesh.

D. Pigmented Sealer:
1. Model: SSTD-1250.
2. Type: Water based clear acrylic coating.
3. Color: Yellow; Shall approximate FS 33538 of Federal Standard 595A.

E. Clear Finish Sealer:
1. Model:SSTD-1250.
2. Type: Water based clear acrylic coating.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Installers shall be certified by manufacturer.

3.2 EXAMINATION

A. Substrates must be structurally sound and meet ADAAG requirements regarding configuration and slope.

B. B. Notify Architect if substrates are not acceptable. Do not install tactile warning surfacing until substrate meets requirements.

3.3 PREPARATION

A. Repair damaged substrate surfaces.

B. Pressure wash substrate and both sides of mat.

C. Substrate and mat shall be dry and free of oil, grease, curing agents, dirt, dust, and other foreign material that may prevent proper adhesion.

D. Layout:
1. Mark location to receive tactile warning surfacing with chalk or tape.
2. Layout mats so row of domes are aligned from mat to mat and perpendicular to direction of anticipated pedestrian traffic.
3. Remove truncated domes where full domes are not practical; do not use partial domes.
4. Trim mats so they do not cover expansion joints in substrate.
5. Install masking tape border ¼ inch outside of mats.

3.4 INSTALLATION

A. Primer: Apply adhesive to substrate with ¼ inch nap roller. Allow to dry to the touch.

B. Adhesive: Apply adhesive with 3/16 inch notched trowel.

C. Mats: Install mats into fresh adhesive. Use push broom to flatten mats and insure positive bond.

D. Mat Perimeter and Seams: Brush or float with additional adhesives to hide seams. Do not allow adhesive to dry on masking tape.

E. Base Coat: Allow adhesive used to install mats to dry to touch. Then, apply adhesive over top of mat using ¾" nap roller.

F. Sand: Broadcast evenly onto wet base coat to refusal. Allow base coat to dry to touch. Then blow-off un-bonded sand.

G. Pigmented Sealer: Apply evenly using a ¾" nap roller. Let dry to touch, then remove masking tape.

H. Clear Finish Sealer. Apply evenly with garden sprayer or roller.

3.5 PROTECTION

A. Protect tactile warning surfacing against rain, freezing, and vehicular and heavy foot traffic until clear finish sealer had dried for eight hours. Provide control (weakened plane) joints at locations shown on drawings, and as follows:

B. Protect installed tactile warning surfacing against damage by subsequent construction activities.

END OF SECTION

SECTION 32 31 13 CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. All Chain link fences, new or modernized shall comply with all local codes and zoning, where located on property and in route of travel all hardware to meet specified requirements listed here-in. Refer to Drawings and Details.

B. Reference Standards:
   1. ASTM International (ASTM):
      a. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
      b. F567, Standard Practice for Installation of Chain Link Fence.
      c. F626, Standard Specification for Fence Fittings.
      d. F900, Standard Specification for Industrial and Commercial Swing Gates.
      e. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded for Fence Structures.
      f. F2611, Standard Guide for Design and Construction of Chain Link Security Fencing.

C. Accessibility Requirements - Comply with applicable requirements:
   1. Americans with Disability Act of 1990, as amended.
   2. CBC 2022 California Building Code:
      a. CBC Chapter 11B - California Building Code - Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
      b. Door and Gate closures shall comply with 11B-404.2.8.1.
      c. Door and Gate opening force shall comply with 11B-404.2.9.
      d. Door and Gate operation shall comply with 11B-309.4.
   3. California Referenced Standards Code:
      a. CCR Title 24, Part 2, as adopted and amended by DSA.
      b. Title 24, Part 12, Section 12-10-202, Item (F).

1.4 SUBMITTALS

A. Product Data:
   1. Manufacturer’s schedules, charts, literature, and illustrations indicating the performance, fabrication procedures, product variations and accessories indicating material compliance and specified options.
   2. Manufacturer’s installation instructions.

B. Shop Drawings: Indicate materials, dimensions, details, and finish, show locations and installation procedures. Include details of fence and gate joints, attachments, accessories, footings, and clearances.

1.3 QUALITY ASSURANCE

A. Accessibility Requirements for Fences, Gates, and Hardware:
   1. Gates that are part of the accessible route shall meet all the requirements of an

accessible door in compliance with CNC Section 11B-404.

2. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within ½ inch of the gate surfaces to prevent catching on the clothing or persons. See California Referenced Standards Code T-24, Part 12, Section 12-10-202, Item (F).
3. Swing doors and gate surfaces within 10 inches of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16 inch of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. See CBC Section 11B-404.2.10.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Specifications are based on products of Anchor Fence by Master Halco Inc., Baltimore, MD, Phone (800) 229-5615.

B. Other manufacturers must have a minimum of five (5) years' experience manufacturing chain link fencing and gates meeting or exceeding the following specifications for design, size, gauge, finish of metal parts and fabrication and comply with Division 01 requirements for substitutions in order to be considered:
   1. Golden State Fence, Co Inc, Rancho Cordova, CA (916) 468-0975
   2. S & S Fence Co, Sacramento, CA (916) 682-1100

2.2 CHAIN LINK FENCE MATERIALS

A. General:
   1. Selvage: Knuckled finish top and bottom.
   2. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 16 feet high. Wire sizes includes zinc coating.
   3. Galvanized Wire: Zinc coated wire-ASTM A392, Class 1, with not less than 1.2 oz. zinc. per sq. ft.

B. Fence Fabric:
   1. Standard Industrial grade, 1" mesh, 9 gauge zinc coated steel wire, top selvage twisted tight, bottom selvage knuckled end closed.

C. Framing:
   1. Strength requirements for posts and rails shall conform to ASTM F1043.
   2. Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:

NPS in inches	Outside Diameter (OD) in inches	Type 1 Steel	Type II Steel
1	1.315	1.68	1.35
1.25	1.660 (1-5/8")	2.27	1.84
1.5	1.900 (2")	2.72	2.28
2	2.375 (2-1/2")	3.65	3.12
2.5	2.875 (3")	5.79	4.64
3	3.500	7.58	5.71
3.5	4.000	9.11	6.56
4	4.500	10.79	---
6	6.625	18.97	---

8	8.625	28.55	---

3. Posts, Rails, Braces, and Gate Frames - Steel pipe - Type I - ASTM F1083, standard weight Schedule 40; minimum yield strength of 25,000 psi; sizes as indicated below. Hot-dipped galvanized with minimum average 1.8 oz/ft² of coated surface area:
   a. Line posts: 2 inch o.d, weighing 2.72 lb/ft.
   b. Terminal, End, Corner, and Pull Posts: 2-1/2 inch o.d., weighing 3.65 lb/ft.
   c. Rails and Braces: 1-5/8 inch o.d., weighing 2.27 lb/ft.
4. End, corner, and pull posts for following fabric heights:
   a. Under 6 feet: 2.375" OD (2-1/2" OD)
   b. 6 feet to 10 feet: 2.875" OD (3" OD) (with privacy slats provide 3.5" OD)
   c. 10 feet to 15 feet: 3.5" OD
   d. 15 feet to 20 feet: 4" OD
   e. 20 feet to 25 feet: 4.5" OD
   f. 25 feet to 30 feet: 6.625" OD (6-5/8" OD)
5. Line or intermediate posts for following fabric heights:
   a. Under 6 feet: 1.90" OD (2" OD)
   b. 6 feet to 8 feet: 2.375" OD (2-1/2" OD) (with privacy slats provide 3" OD)
   c. 8 feet to 15 feet: 2.875" OD (3" OD)
   d. 15 feet to 20 feet: 3.5" OD
   e. 20 feet to 25 feet: 4" OD
   f. 25 feet to 30 feet: 6.625" OD (6-5/8" OD)
6. Top, Bottom and Horizontal Intermediate Rails:
   a. Top, bottom and horizontal intermediate rails (as applicable) shall be 1.66" OD (1-5/8"OD)
7. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
   a. 6 feet to 10 feet: 3.5" OD
   b. Under 6 feet: 2-7/8" OD
8. Gate Frames: Furnish frames (single or double gate), for nominal gate widths as follows:
   a. 6 feet to 10 feet: 1.90" OD (2" OD)
   b. Under 6 feet:1.66" OD (1-5/8"OD)

D. Concrete Footings: ASTM C94/C94M-19a; Portland Cement, 2,500 p.s.i. strength at 28 days, 3 inch slump; one inch maximum sized coarse aggregate.

E. Fence Accessories:
1. Chain Link Fence Accessories: Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.
2. Post Caps: Formed steel, cast malleable iron, or aluminum alloy weathertight closure cap for tubular posts. Provide one (1) cap for each post (where top rail is used, provide tops to permit passage of top rail).
3. Top Rail and Brace Rail Ends: Formed steel, malleable or cast iron, for connection of rail and brace to terminal posts.
4. Top Rail Sleeves: 6 inch sleeve allowing for expansion and contraction of top rail.
5. Wire Ties: 9 gauge galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge for rails and braces. Hog ring ties of 12-1/2 gauge for attachment of fabric to tension wire.
6. Brace and Tension (Stretcher Bar) Bands: Pressed steel.
7. Tension (Stretcher) Bars: One piece lengths equal to 2 inches less than full height of fabric with a minimum cross-section of 3/16 inch x 3/4 inch or equivalent fiber glass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.
8. Tension Wire: 7 gauge, diameter core wire with tensile strength of 75,000 psi.
9. Truss Rods: Steel rods with minimum diameter of 5/16 inch.
10. Fasteners: Galvanized nuts and bolts.

2.3 CHAIN LINK SWING GATES

A. Gate Frames: Fabricate chain link swing gates in accordance with ASTM F900 using galvanized steel tubular members, 2 inches square, weighing 2.60 lb/ft. Fusion or stainless steel welded connections forming rigid one-piece unit.

B. Chain Link Fence Fabric: Same as specified above for fence. Install fabric with hook bolts and tension bars at all four (4) sides. Attach to gate frame at not more than 15 inches on center.

C. Hardware:
1. As defined in Section 08 71 00.
2. Shall conform to 1.2.C this section.

D. Gate Posts - Steel pipe, ASTM F1083, standard weight Schedule 40; minimum yield strength of 25,000 psi. Hot-dipped galvanized with minimum 1.8 oz/ft² of zinc. Sizes as follows:
1. Width for single gate or one gate leaf of double gates:
   a. 6 feet or less: 2.875 inches in diameter, weighing 5.79 lb/ft.
   b. Over 6 feet to 12 feet: 4.00 inches in diameter, weighing 9.11 lb/ft.
   c. Over 12 feet to 19 feet: 6.625 inches in diameter, weighing 18.97 lb/ft.
   d. Over 19 feet to 23 feet: 8.625 inches in diameter, weighing 28.55 lb/ft.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify areas to receive fencing are completed to final grades and elevations.

B. Ensure property lines and legal boundaries of work are clearly established.

3.2 CHAIN LINK FENCE FRAMING INSTALLATION

A. Install chain link fence in accordance with ASTM F567 and manufacturer's instructions.

B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30 degrees or more.

C. Space line posts uniformly at 10 feet on center.

D. Concrete fence post footings:
1. Drill holes in firm, undisturbed or compacted soil. Excavate deeper than specified below as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
2. Line posts shall be set in 9 inch minimum diameter concrete piers, with a minimum of 36 inches of post embedment in concrete with an additional 3 inch concrete cover at bottom.
3. All end, corner, and pull posts shall be set in minimum 12 inch minimum diameter concrete piers, with a minimum of 36 inches of post embedment in concrete with an additional 3 inch concrete cover at bottom.
4. Place concrete around posts in a continuous pour.
5. Trowel finish around post. Slope to direct water away from posts.

E. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

F. Bracing: Install horizontal pipe brace at mid-height for fences six (6) and over, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.

G. Tension Wire: Provide tension wire at bottom of fabric. Install tension wire before stretching fabric and attach to each post with ties. Secure tension wire to fabric with 12-1/2 gauge hog rings 24 inches on center.

H. Top Rail: Install lengths, 21 feet. Connect joints with sleeves for rigid connections for expansion/contraction.

I. Bottom Rails: Install bottom rails between posts with fittings and accessories.

3.3 CHAIN LINK FABRIC INSTALLATION

A. Fabric: Install fabric on security side and attach so that fabric remains in tension after pulling force is released. Leave approximately 2 inches between finish grade and bottom selvage. Attach fabric with wire ties to line posts at 15 inches on center and to rails, braces, and tension wire at 24 inches on center.

B. Tension (stretcher) bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced maximum of 15 inches on center.
   1. Install to the guideline of ASTM F2611.

3.4 ACCESSORIES

A. Tie Wires: Bend ends of wire to minimize hazard to persons and clothing.

B. Fasteners: Install nuts on side of fence opposite fabric side for added security.

3.5 CHAIN LINK SWING GATE POST INSTALLATION

A. Install gate posts in accordance with manufacturer’s instructions.

B. Concrete gate post footings: Provide as detailed in the drawings.

3.6 GATE INSTALLATION

A. Install gates plumb, level, and secure for full opening without interference.

B. Attach hardware by means which will prevent unauthorized removal.

C. Adjust hardware for smooth operation.

3.7 CLEANING

A. Clean up debris and unused material, and remove from the site.

END OF SECTION

SECTION 32 31 19 DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section relates to Ornamental Fence Systems.

B. System Description:
1. The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system defined herein.
2. The manufacturer shall supply a total fence system of **Montage II® *Welded and Rackable* (ATF – All Terrain Flexibility) Ornamental Steel Majestic™ design.** The system shall include all components (i.e., panels, posts, gates and hardware) required.

C. Reference Standards:
1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
3. ASTM D523 - Test Method for Specular Gloss.
4. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
5. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
6. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
7. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
8. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
9. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
10. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.3 SUBMITTALS

A. Shop Drawings - Submit shop drawings detailing the fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items:
1. For installed products indicated to comply with design loads, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.

B. Welding certificates.

C. Paint Compatibility Certificates: Submit manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.4 QUALITY ASSURANCE

A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the

type of construction involved and materials and techniques specified.

B. Accessibility Requirements for Fences, Gates, and Hardware:
1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404.
2. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within ½ inch of the gate surfaces to prevent catching on the clothing or persons. See California Referenced Standards Code T-24, Part 12, Section 12-10-202, Item (F).
3. Swing doors and gate surfaces within 10 inches of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16 inch of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. See CBC Section 11B-404.2.10.

1.5 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

PART 2 MATERIALS

2.1 MANUFACTURER

A. The fence system shall conform to **Montage II® *Welded and Rackable* (ATF: All Terrain Flexibility) Ornamental Steel, Majestic™ design**, extended picket bottom rail treatment, 3-Rail style manufactured by **Ameristar Fence Products, Inc**., Tulsa, Oklahoma.

2.2 MATERIAL

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.90 oz/ft2 (276 g/m2), Coating Designation G-90.

B. Material for pickets shall be 1” square x 14 Ga. tubing. The rails shall be steel channel, 1.75” x 1. 75” x .105”. Picket holes in the rail shall be spaced 4.715” o.c. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

Table 1 – Minimum Sizes for Montage II Posts			
Fence Posts	Panel Height		
2-1/2" x 12 Ga.	Up to & Including 6' Height		
3" x 12 Ga.	Over 6' Up to & Including 8' Height		
Gate Leaf	Gate Height		
	Up to & Including 4'	Over 4' Up to & Including 6'	Over 6' Up to & Including 8'
Up to 4'	2-1/2" x 12 Ga.	3" x 12 Ga.	3" x 12 Ga.
4'1" to 6'	3" x 12Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	3" x 12 Ga.	4" x 11 Ga.	6" x 3/16"
8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
10'1" to 12'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
12'1" to 14'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
14'1" to 16'	6" x 3/16"	6" x 3/16"	6" x 3/16"

2.3 FABRICATION

A. Pedestrian gates 4 feet or less shall have accessible hardware complying with CBC 11B-404.2.7 and 11B-309.4.

B. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

C. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

D. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).

Table 2 – Coating Performance Requirements		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60˚ Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

E. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

F. Swing gates shall be fabricated using 1.75" x 14ga Forerunner double channel rail, 2" sq. x 12ga. gate ends, and 1" sq. x 14ga. pickets. Gates that exceed 6' in width will have a 1.75" sq. x 14ga. intermediate upright. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gusset plates will be welded at each upright to rail intersection. Cable kits will be provided for additional trussing for all gates leaves over 6'.

G. Pedestrian swing gates shall be self-closing, having a gate leaf no larger than 48" width. Integrated hinge-closer set (2 qty) shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5" x 6" footprint). Hinge-closer set (2 qty) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (.5" - 1.375") and vertical (0 - .5"). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

H. Alternate Hinges:
1. Products:
   a. Mammoth Hydraulic Gate Closer For Heavy Gates (up to 330 pounds) by Locinox.
      1) Self-closing, 180-degree hinge with hydraulic damping.
      2) Powder-coated aluminum housing.
      3) ADA compliant.
      4) Opening resistance: Maximum 15 Nm (3-5 pounds).
      5) Vandal-proof.
   b. Mammoth-HD Heavy Duty Hydraulic Gate Closer and Hinge-In-One (up to 440 pounds and 6' wide):
      1) Includes Mammoth hinge and Raptor hinge.
      2) Self-closing, 180-degree closing angle with hydraulic damping system.
      3) Powder-coated finish.
      4) ADA compliant.
      5) Opening resistance: Less than five (5) pounds from gate width 4.6 feet and up (max 30 Nm).
      6) Vandal-proof.
      7) Installation gap: 9/16-inch minimum up to 1-3/8 inch maximum (ornamental).
      8) Adjustability: 3/4-inch gap and 3/4-inch height.

2.4 ACCESSORIES

A. Knox Boxes:
1. Knox Rapid Entry System, 3200 Series, Knox Company, 1601 W. Deer Valley Road, Phoenix, AZ 85027 800-552-5669.
   a. Location as noted on Drawings.

PART 3 EXECUTION

3.1 PREPARATION

A. All new installation shall be laid out by the contractor in accordance with the construction plans.

3.2 FENCE INSTALLATION

A. Fence post shall be spaced according to Table 3, plus or minus ½". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36".

Table 3 – Montage II – Post Spacing By Bracket Type

Span	For INVINCIBLE® 8' Nominal (91-1/2" Rail)				For CLASSIC, GENESIS, & MAJESTIC 8' Nominal (92-5/8" Rail)					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)*		Industrial Line 2-1/2" (BB319) 3" (BB320)		Industrial Universal 2.5" (BB302) 3" (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)*	
Post Settings ± ½" O.C.	94-1/2"	95"	94-1/2"	95"	96"	96-1/2"	96"	96-1/2"	*96"	*96-1/2"

*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel. When using the BB301 flat mount bracket for Invincible style, rail may need to be drilled to accommodate rail to bracket attachment.

3.3 FENCE INSTALLATION MAINTENANCE

A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces:
   1. Remove all metal shavings from cut area.
   2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.
   3. Apply 2 coats of custom finish paint matching fence color.

B. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.4 GATE INSTALLATION

A. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.

3.5 CLEANING

A. The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

END OF SECTION

SECTION 32 84 00 LANDSCAPE IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. It is the intent of the specifications and drawings that the finished system is complete in every respect and shall be ready for operation satisfactory to the Owner.

B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as indicated on the drawings, in these specifications, and as necessary to complete the contract.

1.2 CONSTRUCTION DRAWINGS

A. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.

B. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications. When an item is shown on the plans but not shown on the specifications or vice versa, it shall be deemed to be as shown on both. The Landscape Architect shall have final authority for clarification.

C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect as soon as detected. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revision necessary.

1.3 QUALITY ASSURANCE

A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.

B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

C. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

D. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to Owner.

E. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.

1.4 SUBMITTALS

A. Submittals Materials List:
   1. After award of contract and before any irrigation system materials are ordered from suppliers or delivered to the job site, submit to the Owner a complete list of all irrigation system materials, or processes proposed to be furnished and installed as part of this contract.
   2. The submittals materials list shall include the following information:
      a. A title sheet with the job name, the contractor's name, contractor's address and telephone number, submittal date and submittal number.
      b. An index sheet showing the item number (i.e. 1,2,3, etc.); an item description (i.e. sprinkler head); the manufacturer's name (i.e. Hunter Industries); the item model number (i.e. I-40-ADV/36V); and the page(s) in the submittal set that contain the catalog cuts.
      c. The catalog cuts shall be one or two pages copied from the most recent manufacturer's catalog that indicate the product submitted. Do not submit parts lists, exploded diagrams, price lists or other extra information.
      d. The catalog cuts shall clearly indicate the manufacturer's name and the item model number. The item model number, all specified options and specified sizes shall be circled on the catalog cuts.
      e. Submittals for equipment indicated on the legend without manufacturer names, or "as approved", shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.
   3. Submittal materials list format requirements:
      a. Submittals shall be provided as one complete package for the project. Multiple partial submittals will not be reviewed.
      b. Submittal package shall be stapled or bound in such a way as to allow for disassembly for review processing. Submittals shall not have tabs, tab sheets, spiral binding, or any other type of binding that will interfere with automated copying of submittals.
      c. Submittal package shall have all pages numbered in the lower right hand corner. Page numbers shall correspond with submittal index.
      d. Re-submitted packages must be revised to include only the equipment being re-submitted. Equipment previously reviewed and accepted shall not be re-submitted in the materials list/index sheet or in the catalog cut sheet package.

B. Substitutions: If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect or Owner's authorized representative for approval.
   1. Provide a written statement indicating the reason for making the substitution.
   2. Provide catalog cut sheets, technical data, and performance information for each substitute item.
   3. Provide in writing the difference in installed price if the item is accepted.

C. The Landscape Architect or Owner's authorized representative will allow no substitutions without prior written acceptance.

D. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

E. The Landscape Architect or Owner's authorized representative will not review the submittal package unless provided in the format described above.

1.5 EXISTING CONDITIONS

A. The Contractor shall verify and be familiar with the locations, size and detail of points of connection provided as the source of water, electrical supply, and telephone line connection to the irrigation system.

B. Irrigation design is based on the available static water pressure shown on the drawings. Contractor shall verify static water on the project prior to the start of construction. Should a discrepancy exist, notify the Landscape Architect and Owner's authorized representative prior to beginning construction.

C. Prior to cutting into the soil, the Contractor shall locate all cables, conduits, sewer septic tanks, and other utilities as are commonly encountered underground and he shall take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, the Contractor shall promptly notify the Landscape Architect and Owner who will arrange for relocations. The Contractor will proceed in the same manner if a rock layer or any other such conditions are encountered.

D. The Contractor shall protect all existing utilities and features to remain on and adjacent to the project site during construction. Contractor shall repair, at his own cost; all damage resulting from his operations or negligence.

E. The Irrigation Contractor shall coordinate with the General Contractor for installation of required sleeving as shown on the plans prior to paving operations.

F. The Contractor shall verify and be familiar with the existing irrigation systems in areas adjacent to and within the Project area of work.

G. The Contractor shall protect all existing irrigation systems, in areas adjacent to and within the project area of work, from damage due to his operations.

H. Contractor shall notify Owner’s Representative if any existing system is temporarily shut off, capped or modified. Provide 48-hour notice, prior to turning off or modifying any existing irrigation system.

I. The Contractor shall repair or replace all existing irrigation systems, in areas adjacent to and within the project area of work, damaged by the construction of this project. Adjacent irrigation systems shall be made completely operational and provide complete coverage of the existing landscaped areas. All repairs shall be complete to the satisfaction of the Owner’s Representative.

J. The contractor shall provide bore holes under any existing pavement or paving encountered for the required lateral, mainline and low voltage control wire sleeving. Bore holes under 2 inches in diameter and smaller shall be made with a BulletMole® underground boring tool as manufactured by Dimension Tools, LLC (Contact telephone number (888)-650-5554 or at www.bulletmole.com). Bore holes larger than 2 inches in diameter shall be made with an approved mechanical boring tool. No air jacking or hydraulic boring of any kind shall be allowed.

1.6 INSPECTIONS

A. The Contractor shall permit the Landscape Architect and Owner's authorized representative to visit and inspect at all times any part of the work and shall provide safe access for such visits.

B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Contractor's expense.

C. Inspections will be required for the following at a minimum:
   1. Pre-construction meeting.
   2. System layout.
   3. Pressure test of irrigation mainline (Four hours at 125 PSI or 120% of static water pressure, whichever is greater.) Mainline pressure loss during test shall not exceed 2 PSI.
   4. Coverage test of irrigation system. Test shall be performed prior to any planting.
   5. Final inspection prior to start of maintenance period.
   6. Final acceptance prior to turnover.

D. Site observations and testing will not commence without the field record drawings as prepared by the Irrigation Contractor. Record drawings must complete and up to date for each site visit.

E. Work that fails testing and is not accepted will be retested. Hourly rates and expenses of the Landscape Architect, Owner's authorized representative, and governing agencies for re-inspection or retesting will be paid by the Irrigation Contractor at no additional expense to Owner.

1.7 STORAGE AND HANDLING

A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and Owner and at no additional cost to the Owner.

B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

1.8 CLEANUP AND DISPOSAL

A. Dispose of waste, trash, and debris in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris will not be permitted. The Contractor shall remove and dispose of rubbish and debris generated by his work and workmen at frequent intervals or when ordered to do so by the Owner's authorized representative.

B. At the time of completion the entire site will be cleared of tools, equipment, rubbish and debris which shall be disposed of off-site in a legal disposal area.

1.9 TURNOVER ITEMS

A. Record Drawings:
   1. Record accurately on one set of drawings all changes in the work constituting departures from the original contract drawings and the actual final installed locations of all required components as shown below.
   2. The record drawings shall be prepared to the satisfaction of the Owner. Prior to final inspection of work, submit record drawings to the Landscape Architect or Owner's authorized representative.

3. All record drawings shall be prepared using AutoCAD 2010 drafting software and the original irrigation drawings as a base. No manual drafted record drawings shall be acceptable. The Contractor may obtain digital base files from the Landscape Architect or Owner's authorized representative.
4. If the Contractor is unable to provide the AutoCAD drafting necessary for the record drawings the irrigation designer does provide record drawing drafting as a separate service.
5. Prior to final inspection of work, submit record drawings plotted onto vellum sheets for review by the Landscape Architect or Owner's authorized representative. After acceptance by the Landscape Architect, City Inspector or Owner's authorized representative re-plot the record drawings onto reproducible Mylar sheets. The Contractor shall also provide record drawing information on a digital AutoCAD Release 2010 drawing file. All digital files shall be provided on a compact disc (CD) clearly marked with the project name, file descriptions and date.
    a. Record drawing information and dimensions shall be collected on a day-to-day basis during the installation of the pressure mainline to fully indicate all routing locations and pipe depths. Locations for all other irrigation equipment shall be collected prior to the final inspection of the work.
    b. Two dimensions from two permanent points of reference such as buildings, sidewalks, curbs, streetlights, hydrants, etc. shall be shown for each piece of irrigation equipment shown below. Where multiple components are installed with no reasonable reference point between the components, dimensioning may be made to the irrigation equipment. All irrigation symbols shall be clearly shown matching the irrigation legend for the drawings. All lettering on the record drawings shall be minimum 1/8 inch in size.
6. Show locations and depths of the following items:
    a. Point of connection (including water POC, backflow devices, master control valves, flow sensors, etc.)
    b. Routing of sprinkler pressure main lines (dimensions shown at a maximum of 100 feet along routing)
    c. Isolation valves
    d. Automatic remote control valves (indicate station number and size)
    e. Quick coupling valves
    f. Drip air relief and flush valves
    g. Routing of control wires where separate from irrigation mainline
    h. Irrigation controllers (indicate controller number and station count)
    i. Related equipment (as may be directed)

B. Controller Charts:
1. Provide one controller chart for each automatic controller. Chart shall show the area covered by the particular controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.
2. Landscape Architect or Owner's authorized representative must approve record drawings before controller charts are prepared.
3. The chart is to be a reduced copy of the actual "record" drawing. In the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a readable size.
4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness.

C. Operation and Maintenance Manuals:
1. Two individually bound copies of operation and maintenance manuals shall be delivered to the Landscape Architect or Owner's authorized representative at least 10 calendar days prior to final inspection. The manuals shall describe the material installed and the proper operation of the system.
2. Each complete, bound manual shall include the following information:

3. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
    a. Operating and maintenance instructions for all equipment.
    b. Spare parts lists and related manufacturer information for all equipment.

D. Equipment:
1. Supply as a part of this contract the following items:
    a. Two (2) wrenches for disassembly and adjustment of each type of sprinkler head used in the irrigation system.
    b. Three 30-inch sprinkler keys for manual operation of control valves.
    c. Two keys for each automatic controller.
    d. Two quick coupler keys with a 3/4" bronze hose bib, bent nose type with hand wheel and two coupler lid keys.
    e. One valve box cover key or wrench.
    f. Six extra sprinkler heads of each size and type.
    g. For specified ball valves if required: One (1) 5-foot long valve handle, to fit the specified ball valves.
2. The above equipment shall be turned over to Owner's authorized representative at the final inspection.

1.10 COMPLETION

A. At the time of the pre-maintenance period inspection, the Landscape Architect, Owner's authorized representative, and governing agencies will inspect the work, and if not accepted, will prepare a list of items to be completed by the Contractor. Punch list to be checked off by contractor and submitted to Landscape Architect or Owner’s Authorized representative prior to any follow-up meeting. This checked off list to indicate that all punch list items have been completed. At the time of the post-maintenance period or final inspection the work will be re-inspected and final acceptance will be in writing by the Landscape Architect, Owner's authorized representative, and governing agencies.

B. The Owner's authorized representative shall have final authority on all portions of the work.

C. After the system has been completed, the Contractor shall instruct Owner's authorized representative in the operation and maintenance of the irrigation system and shall furnish a complete set of operating and maintenance instructions.

D. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired to the Owner's satisfaction by the Contractor without any additional expense to the Owner. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

1.11 GUARANTEE

A. The entire sprinkler system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the filing of the Notice of Completion.

B. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to Owner within ten (10) calendar days of receipt of written notice from Owner. When the nature of the repairs as determined by the Owner constitute an emergency (i.e. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvement resulting either from faulty materials or workmanship, or from the necessary

repairs to correct same, shall be repaired to the satisfaction of the Owner by the Contractor, all at no additional cost to the Owner.

C. Guarantee shall be submitted on Contractors own letterhead as follows:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defective material during the period of one year from date of filing of the Notice of Completion and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 calendar days following written notification by the Owner. In the event of our failure to make such repairs or replacements within the time specified after receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT NAME:
PROJECT LOCATION:

CONTRACTOR NAME:
ADDRESS:

TELEPHONE:

SIGNED:

DATE:

PART 2 - MATERIALS

2.1 SUMMARY

Use only new materials of the manufacturer, size and type shown on the drawings and specifications. Materials or equipment installed or furnished that do not meet Landscape Architect's, Owner's, or governing agencies standards will be rejected and shall be removed from the site at no expense to the Owner.

2.2 PIPE

A. Pressure supply line between the water meter and the backflow prevention device shall be type K copper, one size larger than backflow device.

B. Backflow prevention assemblies, and all other above grade assemblies, shall be constructed of threaded brass pipe and threaded brass fittings the same size as the backflow device, unless otherwise directed.

C. Pressure supply lines 2 inches in diameter and smaller downstream of the backflow prevention unit shall be Schedule 40 solvent weld PVC conforming to ASTM D1785.

D. Non-pressure lines 3/4 inch in diameter and larger downstream of the remote control valve shall be SCH 40 solvent weld PVC conforming to ASTM D1785.

2.3 METAL PIPE AND FITTINGS

A. Brass pipe shall be 85 percent red brass, ANSI, IPS Standard 125 pounds, Schedule 40 screwed pipe.

B. Fittings shall be medium brass, screwed 125-pound class.

C. Copper pipe and fittings shall be Type "K" sweat soldered, or brazed as indicated on the drawings.

2.4 PLASTIC PIPE AND FITTINGS

A. Pipe shall be marked continuously with manufacturer's name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.

B. All plastic pipe shall be extruded of an improved PVC virgin pipe compound in accordance with ASTM D2672, ASTM D2241 or ASTM D1785.

C. All solvent weld PVC fittings shall be standard weight Schedule 40 (and Schedule 80 where specified on the irrigation detail sheet, all mainline fittings shall be Schedule 80 PVC) and shall be injection molded of an improved virgin PVC fitting compound. Slip PVC fittings shall be the "deep socket" bracketed type. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated. All fittings shall conform to ASTM D2464 and ASTM D2466.

D. All threaded nipples shall be standard weight Schedule 80 with molded threads and shall conform to ASTM D1785.

E. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer's recommendations. Cement shall be of a fluid consistency, not gel-like or ropy. Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.

F. When connection is plastic to metal, female adapters shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base Teflon paste, tape, or equal.

G. All pressure mainlines installed with solvent weld PVC fittings shall be installed with concrete thrust blocking at all directional changes in the mainline routing. Concrete thrust blocking shall not be required when ductile iron fittings and mechanical restraints are specified.

2.5 BACKFLOW PREVENTION UNITS

A. The backflow prevention unit shall be of the manufacturer, size, and type indicated on the drawings.

B. The backflow prevention unit shall be installed in accordance with the requirements set forth by local codes.

C. The backflow enclosure shall be of the manufacturer, size, and type indicated on the drawings.

D. The backflow freeze prevention cover shall be of the manufacturer, size, and type indicated on the drawings.

2.6 VALVES

A. Ball Valves:
1. Ball valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Ball valves shall be constructed of a bronze or stainless steel body, stainless steel ball and stem. Ball valves shall have threaded connections.
3. All ball valves shall have a minimum working pressure of not less than 150 PSI and shall conform to AWWA standards.

B. Quick Coupler Valves:
1. Quick coupler valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Quick coupler valves shall be brass with a wall thickness guaranteed to withstand normal working pressure of 150 psi without leakage. Valves shall have 1” female threads opening at base, with two-piece body. Valves to be operated only with a coupler key, designed for that purpose. Coupler key is inserted into valve and a positive, watertight connection shall be made between the coupler key and valve.

C. Automatic Control Valves:
1. Automatic control valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Automatic control valves shall be electrically operated.
3. Provide Christy's valve ID tags for each remote control valve with valve number.

2.7 VALVE BOXES

A. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.

B. The valve box cover shall be green in color and secured with a hidden latch mechanism or bolts.

C. The cover and box shall be capable of sustaining a load of 1,500 pounds.

D. Valve box extensions shall be by the same manufacturer as the valve box.

E. The plastic irrigation valve box cover shall be an overlapping type.

F. Automatic control valve, master valve, and flow sensor shall be 17"x11"x12" ‘nominal’ rectangular size. Valve box covers shall be marked "RCV" with the valve identification number, or “MV”, “FS” "heat branded" onto the cover in 1-1/4 inch high letters / numbers.

G. Quick coupler valve boxes shall be 10" circular size. Valve box covers shall be marked with "QCV" "heat branded" onto the cover in 1-1/4 inch high letters.

2.8 AUTOMATIC CONTROLLER

A. Automatic controller shall be of the manufacturer, size, and type indicated on the drawings.

B. Controller enclosure shall be of the manufacturer, size, and type indicated on the drawings.

C. Controller shall be grounded according to local codes using equipment of the manufacturer, size, and type indicated on the drawings; or as required by local codes and ordinances.

2.9 ELECTRICAL

A. All electrical equipment shall be NEMA Type 3, waterproofed for exterior installations.

B. All electrical work shall conform to local codes and ordinances.

2.10 LOW VOLTAGE CONTROL WIRING

A. Remote control wire shall be direct-burial AWG-UF type, size as indicated on the drawings, and in no case smaller than 12 gauge.

B. Remote control wire shall be 14 AWG solid core twisted pair, type as indicated on the irrigation drawings.

C. Connections shall of the manufacturer, size, and type indicated on the drawings.

D. Common wires shall be white in color. Control wires shall be red (where two or more controllers are used, the control wires shall be a different color for each controller. These colors shall be noted on the "Record Drawings" plans located on controller door).

2.11 IRRIGATION HEADS

A. Irrigation heads shall be of the manufacturer, size, type, with radius of throw, operating pressure, and discharge rate indicated on the drawings.

B. Irrigation heads shall be used as indicated on the drawings.

C. Irrigation heads shall have purple recycled water warning cover.

2.12 MISCELLANEOUS EQUIPMENT

A. Landscape Fabric:
   1. Landscape fabric for valve box assemblies shall be 5.0- oz. weight woven polypropylene weed barrier. Landscape fabric shall have a burst strength of 225 PSI, a puncture strength of 60 lbs. and capable of water flow of 12 gallons per minute per square foot.
   2. Type: DeWitt Pro 5 Weed Barrier or approved equal.

B. Equipment such as flow sensors, rain sensors, freeze sensors, flush valves, air relief valves, wye strainers, and master valves shall be of the manufacturer, size and type indicated on the drawings.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspections:
   1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
   2. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

B. Discrepancies:
   1. In the event of discrepancy, immediately notify the Landscape Architect or Owner's authorized representative.

2. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved.

C. Grades:
1. Before starting work, carefully check all grades to determine that work may safely proceed, keeping within the specified material depths with respect to finish grade.
2. Final grades shall be accepted by the Engineer before work on this section will be allowed to begin.

D. Field Measurements:
1. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other work.
2. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions prior to proceeding with work under this section.
3. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities, which are caused by his operations or neglect.

E. Diagrammatic Intent:
The drawings are essentially diagrammatic. The size and location of equipment and fixtures are drawn to scale where possible. Provide offsets in piping and changes in equipment locations as necessary to conform with structures and to avoid obstructions or conflicts with other work at no additional expense to Owner.

F. Layout:
1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads, valves, backflow preventer, and automatic controller.
2. Layout irrigation system and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.

G. Water Supply:
Connections to, or the installation of, the water supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made at no additional expense to Owner.

H. Electrical Service:
1. Connections to the electrical supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made at no additional expense to Owner.
2. Contractor shall make electrical connections to the irrigation controller. Electrical power source to controller locations shall be provided by others.
3. Contractor shall make electrical connections to the irrigation controller. 230-volt single-phase electrical power source to pump assembly location shall be provided by others per NEC codes.

3.2 TRENCHING

A. Excavations shall be straight with vertical sides, even grade, and support pipe continuously on bottom of trench. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.

B. Provide minimum cover of 18 inches on pressure supply lines 2 ½ inches and smaller.

C. Provide minimum cover of 24 inches on pressure supply lines 3 inches and larger.

D. Provide minimum cover of 18 inches for control wires within planters.

E. Provide minimum cover of 24 inches for control wires within sleeves below paving.

F. Provide minimum cover of 36 inches on pressure supply lines under vehicular travel ways.

G. Provide minimum cover of 12 inches for non-pressure lines.

H. Pipes installed in a common trench shall have a 4-inch minimum space between pipes.

3.3 THRUST BLOCKS

A. Thrust blocks must be constructed of Class “B” concrete.

B. Thrust blocks shall be poured against undisturbed site soil.

C. PVC fitting joints shall be kept free of concrete. Do not encase fitting in concrete.

D. Thrust blocking shall be sized to provide the minimum bearing areas as shown below. Bearing areas indicated have been calculated for Class 200 PVC pipe at a test pressure of 150 PSI in soil with 2,000 PSI bearing capacity. Increase thrust block sizing as necessary for varying soil conditions.
   1. Provide a minimum thrust block bearing area of 2.0 square feet on all bends (all degrees) and tees installed on pressure supply lines 4 inches and smaller.
   2. Provide a minimum thrust block bearing area of 4.0 square feet on all 90 degree bends installed on pressure supply lines 6 inches in size. Bends of less than 90 degrees shall require a thrust block with a bearing area of 2.0 square feet for 6 inch mainline.
   3. Provide a minimum thrust block bearing area of 3.0 square feet on all tees installed on pressure supply lines 6 inches in size.
   4. Provide a minimum thrust block bearing area of 6.5 square feet on all 90 degree bends installed on pressure supply lines 8 inches in size. Bends of less than 90 degrees shall require a thrust block with a bearing area of 3.5 square feet for 8 inch mainline.
   5. Provide a minimum thrust block bearing area of 4.5 square feet on all tees installed on pressure supply lines 8 inches in size.

3.4 BACKFILLING

A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 inches in diameter.

B. Backfill shall be tamped in 4-inch layers under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Backfill materials shall be sufficiently damp to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.

C. Flooding in lieu of tamping is not allowed.

D. Under no circumstances shall truck wheels be used to compact backfill.

E. Provide sand backfill a minimum of 4 inches over and under all piping under paved areas.

3.5 PIPING

A. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. No hydraulic driving is permitted under asphalt pavement.

B. Cutting or breaking of existing pavement is not permitted.

C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, burrs, and reaming. Install pipe with all markings up for visual inspection and verification.

D. Remove all dented and damaged pipe sections.

E. All lines shall have a minimum clearance of 4 inches from each other and 12 inches from lines of other trades.

F. Parallel lines shall not be installed directly over each other.

G. In solvent welding, use only the specified primer and solvent cement and make all joints in strict accordance with the manufacturer's recommended methods including wiping all excess solvent from each weld. Allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling.

H. PVC pipe shall be installed in a manner, which will provide for expansion and contraction as recommended by the pipe manufacturer.

I. Center load all plastic pipe prior to pressure testing.

J. All threaded plastic-to-plastic connections shall be assembled using Teflon tape or Teflon paste.

K. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope an all threaded plastic-to-metal connections, except where noted otherwise. All plastic-to-metal connections shall be made with plastic female adapters.

3.6 CONTROLLER

A. The exact location of the controller shall be approved by the Landscape Architect or Owner's authorized representative before installation. The electrical service shall be coordinated with this location.

B. The Irrigation Contractor shall be responsible for the final electrical hook up to the irrigation controller.

C. The irrigation system shall be programmed to operate during the periods of minimal use of the design area.

3.7 CONTROL WIRING

A. Low voltage control wiring shall occupy the same trench and shall be installed along the same route as the pressure supply lines whenever possible.

B. Where more than one wire is placed in a trench, the wiring shall be taped together in a bundle at intervals of 10 feet. Bundle shall be secured to the mainline with tape at intervals of 20 feet.

C. All connections shall be of an approved type and shall occur in a valve box. Provide an 18-inch service loop at each connection.

D. An expansion loop of 12 inches shall be provided at each wire connection and/or directional change, and one of 24 inches shall be provided at each remote control valve.

E. A continuous run of wire shall be used between a controller and each remote control valve. Under no circumstances shall splices be used without prior approval.

3.8 VALVES

A. Automatic control valves, quick coupler, and ball valves are to be installed in the approximate locations indicated on the drawings.

B. Valve shall be installed in shrub areas whenever possible.

C. Install all valves as indicated in the detail drawings.

D. Valves to be installed in valve boxes shall be installed one valve per box.

E. Provide valve ID tags for each remote control valve with valve number.

3.9 VALVE BOXES

A. Valve boxes shall be installed in shrub areas whenever possible.

B. Each valve box shall be installed on a foundation of 3/4 inch gravel backfill, 3 cubic feet minimum. Valve boxes shall be installed with their tops 1/2 inch above the surface of surrounding finish grade in lawn areas and 2 inches above finish grade in ground cover areas.

3.10 IRRIGATION HEADS

A. Irrigation heads shall be installed as indicated on the drawings.

B. Spacing of heads and inline drip tubing shall not exceed maximum indicated on the drawings.

C. Riser nipples shall be of the same size as the riser opening in the sprinkler body.

3.11 BACKFLOW PREVENTION UNITS

A. Backflow Prevention Units shall be installed as indicated on the drawings. The backflow prevention unit shall be installed in accordance with the requirements set forth by local codes.

B. The exact location of the backflow device shall be approved by the Landscape Architect or owner's authorized representative before installation.

C. The contractor shall be responsible for the testing and certification of the backflow device for proper operation. Testing and certification shall be performed by a state qualified backflow tester.

3.12 MISCELLANEOUS EQUIPMENT

A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.

B. Quick coupler valves shall be set approximately 18 inches from walks, curbs, header boards, or paved areas where applicable.

C. Install devices such as rain sensors, flush valves, and air relief valves, master valves and flow sensors as indicated on the drawings and as recommended by the manufacturer.

3.13 FLUSHING THE SYSTEM

A. Prior to installation of irrigation heads, the valves shall be opened and a full head of water used to flush out the lines and risers.

B. Irrigation heads shall be installed after flushing the system has been completed.

3.14 ADJUSTING THE SYSTEM

A. Contractor shall adjust valves, align heads, and check the coverage of each system prior to coverage test.

B. If it is determined by the Landscape Architect or Owner's authorized representative that additional adjustments or nozzle changes will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to any planting.

C. The entire system shall be operating properly before any planting operations commence.

D. Automatic control valves are to be adjusted so that the irrigation heads operate at the pressure recommended by the manufacturer.

3.15 TESTING AND OBSERVATION

A. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been observed, tested and accepted by the Landscape Architect, Owner, and governing agencies.

B. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing.

C. When the sprinkler system is completed, the Contractor shall perform a coverage test of each system in its entirety to determine if the water coverage for the planted areas is complete and adequate in the presence of the Landscape Architect.

D. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate, without bringing this to the attention of the Landscape Architect. This test shall be accepted by the Landscape Architect and accomplished before starting any planting.

E. Areas to be maintained for the formal maintenance period shall start maintenance at the same time, as directed by the Landscape Architect, Owner, and governing agencies. Partial areas will not be released into maintenance prior to completion of items listed in the pre-maintenance review. The maintenance period may not be phased.

F. If, after the maintenance review, the irrigation systems are not accepted by the Landscape Architect, the contractor shall reimburse the Architect for additional site visits, or additional time required to review work. All additional time will be billed at the Architect’s hourly rate and will be paid for by the contractor at no additional cost to the owner.

G. Final inspection will not commence without record drawings as prepared by the Irrigation Contractor.

3.16 MAINTENANCE

During the maintenance period the Contractor shall adjust and maintain the irrigation system in a fully operational condition providing complete irrigation coverage to all intended plantings.

3.17 COMPLETION CLEANING

Clean up shall be made as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be swept, and any damage sustained on the work of others shall be repaired to original conditions.

END OF SECTION

SECTION 32 91 00 - SOIL PREPARATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Furnish components of the planting mediums.
2. Testing and/or certifications of components
3. Mixing of planting mediums.
4. Transporting mediums as required.
5. Weed Control

B. Related Sections:
1. Finish Grading - Section 31 22 15
2. Sprinkler Irrigation System - Section 32 84 00
3. Lawns and Grasses - Section 32 92 00
4. Planting - Section 32 93 00

1.02 QUALITY ASSURANCE

A. Certificates of Inspection: Certificates of inspection required for transportation shall accompany invoice for each shipment of materials. File copies of certificates with Landscape Architect after acceptance of material.

B. Testing:
1. Chemical and Physical - All soil components shall be tested by one of the following testing laboratories for conformity to the specifications:

Texas Plant and Soil Lab
5115 West Monte Cristo
Edinburg, Texas 78539
(956) 383-0739

A&L Plains Agricultural Laboratories, Inc.
302 34th Street
Lubbock, Texas 79404
(806) 763-4278

Soil and Plant Laboratory, Incorporated
Post Office Box 153
Santa Clara, California 95052
(408) 243-0330

2. Biological:
Soil Food Web, Inc.
1128 NE 2nd Street Suite 120
Corvallis, Oregon 97330
www.soilfoodweb.com
(541) 752-5066

3. If herbicide contamination is suspected, then a radish/rye-grass growth trial must be performed.

4. For delivered material, test one grab sample for each fifty (100) cubic yards of bulk material delivered to the site.

5. Testing will be at the expense of Contractor.

6. Deviations greater than plus or minus twenty (20%) percent from control data may be grounds for rejection of mixes tested. Non-conforming materials shall not be used. Materials which do not conform to standards specified herein shall be removed from the site.

1.03 SUBMITTALS: Furnish copies of manufacturers literature, certifications, sources, samples, or laboratory analytical data for the following items:

1. Existing soil testing data
2. Organic Amendments and Fertilizers
3. Planting Soil
4. Topsoil.
5. Sand.
6. Native Mulch (composted).
7. Compost.
8. Herbicides

PART 2 PRODUCTS

2. 01 PLANTING SOIL:

A. Grading:

Sieve Size	Percent Passing Sieve
25.4 mm (1")	95-100
9.51 mm (3/8")	85-100
53 Micron (270 mesh)	10- 30

B. Chemistry - Suitability Considerations:

1. Salinity: Saturation Extract Conductivity (ECe x 103 @ 25 degrees C.) less than 2.2 mmhos/cm.
2. Sodium: Sodium Absorption Ratio (SAR) less than 9.0.
3. Boron: Saturation Extract Concentration less than 2.0 ppm.
4. Reaction: pH of Saturated Paste: 6 - 7.5.

C. Pests:
The population of any single species of plant pathogenic nematode: Fewer than 500 per pint of soil (confirm by biological testing).

D. Fertility Considerations:
Soil to contain sufficient quantities of available nitrogen, phosphorus, potassium, calcium, and magnesium to support normal plant growth. In the event of nutrient inadequacies, provisions shall be made to add required materials to overcome inadequacies prior to planting.

E. Source of above shall be approved and conformity of material shall be laboratory verified for each 100 cubic yards of material delivered to the site.

F. Percentage of Organic Matter: Min. 4-8%

G. Physical Soil Parameters
1. Clay: 5-25%
2. Silt: 25-50%
3. Sand: 25-50%

2.02 ON SITE MATERIAL:

A. Specified backfill mixes shall consist of on site material generally conforming to the requirements in this specification.

B. Test on site topsoil from designated stockpile area or borrow site for conformity to this specification. Submit test to Landscape Architect for verification and alteration of components.

2.03 WOOD RESIDUALS:

A. Source:
Shall be non-composted and/or stockpiled, and not have been chemically treated or dyed.

B. Physical Properties - Grading:

U.S. Sieve	Dry Weight Percent Passing
3/8"	100
1/4"	90 - 100
No. 8	70 - 100
No. 35	0 - 30

C. Organic Content by Ash Analysis:

90 - 100 Percent Dry Weight

D. Chemistry Range:

1. Saturation Extract Conductivity (ECc) Nil - 3.5

2. Reaction (pH) 6-8

E. Salinity: Maximum saturation extract conductivity 3.5 millimhos per cm @ 25 degrees centigrade.

2.04 SAND:

A. Physical Properties - Grading:

U.S. Sieve	Percent Passing
No. 4	100
No. 10	95 - 100
No. 18	90 - 100
No. 35	65 - 100
No. 60	0 - 50
No. 140	0 - 20
No. 270	0 - 7

B. Chemistry: Range:
1. Saturation Extract Conductivity (ECc) Nil - 3.0
2. Sodium Absorption Ratio (SAR) Nil - 6.0
3. Boron - ppm in saturation extract solution Nil - 3.0
4. Reaction (pH) 6.0 - 7.5
5. Available calcium - sodium acetate extractable - ppm dry weight Nil – 4000
6. Soluble-Salt Content: 1 to 2dS/m measured by electrical conductivity
7.

C. Coarse Sand – concrete sand

2.05 COMPOST:

Made from recycled natural materials screened to 1" minus (for soil additive). On the Solvita compost maturity test score, must score a value of 5 or higher for tilling into the soil and be a minimum of 6 months old and fully composted. Supplied by Nature's Way Resources, Inc., Conroe, Texas or approved equal.

A. Chemical components:
1. pH - 6.0-8.0
2. Nitrogen – 30 ppm or higher
3. Phosphorus – 150 ppm or higher
4. Potassium – 400 ppm or higher
5. Calcium – 3000 ppm or higher
6. Magnesium – 250 ppm or higher
7. Salinity – 2500 ppm or lower
8. Zinc – 6 ppm or higher
9. Iron – 25 ppm o higher
10. Manganese – 16 ppm or higher
11. Copper – 0.4-2.0 ppm
12. Sodium – 1000 ppm or less
13. Sulfur – 25 ppm or higher
14. Boron – 2 ppm or higher

B. Biological components:
1. Bacteria – minimum of 150 micrograms per gram of soil of total bacteria
2. Fungus – minimum of 150 micrograms per gram of soil of total fungus
3. Protozoa
   a. flagellates – 10,000 units per gram of soil
   b. amoebae – 10,000 units per gram of soil
   c. ciliates – 20 units per gram of soil

2.06 CHEMICAL ADDITIVES (OR EQUIVELANTS):

The following soil components listed may have a particular application specified within this Section. Some of the soil components included shall be applied at rates determined by the soil tests called for under other paragraphs of this Section or as a result of soil tests. Some of the components may not be required by the soils tests. All additives shall be the slow release type.

A. Ground Limestone: Agricultural limestone containing not less than eighty five (85%) percent of total carbonates, ground to such fineness that fifty (50%) percent will pass a 100 mesh sieve and ninety (90%) percent will pass a 20 mesh sieve.

B. Dolomite Lime: Agricultural grade mineral soil conditioner containing thirty five (35%) percent minimum magnesium carbonate and forty nine (49%) percent minimum calcium carbonate, 100 percent passing #65 sieve. Kaiser Dolomite 65 AG or approved equal.

C. Gypsum: Agricultural grade product containing eighty (80%) percent minimum calcium sulphate.

D. Iron Sulphate (Ferric or Ferrous): Shall contain thirty (30%) to thirty five (35%) percent iron, thirty five (35%) to forty (40%) percent sulphur and be supplied by a commercial fertilizer supplier.

E. Sulphate of Potash: Agricultural grade containing fifty (50%) percent to fifty three (53%) percent of water soluble potash.

F. Single Superphosphate: Commercial product containing nineteen (19%) to twenty (20%) percent available phosphoric acid.

G. Ammonium Sulphate: Commercial product containing approximately twenty one (21%) percent ammonia.

H. Calcium Nitrate: Agricultural grade containing fifteen and one-half (15 1/2%) percent Nitrogen.

I. I.B.D.U. (Iso Butyldiene Diurea): Commercial product containing thirty one (31%) percent Nitrogen.

J. Soil Sulphur: Agricultural grade sulphur containing a minimum of ninety six (96%) percent sulphur.

K. Iron Chelate Micronutrient: Sequestrene - 330 Fe; 0-0-0; ten (10%) percent Fe; Ciba-Geigy Company.

2.07 FERTILIZERS AND NUTRIENT AMENDMENTS: all 100% organic

A. Fertilizer: MicroLife organic fertilizer as supplied by San Jacinto Environmental Supplies, Houston, Texas or approved equal.

B. Minor and Trace Elements: Humates Plus 0-0-4 as supplied by San Jacinto Environmental Supplies, Houston, Texas or Green Sand as supplied by Nature's Way Resources, Inc. or approved equals.

PART 3 EXECUTION

PLANTING

3.01 LAWN AND NATIVE SEED AREAS – Hydromulch and Sod

A. After finish grade approval and before laying sod or spreading seed apply:
1. 2" layer of compost uniformly across area
2. 20# of MicroLife 6-2-4 fertilizer per 1,000 sq. ft.
3. 10# of MicroLife humates plus 0-0-4 trace elements per 1,000 sq. ft.
4. After laying sod or spreading seed, foliar spray the entire area with 8ox of MicroLife Super Seaweed mixed with a gal of water. Each gallon of mix to cover 1,000 sq. ft.

B. Disk or till into the soil to a depth of 2"-4" until the amendments are fully incorporated before seeding and/or planting (See Section 32 92 00).

3.02 SHADED GROUNDCOVER AREAS

A. After finish grade approval apply:

1. 1” layer of Compost uniformly across area
2. 3” (in) Planting Soil
3. 40# of MicroLife ultimate 8-4-6 fertilizer per 1,000 sq. ft.
4. 10# of MicroLife humates plus 0-0-4 trace elements per 1,000 sq. ft.

B. Disk or till into the soil to a depth of 4” until the amendments are fully incorporated before groundcover planting (See Section 32 92 00).

3.03 TREE PLANTING AREAS (Within Tree Excavation Pit)

A. After finish grade approval before mulching apply:
1. Backfill with a 50/50 blend of existing topsoil and Planting Soil
2. For every 15 gal. tree size, add 6 oz. MicroLife Ultimate 8-4-6
3. 3 oz of JRM Mycorrhizal Tree Transplant
4. 2 oz of MicroLife Super Seaweed mixed with a gal. of water. Use 2 gal. of mixed solution per 15-gal. tree size

3.04 SUNNY GROUNDCOVER AND PERENNIAL AREAS

A. After finish grade approval apply:
1. 4”(in) Planting Soil
2. 40# of MicroLife ultimate 8-4-6 fertilizer per 1,000 sq. ft.
3. 10# of MicroGro Granular per 1,000 sq. ft.
4. 2 oz of MicroLife Maximum Bloom 3-8-3 mixed with a gal. of water as a new plant/root stimulator. Water soak the area sufficiently to get uniform saturation.

B. Disk or till into the soil to a depth of 6” until the amendments are fully incorporated before planting (See Section 32 93 00).

3.05 SHRUB PLANTING

A. After finish grade approval before mulching apply:
1. 4”(in) Planting Soil
2. 40# of MicroLife ultimate 8-4-6 fertilizer per 1,000 sq. ft.

B. Disk or till into the soil to a depth of 6” until the amendments are fully incorporated before planting (See Section 32 93 00).

3.06 EXISTING TREES (12”+ cal.)

A. Once a year treatment
1. 2 gal. of MicroLife Bio-Matrix 7-1-3
2. 6 oz of JRM Mycorrhizal Injectables per 100 gal. of water

WEED CONTROL/TREATMENT

A. All site locations to receive planting where weeds exist, shall be treated with post-emergent herbicide.
1. Repeat treatment as required to ensure that no weeds are present at the beginning of work on the landscape planting of the Project.

B. Weeds shall not be present at the date of inspection for Substantial Completion of the Project and at the conclusion of the maintenance and establishment period following acceptance of the Contractor's work.

C. Post-emergent weed treatment includes:
   1. Removal of weeds and other undesirable ground cover vegetation in turf/grass and planting areas shall be accomplished a minimum of 14 days prior to soil preparation for planting operations.
   2. Care shall be taken not to affect existing trees, shrubs, and plants on and near the site.

D. Pre-Emergent Herbicide treatment:
   1. Apply per manufacturers distribution rate prior to mulching and directly after mulching.
   2. Snapshot, Princep or Specticle are approved Pre-Emergents. Contractor to submit product for approval.

END OF SECTION

SECTION 32 93 00 - PLANTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Tree-watering devices.
4. Landscape edgings.
5. Landscape mulches and gravels

B. Related Requirements:
1. Section 32 9200 "Lawns and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
2. Section 32 9100 “Soil Preparation”

1.2 COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
3. Irrigation inspection tube and cap materials.
4. Fertilizer tablets for tree installation

B. Samples for Verification: For each of the following:

1. Mulch: 1-quart volume of mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
2. Planting Soil Mix: 1-quart volume of mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall

be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

3. Weed Control Barrier: 12 by 12 inches.
4. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
5. Tree Staking Materials and Accessories: post, hose, and webbing (sample of each)

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Three years' experience in landscape installation in addition to requirements in Section 01 4000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Interior.
    c. Landscape Industry Certified Horticultural Technician.

5. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants shall be made by Architect, who tags plants at their place of growth before they are prepared for transplanting.

C. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.

F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

H. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.

2. Warranty Periods: From date of Substantial Completion.

a. Trees: 1 year.
b. Shrubs, Vines, Ornamental Grasses, Ground Covers, Biennials, Perennials, and Other Plants: 1 year
c. Sod:1 year
d. Annuals: Three months.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 FERTILIZERS

A. Trees: Ref 32 9100 “Soil Preparation” for fertilizer selection

B. Shrub, groundcover, annuals and perennials: MicroLife all organic fertilizer as supplied by San Jacinto Environmental (713) 957-0909. Apply at mfg. max. recommended rates. Ref. Section 32 9100- “Soil Preparation”

2.3 MULCHES

A. Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Hardwood mulch
2. Grind: 1.5”x2”max, Double Ground
3. Color: Natural (Brown)
4. Depth: 1.5” min 3.5” maximum

B. Compost: Ref 32 9100 “Soil Preparation”

C. Rock Mulch:
1. Decomposed Granite (¼ Minus)
   a. Size: ¼” Minus
   b. Clean, hard, durable particles of fragments of decomposed granite, as indicated on plans or approved equal.
   c. Free of clay lumps, organic material, and deleterious material.

2. Cobbles
   a. Size: 2”-4”, 6”-12”
   b. Available from Southwest Boulder & Stone or approved equal.

2.4 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

B. Miriafi 140 NL as manufactured by Nicolon Mirafi Group, Pendergrass, GA, (888) 795-0808 or approved equal.

2.5 PESTICIDES

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 TREE-STABILIZATION MATERIALS

A. Stakes and Guys:

Contractor shall use staking materials necessary to meet requirements of specifications, subject to approval:

1. Tree Stakes: 7' & 8’ long steel T-post weighing 1.33 pounds per foot.
2. Paint for Stakes: Pittsburgh Paint No. 515-5 Stonehenge Greige.
3. Tie Webbing: Tree Tie Webbing by AM Leonard-Green

2.7 LANDSCAPE EDGINGS

A. Concrete Edging: Ref. Materials Schedule

B. Steel Edging: Ref. Materials Schedule

C. Aluminum Edging: Ref. Materials Schedule

D. Bender Board Edging: Ref. Materials Schedule

2.8 MISCELLANEOUS PRODUCTS

A. Root Barrier: Black, molded, modular panels manufactured with 50 percent recycled polyethylene plastic with ultraviolet inhibitors, 85 mils thick, with vertical root deflecting ribs protruding 3/4 inch out from panel, and each panel 24 inches wide.

B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

C. Burlap: Non-synthetic, biodegradable.

D. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

E. Planter Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

F. Mycorrhizal Fungi: Dry, granular inoculants containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable, and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply fertilizer directly to subgrade before loosening.
2. Thoroughly blend planting soil off-site before spreading.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil to a depth indicated on the Drawings.

a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at maximum application rate recommended by manufacturer.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
1. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
5. Maintain supervision of excavations during working hours.
6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
7. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Follow Soil Preparation Execution. Ref. 03 9100

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.

1. Use Blended Planting Soil for backfill. Follow Soil Preparation Specification. Ref. 329100
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Follow Soil Preparation Specification. Ref. 039100 for fertilization.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Set balled and potted, and container-grown stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.

1. Use Blended Planting Soil for backfill. Follow Soil Preparation Specification. Ref. 329100
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Follow Soil Preparation Specification. Ref. 039100 for fertilization.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

3.6 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.

C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders;

remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.7 TREE STAKING

A. Staking of trees is to be used by the Contractor, who will be responsible for material remaining plumb and straight for all given conditions through the guarantee period. Tree support shall be done as outlined on the following tables.

B. Staking shall be completed immediately after planting. Plants shall stand plumb after staking.

C. Stake all trees in accordance with the following table:

Tree	Stakes	Stake Size
15-45 Gal. and B&B under 3”	2	6 ft Post
65 Gal. and B&B 3”& larger	3	7 ft Post

D. Locate first stake on prevailing windward side of tree and as close to the main trunk as is practical, avoiding root injury. Stakes shall be driven at least 18" into firm ground.

E. Tie tree to stake using approved tree tie. Tie shall be located midway within tree crown or at a location approximately 2/3 of the overall height of the tree. Locate tie just above major side branch in order to deter slippage of tie.

F. Locate second stake opposite first. Secure with one tie opposite upper tie at first stake.

G. Auxiliary stem stakes shipped with trees shall be secured as above after shipping.

3.8 ROOT-BARRIER INSTALLATION

A. Install root barrier where trees are planted within 60 inches of paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise shown on Drawings. Deep Root 24-2 or approved eq.

B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.

C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.

1. Position top of root barrier flush with finish grade.
2. Overlap root barrier a minimum of 12 inches at joints.
3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.

3.9 GROUND COVER AND PERRENIAL PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on the Drawings

B. Use planting soil for backfill. Follow soil preparation execution. Re. 329100

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.10 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Tree-like Shrubs in Turf Areas: As indicated on the Drawings or 3”depth
2. Organic Mulch in Planting Areas: As indicated on the Drawings or 3”depth
3. Mineral Mulch in Planting Areas: As indicated on the Drawings

3.11 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

D. Reference the Maintenance Specification 329400 for further information.

3.12 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate

applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas. Ref. 32 9100-Soil Preparation for clarifications.

C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations. Ref. 32 9100-Soil Preparation for clarifications.

3.13 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before Substantial Completion remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.14 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

3.15 DECOMPOSED GRANITE/ WASHED GRANITE GRAVEL

A. Install soil separator per manufacturer’s recommendations at locations indicated in the details on the drawings.

B. Install decomposed granite to depth and elevations indicated on the Drawings.

C. Place decomposed granite in two lifts, 2” each lift and compact.

G. Compact lifts to 98% SPD (standard proctor density).

END OF SECTION

SECTION 32 94 00 - LANDSCAPE GROUNDS MAINTENANCE FOR NINETY (90) DAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: The Drawings, Division 0 and Division 1 apply to work under this Section.

1.2 SCOPE OF WORK:

A. Work included in Base Bid:

1. Monitoring adjustment and minor repair of the landscape irrigation system.
2. Mowing, edging and trimming of lawn areas.
3. Mowing of Love Grass and Native Grass Plantings
3. Pruning and trimming of plant materials.
4. Weed, cultivating and cleaning of planting beds, turf areas, and Native grass areas..
5. General site clean up; removal of trash and products of maintenance.
6. Applications of fertilizers, ant control, insecticides and herbicides.
7. Pruning and trimming of trees.
8. Mulching trees, shrubs, groundcovers and seasonal color.
9. Extra services as needed.

B. Work Not Included in Base Bid: (Extra Service)

1. Street cleaning - other than that required as a result of maintenance operations.
2. Replacement of plant material - other than that required under the one year warranty requirement.
3. Compost amendment application
4. Aerating lawn areas.
5. Overseeding with cool-season grasses.
6. Application of pre/post emergents.
7. Additional clean-up and/or plant material replacement relating to natural weather events including hurricanes, tornadoes, severe thunderstorms, major rain events causing flooding, freezing temperatures, ice/ice storms, extended periods of draught and snow.

1.3 EXTRA SERVICES:

The intent of the ninety day maintenance period is to provide a comprehensive maintenance program to include all required services, except those services specifically excluded, to perform the work for the stated time period.

1. All services not included in the list of Base Bid items shall be considered 'extra services" and will be charged for separately according to the nature of the item of work. The consent and authorization of the Owner’s representative or their authorized representative must be obtained prior to the performance or installation of such "extra services" items and prior to purchase of any chargeable materials.

2. Such work may include replacement of dead plant materials other than what is already covered under the warranty period, major repairs of irrigation system, by-products of vandalism or other contracts or other site related work.

3. Application of pre/post emergents.

4. Authorized extra services work must be summarized weekly and submitted with receipts to the Owner’s representative.

5. The Owner's representative is not bound by the specifications or contract to utilize the landscape maintenance contractor in the performance of "extra services" work.

6. The landscape maintenance contractor shall coordinate his activities with other contractors on the site so as to not hinder the performance of any work.

6. Authorized charges for extra work will be paid per the General Conditions of the Contract.

1.4 SUBSTITUTIONS:

A. Specific reference to manufacturer's names and products specified in this Section are used as standards, but this implies no right to substitute other material or methods without written approval of the Owner's representative. Such permission must be secured without additional cost to Owner's representative.

B. Installation of any approved substitution is Contractor's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of and without additional cost to Owner's representative.

1.5 INTENT OF THE MAINTENANCE PROGRAM:

It is the intent of the maintenance program is to provide the Owner's representative with a project site that is attractive in appearance and keep all plant materials and lawns in a healthy and vigorous condition.

1.6 THE CONTRACT:

This Maintenance Contract is a period ninety days. The Contract can be terminated with cause.

1.7 CONTRACTORS PERFORMANCE:

The Contractor shall perform all work required once per week or as often as necessary to fulfill the spirit and intent of the Contract. The workmen shall be dressed in company uniforms and all required PPE (Personal Protective Equipment), and neat in appearance, perform their work in a professional manner, keep noise to a minimum and stage their work from a location on the site out of the way of the mainstream of the users. In general, the Contractor's presence on the site shall be as inconspicuous as possible.

1.8 COMMENCEMENT OF THE MAINTENANCE PERIOD:

This maintenance period shall become effective at the date of Substantial Completion.

1.9 NEGLECT AND VANDALISM:

1. Turf, shrubs, trees or plants that are damaged or killed due to contractors operations, negligence or chemicals shall be replaced at no expense to the Owner's representative. If plant damage or death is caused by conditions beyond the contractor's control, replacement shall be at the Owner's representative's expense.

2. Sprinklers or structures that are damaged due to the contractor's operations must be replaced by the contractor promptly. Likewise, damage to the irrigation system by others shall be corrected immediately by the contractor, at the Owner's representative's expense.

3. All water damage, either natural or man-made, resulting from contractor's neglect shall be corrected at the contractor's expense.

4. All damage to or thefts of landscaping and irrigation installations not caused or allowed by the contractor shall be corrected by the contractor at the Owner’s expense upon receipt of written authorization to proceed.

1.12 EMERGENCIES:

1. The Contractor shall answer emergency or complaint calls within twelve (12) hours and corrective action shall be complete within twenty-four (24) hours.

2. The Contractor shall answer emergency calls regarding the Landscape Irrigation system failure or need of repair, and take corrective action within eight (8) hours. Such work, unless caused due to neglect on the part of the Landscape Maintenance Contractor, shall be considered "Extra Services".

1.13 JOB CONDITIONS:

A. Contractor shall be familiar with all site conditions.

1.14 RESTRICTIONS:

A. Do not use growth regulators or growth retardants or any chemicals that will have adverse effects on the organic fertilizers and soil conditioners utilized for this project.

PART 2 - PRODUCTS AND MACHINERY

2.1 MATERIALS:

Materials listed under this Section are expressly requested for use and does not prohibit or restrict the Contractor from providing other materials not listed in order to complete the work required herein.

1. Pre-Emergence Weed Control: Shall be Surflan A.S., Atrazine 4L or approved equal.

2. Post-Emergence Weed Control: Shall be Trimec Lawn Weed Killer, Sedge Hammer, Vantage, Image or approved equal.

3. Sufactant: Spreader Sticker shall be used with both pre and post emergence herbicides.

3. Herbicide: Shall be "Round Up", by Monsanto, St. Louis, Missouri.

4. Insecticide: Shall be Shall be "Astro Insecticide” as manufactured by FMC Corporation, Agricultural Products Group, 1735 Market Street, Philadelphia, PA 19103 (800.321.1362) or approved equal.

5. Fire Ant Control: Ortho Orthene Fire Ant Killer.

6. Compost: Made from recycled natural materials screened to 1” minus (for soil additive). On the Solvita compost maturity test score, must score a value of 5 or higher for tilling into the soil and be a minimum of 6 months old and fully composted. Supplied by Nature’s Way Resources, Inc., Conroe, Texas or approved equal.

7. Fertilizer: FERTILIZERS AND NUTRIENT AMENDMENTS:

A. Fertilizer: MicroLife Hybid 20-0-5, MicroLife Ultimate 6-2-4, and MicroLife Humates Plus 0-0-4 as supplied by San Jacinto Environmental Supplies, Houston, Texas or other approved equal supplier.
B. Contractor shall keep all empty bags with certificates intact and submit them to the Owner's representative.
   1. Submission of empty fertilizer bags is required to verify operation has been performed as specified.
C. Humate Soil Conditioner: Vigoro modified humate, Earthgreen Menefee Humate, Humate International AG 16-35 or approved equal.
D. Aerated Compost Tea: Natures Own or approved equal.

8. Tree Deep Feeding Fertilizer: Shall be Aerated Compost Tea with mycorrhizal fungi manufactured by Natures Own, MicroGrow or approved equal

9. Fungicide: Shall be "Systemic Fungicide" with Benomyl by Greenlight Products, San Antonio, Texas 78217, and/or Cleary Chemical 3336 WP "Turf and Ornamental Fungicide.

10. Fertilizer for annuals/perennials:

    Nelson ColorStar Plus 19-13-6 with Fungicide

    Foliar spray Maximum Blooms 3-8-3 Organic liquid color fertilizer

11. Soil Drenching Material: Shall be "Sub Due 2E", by the Agricultural Division of Ciba-Geigy Corporation, Greensboro, North Carolina 27409.

12. Mulch: Shall be equal to that already in use at the site. Shredded hardwood bark for groundcover areas.

13. Tree Stakes and Guys: Shall match those in use at the site.

2.2 MACHINERY:

Machinery requirements listed under this Section are not intended to be restrictions of specific manufacturers or models unless so stated. Specific mention of manufacturers is intended as a guide to illustrate the final product of maintenance operations desired.

1. Lawn Mowers: Shall be of the rotary type in good working order, finely tuned to protect the lawn from excessive exhaust fumes. Blades shall be sharp to reduce shredding of the cut grass blades.

2. Lawn Edgers: Shall be of a rigid or flexible blade type that will produce a fine clean edge where lawns meet walkways, pavements or curbs.

3. Fertilizer Spreaders: Cyclone type spreader or equal. No visible underlapping of applications will be permitted.

4. Deep Root Feeder: Shall be the Ross type by Ross Daniels, Incorporated, Des Moines, Iowa 50265.

5. Pruning Tools: Shall be maintained in good working order, cutting edges shall be sharp. Disinfect all tools when used for the removal of diseased limbs.

PART 3 - EXECUTION

3.1 LANDSCAPE IRRIGATION SYSTEM:

The Contractor shall monitor and program the automatic controlling devices to proceed optimum moisture levels in all planted areas.

1. Irrigation cycles shall be set to take place prior to sunrise (usually 4:00 - 5:00 am) unless otherwise instructed by the Owner's representative, except during visits of grounds maintenance personnel; during such visits the irrigation system may be operated as desired by those personnel.

2. Do not program controllers operating on the same water meter to water during the same time period so as to prevent over-draft of water meters. Do not switch controller to "off" at any time, except as required for testing and for maintenance operations.

3. Complete sprinkler system servicing shall be performed as required to maintain sprinklers in correct operating condition, including all required labor. Monitor and inspect sprinklers once a month or upon request of the Owner's representative. This check shall include visual "inspection" of all accessible components of the irrigation system including but not limited to controllers, remote control valves, quick couplers and heads.

4. Adjust sprinklers to avoid damage to automobiles, signs and also adjust heads to keep water off the street and sidewalks. Make repairs and alterations to the sprinkling system and water lines. All sprinklers repairs such as cleaning of heads or breaks caused by the Contractor shall be the Contractor's responsibility.

5. Minor repairs: Contractor shall make necessary repairs under $300.00 without Owner's representative's approval to maintain operation of the system.

6. Replacement materials throughout the system shall be as specified in Section 02810.

3.2 TREES MAINTENANCE:

A. Contractor shall maintain staking and guying of trees at all times and shall be responsible for any damage to trees or plant materials caused by chafing or breakage of foliage or limbs coming in contact with stakes or ties. Replace broken plant stakes and ties and bent stakes as needed. If ties are too tight, they must be replaced or adjusted. If stakes are not needed, remove.

B. Trees that may require guys, stakes or special care during the winter winds and rains shall receive the required care prior to the time of rains and high winds to insure that no damage results to the plant material.

C. All suckers shall be continually removed from trees.

3.3 SEASONAL AND PERENNIAL FLOWERS:

A. The maintenance contractor shall continually maintain seasonal flower beds in all contract areas.

B. Complete weeding, trimming, edging, and cultivation of all flower beds as required to keep the beds free of weeds, to promote growth and maintain neat, orderly appearance. As flowers cover open soil, cultivating shall be discontinued.

C. Maintenance shall include:

1. Pinching of blooms and pruning of dead or damaged foliage.

2. Fertilize in alternate months with organic fertilizer. (RE: PART 2)

3. Apply supplemental organic fertilizer to keep each type of seasonal flower performing at its optimum level.

4. Spraying or dusting for disease or insect control as a preventive or corrective measure.

5. Seasonal Color Change out: seasonal color change out after the initial planting (Extra Service) by the installing contractor.

D. Fertilizer for annuals/perennials: Add ColorStar Plus 19-13-6 with Fungicide at the manufacturers recommended rate and feeding schedule. Foliar spray Maximum Blooms 3-8-3 Organic liquid color fertilizer (6 ounces per 1000 sq ft) & Garlic Oil (1 ounce per 1000 sq ft) mixed together with water and sprayed every 30 days.

3.4 HEDGE MAINTENANCE:

A. Edge, weed, fertilize and cultivate all hedge beds in accordance with Schedule.

B. Pruning of shrubs should create a uniformly dense plant, trapezoid in shape. Height as approved by Owner's representative. Selectively thin and tip back annually. Prune to enhance natural branching effect of plants. Do not change shape of shrubs by pruning.

3.5 GROUNDCOVER BEDS:

A. Complete weeding, trimming, edging, and cultivating of all groundcover as required to keep the beds free of weeds, to promote growth and maintain neat, orderly appearance. As groundcovers cover open soil, cultivating shall be discontinued.

B. Groundcover beds bordering on paved surfaces must be edged as needed to retain a neat edge. Do not trim vertically so as to expose stems and thatch.

C. Fertilize all groundcovers with complete commercial fertilizer four times per year. (Extra Service)

D. Replant all damaged or thin areas in groundcover beds at direction of the Owner's representative, at proper spacing.

E. Slopes of 2:1 ratio, or steeper, shall not be cultivated due to erosion nuisance, unless otherwise instructed to cultivate by the Owner's representative.

3.6 TURF MAINTENANCE:

A. Mowing: During periods of mild weather, mow at one and one-half (1 1/2") inches but during hot weather, the cut should be not lower than two (2") inches from the soil. Regular weekly mowing is required. Never scalp the lawn or cut more than one half the existing top growth in one mowing. Remove or catch the clippings, never allowing clippings to remain on lawn surface more than four (4) hours.

Allow grass to grow up to but not over sprinkler heads. Trim grass around heads with a circular sprinkler head trimmer. DO NOT USE LINE TRIM AROUND SPRINKLER HEADS.

B. Watering: Provide a regular, deep watering program. The established turf should not be kept wet but should dry out somewhat between waterings. A twice weekly watering is good under regular conditions, but if it is hot or windy, water more often. In very hot weather, a fast watering with fine spray will cool the turf zone and can supplement the regular, deeper watering program. In shaded areas caused by trees or shrubs, water more frequently because of the competition for soil moisture. If lawn wilts (shows grey-brown) water more frequently.

C. Lawn Fertilizer: Analysis based upon soil sample.

March 1	MicroLife Hybird 20-0-5 applied at manufacturer's maximum recommended rate.
May 25	MicroLife Humates Plus 0-0-4 at manufacturer's maximum recommended rate.
July 18	Same as the March application.
October 11	MicroLife (6-2-4) at manufacturer's maximum recommended rate.

D. Weed Control: Contractor shall use extreme care in the use of chemicals for weed control. Before such applications are made, the turf should be well established and in a vigorous condition. Broadleaf weeds such as malva, dandelion and plantain can be controlled with applications of selective and recommended herbicides. Always follow label directions fully and carefully; wash sprayer carefully after using herbicides.

E. Insects: Control insects with regular applications of commercial insecticides at the manufacturer's recommended rate. Spray for insects once a month from mid-spring through summer as a preventative measure.

F. Diseases: When they first appear, spray for diseases with an approved commercial fungicide strictly according to the manufacturer's recommendations.

3.7 NATIVE GRASSES MAINTENANCE

A. Native grass mixes – Twice annually on or about June 1st and January 1st
B. Above grasses shall be mowed to a 6" height.

3.8 CONTROL OF NOXIOUS WEEDS (Johnson Grass, Nut Grass, Poison Ivy, and other Noxious Weeds.)

A. Noxious weeds shall be killed by using "Round Up" or other spray as approved by Owner's representative. Spray only foliage of grass to be eradicated, as this spray will kill any plant that it contacts.

B. Irrigation to sprayed area should remain "off" for a period of three days following spray application. Repeat spray as required to kill completely.

C. Apply pre/post-emergent weed killer as per manufacturer's recommendation as required by the "Schedule" and approved by Client prior to application.

C. Weeds 30" or taller shall be removed/eradicated in Native Grass zones.

3.9 USE OF HERBICIDES, INSECTICIDES, AND STERILANTS:

A. The Contractor is hereby granted permission to use such herbicides, insecticides, and sterilants as it may find necessary and advantageous in its grounds maintenance activities. Herbicides, insecticides, and sterilants, must be used responsibly and in conformance with Federal, State, and Local laws and regulations. The Contractor assumes all liability for damage and/or injury resulting from accident or misuse of these products and/or equipment. The Owner's representative retains the right to prohibit the use of any herbicide, insecticide, and sterilant that he may judge to be undesirable for any reason.

B. Products leaving an undesirable residue or odor (i.e., weed oil) shall not be used.

C. The Owner's representative shall be notified prior to application and advised of any danger associated with the use of these products (i.e., to avoid personal contact with sprayed areas, etc.).

D. Apply insecticides as needed to protect all plant materials from damage. The insect control program shall include slugs and snails and advance preventive spraying for twig borers. The Contractor shall be responsible for the choosing of chemicals and insecticides he uses and shall be accountable for any misuse of same.

E. Apply the proper fungicide, herbicide and pesticides for the control of pests, weeds and plant diseases or treat cuts on exposed surfaces of trees or shrubs for disease and pest control on turf, plants and trees.

3.10 GENERAL CLEAN UP:

A. The Contractor shall dispose of all waste materials or refuse from his operations legally off the property except where agreement is reached with the Owner's representative.

B. All plant growth shall be prevented in any cracks in walks or within paved areas.

C. Leaves, papers, grass clippings or other debris shall be removed at least weekly or at each visit from all areas.

D. Trash receptacles shall be checked regularly and emptied, and trash removed from the site frequently enough so that trash never overflows the receptacles. Trash receptacles shall be lined with black plastic bags which shall be emptied and removed from the site daily.

PART 4.00 - SCHEDULE

4.1 SCHEDULE:

The Schedule as included herein shall govern the work. Should the Contractor require an alteration of the Schedule, contact the Owner's representative.

JANUARY: WEEKS 1, 2, 3, 4

TURF

The turf shall be watered as needed. Turf shall be raked during the latter part of the month, to remove thatch. Mow turf for the first time in week 4.

TREES, SHRUBS, AND VINES

Trees shall be pruned except flowering trees and flowering shrubs which shall be pruned after flowering. Do not change shape of tree, prune to enhance shape. Pre-emergent herbicides shall be applied if approved by Client. Weed beds as required.

FEBRUARY: WEEKS 1, 2, 3, 4

TURF

The turf shall be watered as needed. Turf shall be raked during the latter part of the month, to remove thatch. Mow turf weeks 2 and 4.

TREES, SHRUBS, AND VINES

Continue pruning trees. Apply tree fertilizer to established trees. Deep root feeding is method to use during this period. Iron and other elements shall be applied if needed. Fertilize acid loving plants as called out under "Material Used". Do not fertilize flowering shrubs until blooming is completed.

MARCH: WEEKS 1,2

TURF

Turf shall be mowed in week two. Mowing shall not remove more than one-quarter (1/4") inch off existing height. First application of fertilizer (Microlife Hybid 20-0-5) shall be applied at manufacturer's maximum recommended rate. Water thoroughly after applying fertilizer. Mow first; then fertilize.

TREES, SHRUBS, AND VINES

Check Plants for adequate watering to prevent any winter damage. Water if necessary. Prune dead wood as required. Continue to weed beds.

Mulch shall be placed in all beds, a two (2") inch to three (3") inch layer over existing mulch if mulch is not adequate. Dead vines should be removed. Flowering plants should be fertilized only after blooming.

MARCH: WEEKS 3, 4

TURF

Mow as required; still only one-quarter (1/4") inch off existing growth. Water as required. Weed control should be continued. Replace any winter damaged sod at this time.

TREES, SHRUBS, AND VINES

Inspect evergreens for insects and diseases, spray as required. Spray for borers. Continue to weed beds. Fertilize trees and flowering shrubs if they have buds.
Application should be 10-8-4 at a rate of ten (10) pounds per 1,000 square feet. Acid loving plants should be given special attention as called out in "Material Used".

APRIL: WEEKS 1, 2, 3, 4

TURF

Mowing should be continued; begin cutting one and one-half (1 1/2") inches to two (2") inches above grade. Water as required.

TREES, SHRUBS, AND VINES

Flowering plants should be through flowering and ready to be pruned and fertilized, if not already completed. Prune remaining dead wood from trees, shrubs, and vines, retaining natural shape. Continually remove all suckers on base of trees.

MAY: WEEKS 1, 2

TURF

Mowing shall continue once a week. During this period, it is important to note the soil moisture. Grasses may have been actively growing for about two and one-half (2 1/2) months, and need to be watered thoroughly.

TREES, SHRUBS, AND VINES

Inspect evergreens for mites and borers and spray as required. Inspect plants for scale insects and spray as required. Inspect flowering trees for powdery mildew and apply fungicide as required. Apply herbicide to shrub beds as required, using the same materials as in early spring. Weed beds as required. Water established trees at a rate of two (2") inches per week.

MAY: WEEKS 3, 4

TURF

Mow as required. Second application of fertilizer (Microlife Humates 0-0-4) shall be applied at manufacturer's maximum recommended rate. Water thoroughly after applying fertilizer. Mow first; then fertilize. Particular attention shall be directed to the amount of water applied to turf.

TREES, SHRUBS, AND VINES

Continue to check plants for pests and control as required. Water any established plants as needed. Pruning shall cease until Fall. Apply fertilizer to acid loving plants again.

JUNE: WEEKS 1, 2, 3, 4

Mulching trees, shrubs, groundcovers and seasonal color.

NATIVE GRASSES

Native grasses and love grass shall be mowed.

TURF

Mowing shall continue once per week. As the temperature rises, the mower should be raised one-half (1/2") inch to one (1") inch higher to maintain a good thick stand of grass. Inspect lawn for disease and inspect pests; apply fungicide only if necessary. Be alert for brown patch, Bermuda decline and chinch bugs in Bermuda sod. Watch Bermuda for bare spots and underwatered areas.

TREES, SHRUBS, AND VINES

Maintain adequate moisture for newly planted trees, shrubs, and vines. Water any established plants as needed. Do not fertilize any wood plants until cooler weather. Continue to check plants for pests and control as required. Weed beds as required.

JULY: WEEKS 1, 2, 3, 4

TURF

Mow weekly, maintain previous months height. Avoid watering in the middle of the day. Check turf for disease again, especially chinch bugs. Third application of fertilizer (Microlife Hybid 20-0-5) should be applied at manufacturer's maximum recommended rate. Apply recommended controls as necessary.

TREES, SHRUBS, AND VINES

Maintain adequate moisture for newly planted trees, shrubs, and vines. Water any established plants as needed. Do not fertilize any woody plants until cooler weather. Continue to check plants for pests and control as required. Weed beds as required.

AUGUST: WEEKS 1, 2, 3, 4

TURF

Mow weekly. Continue to irrigate as needed to keep turf from being stressed by lack of water. Inspect lawn for diseases. Apply necessary chemicals if needed; use caution.

TREES, SHRUBS, AND VINES

Continue to check trees, shrubs, and vines for adequate moisture around rootballs. No pruning shall be done during this period. Check all trees, shrubs, and vines for possible disease and insects, spray if necessary. Second application of fertilizer should be spread at manufacturer's maximum recommended rate.

SEPTEMBER: WEEKS 1, 2

TURF

Mow weekly. At this time lower mower to one and one-quarter (1 1/4") inches to one and one-half (1 1/2") inches. Irrigate as needed.

TREES, SHRUBS, AND VINES

Maintain adequate moisture for newly planted trees, shrubs, and vines. Water any established plants as needed. Root feed trees again. Acid type fertilizer and iron should be applied to trees, shrubs, and vines.

SEPTEMBER: WEEKS 3, 4

TURF

Mow weekly. Watch turf for diseases, apply chemicals as required.

TREES, SHRUBS, AND VINES

Maintain adequate soil moisture for all trees, shrubs, and vines. Prune only if necessary. Continue to check for any pests or disease, apply chemicals as required.

OCTOBER: WEEKS 1, 2, 3, 4

TURF

Mow weeks 1, 2 and 4. Watering can be reduced at this time. Continue to check for diseases. Fourth application of fertilizer (MicroLife 6-2-4) shall be applied at manufacturer's maximum recommended rate. Mow first; then fertilize. Water thoroughly after applying fertilizer. Turf should be thick and healthy for winter

months. Overseed with annual rye grass at the rate of four (4) pounds per 1,000 square feet (only if requested by the Owner).
TREES, SHRUBS, AND VINES

Check trees for proper fertilization. Apply necessary elements, if inadequate. Pruning can be started lightly at this time. Weed beds as required. A two (2") inch layer of mulch shall be added on top of existing mulch.

NOVEMBER: WEEKS 1, 2, 3, 4

TURF

Mow weeks 2 and 4. Water less at this time.

TREES, SHRUBS, AND VINES

Examine plants for pests and spray as required. Do not use pesticides unless necessary. Weed beds as required.

DECEMBER: WEEKS 1, 2, 3, 4

NATIVE GRASSES

Native grasses and love grass shall be mowed.

TURF

Last mowing shall be performed during first 2nd week of month. Rake leaves as required.

TREES, SHRUBS, AND VINES

Remove leaves from beds. Weed beds as required. Check plants for diseases, spray as required.

END OF SECTION

SECTION 33 11 00 - WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 SCOPE

A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide water distribution system components and other work, as required in these specifications, on the drawings and as otherwise deemed necessary to complete the work. The limits of the work, including the responsible party for testing purposes, shall be clearly defined on the Drawings. Included are the following topics:

1.02 RELATED WORK

A. Applicable provisions of Division 1 govern work under this section.

B. Related work specified elsewhere:
1. Section 33 31 00 – Sanitary Sewage Systems
2. Section 33 41 00 – Storm Drain Systems
3. Section 31 23 17 – Trenching

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):
1. B88 Standard Specifications for Seamless Copper Water Tube
2. F477 Standard Specifications for Elastomeric Gaskets for Joining Plastic Pipe
3. D3139 Standard Specifications for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
4. D3350 Standard Specifications for Polyethylene Plastic Pipe and Fittings Materials

B. American Water Works Association (AWWA):
1. C502 Dry Barrel Fire Hydrants
2. C504 Rubber-Seated Butterfly Valves
3. C509 Resilient-Seated Gate Valves for Water Supply Service
4. C515 Reduced Wall, Resilient Seated Gate Valves for Water Supply Service
5. C550 Protective Epoxy Interior Coatings for Valves and Hydrants
6. C800 Underground Service Line Valves and Fittings
7. C900 Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings for Water Distribution (4”-12”)
8. C905 Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings for Water Distribution (14”-48”)
9. C906 Polyethylene Pressure Pipe, and Fabricated Fittings for Water Distribution (4”-63”)
10. C104/ANSI A21.4 Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
11. C105/ANSI A21.5 Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
12. C111/ANSI A21.11 Standard for Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
13. C151/ANSI A21.51 Standard for Ductile Iron Pipe, Centrifugally Cast
14. C153/ANSI A21.53 Standard for Ductile Iron Compact Fittings

1.04 SUBMITTALS

A. Provide manufacturers product information (cut sheets) and O&M information for watermain materials including:
   1. Pipe
   2. Fittings
   3. Valves
   4. Hydrants
   5. Joint Restraint Materials

B. Provide copies of all pressure and electric continuity testing procedures and results for the project to the Project Representative and the AE within 48 hours of completing the individual tests.

C. Provide reports that document safe sample collection procedures and results.

1.05 CONTINUITY OF EXISTING WATER DISTRIBUTION SYSTEM

A. Provide a construction schedule to Project Representative, municipal water utility (if applicable) and local fire department (if applicable) for review and approval prior to starting construction. Schedule shall indicate the date and time of all required water supply interruptions.

B. Do not interrupt existing water supply without approval from Project Representative, municipal water utility, and local fire department.

C. Once approved, notify all distribution system users impacted by outages a minimum of 48 hours in advance of outage. Notification shall be provided in writing and describe the nature and duration of outages and provide the name and number of Contractor's foreman or other contact.

1.06 PROVISIONS FOR FUTURE WORK

A. Construct watermain system in a manner that will facilitate future extension or connection.

B. Unless otherwise shown on the drawings, provide valves on "dead end" mains that will allow dry connection to the watermain system. Terminate "dead end" mains with full length of pipe be-yond the valve, and a bell end with restrained plug.

1.07 AS-BUILT DRAWINGS

A. Show the actual locations of watermain and services, valves and hydrants on drawings and show changes to proposed watermain size, alignment, or grades. Show the actual locations, siz-es and types of underground utilities and other features encountered during construction.

PART 2 - MATERIALS

2.01 PVC WATERMAIN

A. Polyvinyl chloride pipe shall have a dimension ratio (DR) of 18 or less and conform to the requirements of AWWA C900 (4"-12") or AWWA C905 (14"-48"). Pipe shall meet applicable NSF standards for use in a potable water distribution system.

B. PVC watermain joints shall be rubber gasket push-on joint conforming to ASTM D 3139, using a gasket that conforms to ASTM F477.

2.02 COPPER WATER SERVICE

A. BELOW GROUND 2-1/2" AND SMALLER:
   1. Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ANSI B16.26.

2.03 DUCTILE IRON WATERMAIN FITTINGS

A. Fittings shall be ductile iron cement mortar lined mechanical joint compact style fittings meeting the requirements of ANSI/AWWA C153/A21.53.

B. Fittings shall be manufactured in the United States.

2.04 POLYETHYLENE FITTINGS

A. HDPE fittings manufactured in accordance with ASTM D2683 (socket fused) or ASTM D3261 (butt fused). Fittings shall be supplied by the HDPE piping manufacturer. Butt fusion outlets shall be made to the same dimensional characteristics and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.

2.05 VALVES

A. Resilient Wedge Gate Valve
   1. Resilient seated wedge gate valve meeting the requirements of AWWA C509 and C515. Body, bonnet and gate shall be constructed of ductile iron. Bolts shall be stainless steel.
   2. Interior and exterior surfaces of valve shall be provided with epoxy coating meeting the requirements of AWWA C550. Symmetrical wedge shall be completely encapsulated with resilient material.
   3. Valve stem shall be non-rising, low-zinc (zinc content not to exceed 6%) bronze. Valve stem shall have an integral thrust collar. Thrust collar bearings shall be designed to withstand maxi-mum torque without distortion.
   4. Stem seal shall be so designed that the O – ring above the stem collar can be replaced while the valve is under pressure and in the fully open position.
   5. Valve shall be left opening and be provided with standard 2” square operating nut.
   6. Valve shall be provided with mechanical joint connections. Mechanical joint ends shall conform to AWWA C509 and shall be furnished complete with all mechanical joint accessories including approved M.J. bolts and nuts. Glands shall be full body gray iron or ductile iron. Mechanical joint bells, glands and rubber gaskets shall be in accordance with AWWA C111.
   7. Mueller, Kennedy, US Pipe, American Flow Control, Clow, or approved equal.

B. Butterfly Valve
   1. Rubber-seated butterfly valve meeting the requirements of AWWA C504, for Class 150B. Body and disc shall be constructed of ductile iron. Bolts shall be stainless steel. Disc shall be lens shaped.
   2. Interior and exterior surfaces of valve shall be provided with epoxy coating meeting the requirements of AWWA C550. Disc shall be provided with a stainless steel disc edge.
   3. Valve stem shall be stainless steel. Packing shall be permanent duty “chevron V-type” or “O-ring” type. Bearings shall be permanent, non-metallic, and self-lubricating.
   4. Valve seat shall be a single piece of elastomeric material that is not penetrated by the valve shaft.

5. Provide manual operator that is suitable for underground service and includes a standard 2” square operating nut.
6. Valve shall be provided with mechanical joint connections. Mechanical joint ends shall conform to AWWA C509 and shall be furnished complete with all mechanical joint accessories including approved M.J. bolts and nuts. Glands shall be full body gray iron or ductile iron. Mechanical joint bells, glands and rubber gaskets shall be in accordance with AWWA C111.
7. Mueller/Henry Pratt, Kennedy or approved equal.

C. Tapping Valve
1. Resilient seated wedge gate tapping valve having 100% port, and meeting the requirements of AWWA C509 and C515. Body, bonnet and gate shall be constructed of ductile iron. Bolts shall be stainless steel.
2. Interior and exterior surfaces of valve shall be provided with epoxy coating meeting the requirements of AWWA C550. Symmetrical wedge shall be completely encapsulated with resilient material.
3. Valve stem shall be non-rising bronze. Stem collar shall be provided with thrust bearings that are protected by upper and lower O-ring seals both above and below.
4. Valve shall be left opening and be provided with standard 2” square operating nut.
5. Valve shall be provided with flange connection on inlet side of valve and mechanical joint connections on outlet side of valve. Mechanical joint end shall conform to AWWA C509 and shall be furnished complete with all mechanical joint accessories including approved M.J. bolts and nuts. Glands shall be full body gray iron or ductile iron. Mechanical joint bells, glands and rubber gaskets shall be in accordance with AWWA C111.
6. Provide suitable companion tapping sleeve.
7. Mueller, US Pipe, American Flow Control, Clow, or approved equal.

2.06 BRASS WATER SERVICE FITTINGS

A. Service Saddles
1. Double strap, bronze service saddles meeting the requirements of AWWA C800. Service saddles shall be provided with nitrile O-ring gasket and AWWA Taper outlet.
2. Service saddles shall be properly sized to accommodate both the main and service lines.
3. Mueller BR 2B Series, Ferguson, Romac, or approved equal.

B. Corporation Stops
1. Corporation stops shall be brass, ball style. Inlets shall be AWWA Taper; outlet connection shall be compression having a positive indicator to avoid over-tightening.
2. Corporation stops shall be Mueller B-25008, A.Y. McDonald Mfg. Co., or approved equal.

C. Curb Stops
1. Curb stops shall be brass, with compression connections having a positive indicator to avoid over-tightening Curb stops shall be provided with a quarter turn check.
2. Curb stops shall be Mueller B-25209, A.Y. McDonald Mfg. Co., or approved equal.

D. Unions
1. Unions shall be 3-piece brass, with compression connections having a positive indicator to avoid over-tightening.
2. Unions shall be Mueller H-15403, A.Y. McDonald Mfg. Co., or approved equal.

E. U-Branch, Wyes, Etc.
1. U-branch, wye and other fittings shall be brass, with compression connections having a positive indicator to avoid over-tightening. Fittings shall be produced specifically for water supply applications.

2. Mueller, A.Y. McDonald Mfg. Co., or approved equal.

2.07 VALVE BOXES

A. Gate/Butterfly Valve Boxes
1. Valve boxes shall be screw type and shall consist of a base, middle section, top section with cover and intermediate extension sections. The top section shall be designed to thread onto the middle section so that the unit can be adjusted to a variable length. The top section shall be de-signed to receive a circular drop cover.
2. The valve box and component parts shall be cast iron in accordance with ASTM-A48 class 20, 30, 35, or approved equal.
3. Boxes shall be 5-1/4" with stay-put "WATER" cover.
4. The cast iron valve box and components shall be free from blowholes, cold shots, shrinkage defects, cracks or other injurious defects and shall have a normal smooth casting finish.
5. All cast iron valve boxes and components shall be thoroughly coated with asphaltic pitch varnish or approved equal.
6. Provide valve box extensions as necessary to accommodate depth of cover shown on drawings, or 6.5-foot minimum.
7. Valve boxes shall be Bingham & Taylor, East Jordan Iron Works, Tyler, or approved equal.

B. Curb Stop Boxes
1. Curb stop boxes shall be 1 1/4" minimum diameter, cast iron, arch style, valve boxes. Boxes shall be telescopic, extendable to accommodate 7' bury. Lid shall be two piece threaded, with a plug having a pentagonal bolt for removal.
2. Provide valve box extensions as necessary to accommodate depth of cover shown on drawings, or 6.5-foot minimum.
3. Ford, Mueller, or approved equal.

2.08 NOT USED

2.09 JOINT RESTRAINTS

A. Retainer Glands for Ductile Iron Pipe
   1. Ductile iron wedge action retainer glands designed for use with ductile iron pipe.
   2. Glands shall be constructed of. Restraint shall be provided by a minimum of three wedges that are tightened onto the exterior of the pipe using a threaded, torque limiting mechanism.
   3. Glands shall be tested to provide restraint at 250 psi operating pressure.
   4. EBAA Iron, Mueller AquaGrip, Romac Romagrip, or approved equal.

B. Retainer Glands for PVC Pipe
   1. Wedge action retainer glands designed for use with PVC pipe.
   2. Glands shall be constructed of ductile iron. Restraint shall be provided by a minimum of four wedges that are tightened onto the exterior of the pipe using a threaded, torque limiting mechanism.
   3. Glands shall be tested to provide restraint at 200 psi operating pressure.
   4. Retainer glands shall be MEGA-LUG by EBAA Iron, or approved equal.
   5. EBAA Iron, Mueller AquaGrip, Romac Romagrip, or approved equal.

2.10 POLYETHYLENE ENCASEMENT BAG

A. 8-mil polyethylene encasement bag meeting the requirements of ANSI/AWWA C105/A21.5, Class “C” black.

2.11 BOARD INSULATION

A. Insulation shall be rigid, closed-cell extruded polystyrene insulation suitable for buried installation. Individual boards shall have minimum dimensions of 8’x4’x2”.

B. Owens Corning, Dow Styrofoam, or approved equal.

2.12 TRACER WIRE

A. Tracer wire shall be #10 solid copper wire with insulated jacket. Tracer wire insulation color for non-metallic, potable water pipe shall be blue. Tracer wire insulation color for non-metallic, non-potable water pipe shall be purple.

2.13 LOCATOR TAPE

A. Tape shall be detectable metallic locator tape, specifically manufactured for marking utilities with a minimum width of 6 inches and detectable at a depth of 18”.

B. Tape for potable water shall be marked “WATER” and blue colored. Tape for non-potable water shall be marked “NON-POTABLE WATER” and purple colored.

2.14 CHLORINE

A. Chlorine disinfectant shall be calcium hypochlorite tablets or granules. Calcium hypochlorite product shall meet requirements for AWWA C651 – Standard for Disinfecting Water Mains - latest revision, Arch “HTH”, or approved equal.

2.15 PIPE JOINT LUBRICANT

A. Petroleum free pipe lubricant formulated for use with potable water systems. Product shall meet the requirements of ANSI/AWWA C111/A21.11 - latest revision.

PART 3 - EXECUTION

3.01 GENERAL

A. Complete exploratory excavations at utility crossings as shown on the drawings and as necessary to complete the work.

B. Maintain clearances between watermains and existing or proposed sewer lines as follows:
1. 8’ horizontal separation (measured center to center) between watermains and existing or proposed sanitary or storm sewers.
2. 12” vertical separation (measured from outsides of pipes) where watermains cross over sanitary or storm sewers.
3. 18” vertical separation (measured from outsides of pipes) where watermains cross under sanitary or storm sewers.

C. Notify the Project Representative of utility conflicts as soon as they are encountered.

D. Store and handle pipe in accordance with manufacturers’ recommendations. Keep pipes clean of soil, debris and animals.

E. Watermain construction shall be completed in a manner that minimizes interruptions to existing services.

3.02 CONNECTIONS TO EXISTING WATERMAINS/TAPPING

A. Provide tapping sleeves, valves, cutting-in sleeves and other materials specifically manufactured for use with the type of pipe to which the connection is being made.

B. Notify the Project Representative if the proposed point of connection is located within 4’ of an existing joint.

C. Connections shall be made at existing pipe stubs, valves or other fittings.

D. At connections to existing mains, locate the new valve as close to the existing main as possible. Swab the interior surfaces of all pipe, fittings, valves that will be exposed to the existing system. Swab solution shall consist of a 5% (by weight) solution of calcium hypochlorite.

3.03 BEDDING /UTILITY COVER

A. Provide bedding and utility cover in accordance with the applicable requirements of Section 31 23 17 – Trenching.

B. Watermain and water service piping shall be provided with 6" of bedding material and 12" of utility cover material (both measured at the bell of the pipe).

C. Bedding and cover material for various types of pipe shall consist of the following:
   1. PVC Watermain: Crushed stone bedding.
   2. Copper Water Services: Bedding sand or crushed stone screenings.

3.04 LAYING WATERMAIN

A. Install pipe in accordance with the SSSWC and ASTM specifications that pertain to the specified type of pipe material and the installation situation.

B. Provide a minimum of 6.5' of cover over watermain, unless otherwise shown on the drawings or directed by the Project representative. For watermains with less than 6.5' of cover, provide insulation as shown on the drawings, or as directed by the Project Representative.

C. Lay watermain at uniform grades between deflection points shown on the drawings; do not install watermains with intermediate high points.

D. Unless otherwise shown or approved by the Project Representative, lay pipe with bell end facing the direction of pipe laying.

E. For ductile iron watermain, place polyethylene encasement bag on watermain prior to lowering into trench. Once pipe is joined, pull bag over entire length of pipe, overlap joint at adjacent pipe and secure using "Duct" tape or other approved method.

F. Prepare pipe bell and gasket in accordance with manufacturers requirements. Lubricate bell and/or pipe with AWWA/NSF approved lubricant.

G. Push pipe home in accordance with manufacturer's recommendations regarding tools and methods.

H. Pipe joint deflection shall not exceed manufacturer's requirements.

I. For ductile iron pipe, connect bonding straps or lugs to provide electrical continuity along entire watermain. Provide exothermic weld to attach new bonding straps, when existing straps are missing or damaged. Follow manufacturer's requirements for exothermic welding procedures.

J. Locate the geographic location of all dead end watermains and services and note actual location on As-Built Drawings.

K. Disinfect pipe by placing calcium hypochlorite in each section of pipe as pipe laying progresses. Provide dosage as indicated on Table 33 11 00-1.

Watermain Nominal Diameter	Dose Calcium Hy-pochlorite*
(inches)	(oz./length pipe)
4-6	1
8	3
10	5
12	7

* Granular/tablet calcium hypochlorite with 68% (weight) available chlorine

L. When required, provide board insulation in the thickness and width shown on the drawings. Unless otherwise shown, insulation shall be provided at a minimum thickness of 2 inches.

M. Install insulation on compacted initial cover material 6 inches above the top of pipe. Stagger joints when placing multiple layers of insulation.

N. Provide insulation with a minimum of 1 foot of utility cover material. Place backfill material in manner that does not damage insulation; replace damaged insulation.

3.05 TRACER WIRE

A. Provide tracer wire for buried non-metallic water piping. Tracer wire shall be installed directly above the top of pipe and within six inches of the pipe.

B. Splices in tracer wire shall be made with split-bolt or compression-type connectors.

C. Access points are required every 400 feet. At access points the tracer wire shall be brought to grade in valve boxes, utility structures or other covered access devices.

3.06 LOCATOR TAPE

A. Install locator tape directly above new non-metallic sanitary sewer pipe approximately 15 inches below finished grade. Bring tape to surface and terminate in valve box or other structure.

3.07 FITTINGS, VALVES

A. Install fittings, valves at locations shown on the drawings.

B. Unless otherwise shown, provide restrained mechanical joint connections. Install materials in accordance with manufacturer's recommendations.

C. Maintain electrical continuity through all fittings, valves. Provide and install suitable jumper cables for epoxy coated valves.

D. Place valves on 4"x8"x16" solid concrete masonry units set on compacted soil.

E. Install joint restraints in accordance with the requirements of this section.

F. Install valve box so that bonnet rests on compacted initial backfill material at the same elevation as the top of the valve stuffing box. Center the valve box over the valve nut.

G. Install valve box plumb and level, backfilling evenly. Extend valve box to proposed final grade; provide valve box extensions as necessary. Valve boxes that shift during backfilling or restoration shall be excavated and re-set.

H. Mark all valve boxes with a steel "U" fence post to protect them from damage.

I. Not used

J. Not used

K. Not used

L. Not used

3.08 JOINT RESTRAINT

A. Unless otherwise noted, all fittings, valves and hydrants shall be installed with restrained joints. Joint restraints shall be used on the adjacent full length (or more lengths as shown on the drawings) of pipe on all sides of fittings. Additionally, branch runs of pipe shall be installed with re-strained joints beginning at the fitting at the main to the first valve.

B. Hydrant leads shall be provided with restrained joints beginning at the fitting at the main to the hydrant.

C. Joint restraint shall be provided using retainer glands.

D. Install all joint restraint products in accordance with manufacturer's recommendations and drawings.

3.09 COPPER WATER SERVICES AND BRASS FITTINGS

A. Connect copper water service piping to watermain, wellhouse, or other supply as shown on the drawings.

B. Watermain taps shall be made under pressure using a tapping machine specifically designed to tap and install corporation stops. Dry watermain taps are not allowed.

C. Service saddles shall be installed on services where the corporation stop is 1 ½" nominal diameter or greater.

D. Provide a horizontal offset adjacent to the main for all copper services. Comply with pipe manufacturer's requirements with respect to minimum radius on bends.

E. Install curb stops as shown on the drawings. If specific curb stop location is not shown on the drawings, consult with Project Representative to determine acceptable location prior to installing.

F. Place curb stop box on a 4"x8"x8" solid concrete masonry unit set on compacted ground. Orient box so that no portion of the box bears on the water service or curb stop.

G. Install curb stop box plumb and level and backfill all side simultaneously. Extend curb stop box to proposed final grade; provide extensions as necessary. Curb stop boxes that shift during backfilling or restoration shall be excavated and re-set.

H. Install copper water service as shown on the drawings. Prepare copper pipe joints in accordance with pipe and fitting manufacturer recommendations. Cut pipe squarely, remove burs and round ends as necessary.

I. Install fittings in accordance with manufacturer's recommendations. Torque compression connections to recommended tightness; do not over-tighten compression joints.

J. Provide dead-end copper water services with compression connectors fitted with plugs. Do not tap or crimp the ends of copper water services shut.

K. Locate the geographic location of all dead end services and curb stop boxes and note actual location on As-Built Drawings.

3.010 FILLING WATERMAIN

A. Fill watermain after main has been installed and completely backfilled.

B. Fill main slowly to limit entrapped air and evenly distribute calcium hypochlorite. Open all hydrants completely to allow air to escape and monitor filling.

C. Once main is full, allow a minimum of 48 hours of time for disinfection to occur before flushing.

3.011 PRESSURE TESTING

A. Pressure test all watermain and copper water services.

B. Provide all valves, fittings, joint restraints, hoses, compressors, water and power supply as necessary to complete pressure testing. Utilize testing apparatus that is fabricated specifically for testing watermains. Calibrate pressure gauges as necessary.

C. Flush main as necessary to remove air prior to testing. Comply with the requirements of this section with respect to flushing.

D. For longer installations or installations consisting of watermain and copper water service, the Contractor may elect to pressure test the system in short segments.

E. All pressure testing shall be conducted in the presence of the Project Representative. Provide minimum of 48 hours advanced notice of testing.

F. Conduct a combined pressure/leakage test for 1 hour at a pressure equal to 150% of system normal operating pressure (as measured at the lowest point in the system), or a minimum pressure of 150 psig.

G. When conducting test, pressure test equipment shall be set-up as close to the highest point in the line as possible.

H. Make-up water for the test shall be clean potable water supplemented with ½ oz of dry calcium hypochlorite per 35 gallons of water.

I. Leakage for test shall not exceed gallons per hour as allowed by the attached formula:

$G=(ND\sqrt{P})/7400$

Where: G= Allowable leakage (gallons per hour of test)
N=Number of joints under test
D=Nominal diameter of main (inches)
P=Average pressure during test (psig)

J. Allowable leakage for high density polyethylene pipe shall be zero.

K. Record and document pressure test by recording the following information:
1. Date of test
2. Section tested
3. Diameter and length of main under test
4. Number of fittings, valves hydrants, etc.
5. Results of test including test length, pressure, actual water loss
6. Calculation of allowable leakage
7. If a failed test, describe actions taken to eliminate leaks and results of re-testing

L. Submit reports documenting pressure testing.

3.012 ELECTRIC CONTINUITY TESTING

A. Conduct electric continuity test on all ductile iron watermain and copper water services.

B. The electric continuity test shall be performed using a multi-meter to verify electrical continuity of the watermain system.

C. The Contractor shall furnish all labor and equipment necessary to conduct the electric continuity test.

D. Document electric continuity testing by recording the following information:
1. Date of test
2. Test methods and equipment
3. Section tested
4. Diameter and length of main under test
5. Number of fittings, valves hydrants, etc.
6. Results of test including resistance
7. If a failed test, describe actions taken to eliminate leaks and results of re-testing

E. Submit reports documenting electric continuity testing.

3.013 DISINFECTION/FLUSHING

A. After filling the main, allow a minimum of 48 hours of time for disinfection to occur before flushing.

B. Flush all sections of watermain and water service. When possible, utilize hydrants or other large diameter orifices to complete flushing and achieve 2.5 fps water velocity. If needed, utilize services or temporary connections to complete flushing.

C. All watermain and services shall be flushed for a minimum of 10 minutes, or as necessary to obtain a sediment-free and bacteriologically safe sample.

D. Utilize diffusers, hoses, settling basins and other devices as necessary to limit erosion and other damage to the site and downstream areas.

E. Contractor shall be responsible for providing all necessary fitting, valves, joint restraints, hydrants and other materials necessary to conduct flushing.

F. Submit reports documenting disinfection and flushing.

3.014 BACTERIOLOGICAL SAMPLE

A. Following all pressure testing and flushing, the contractor shall collect a sample from the newly installed watermain or water service(s). Samples shall be submitted to the State Laboratory of Hygiene, or other licensed testing laboratory for bacteriological (coliform bacteria) analysis.

B. The Contractor shall be responsible for all costs associated with sample collection(s) and analysis.

C. Document bacteriological sample collection and analysis by recording the following information:
   1. Date of sample collection
   2. Sample collection methods and equipment
   3. Person collecting the sample
   4. Location(s) sample was collected
   5. Results of sample analysis

D. If sample results indicate water is “Unsafe – Coliform Bacteria Present”, Contractor shall re-disinfect watermain and water services by introducing additional chlorine into the line and re-flushing the main. This process shall be repeated as necessary until a clean sample is obtained. The Contractor shall be responsible for all costs associated with all efforts necessary to obtain a “Safe – Coliform Bacteria Not Present” sample.

E. Submit reports documenting bacteriological sample collection and analysis.

END OF SECTION 31 11 00

SECTION 33 31 00 - SANITARY SEWAGE SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Sanitary drainage piping, fittings and accessories.

B. Connection of building sanitary drainage system to site sewer systems.

C. Cleanout access.

D. Connection of site sewer system to campus sewer system unless indicated otherwise on Drawings.

E. Grease Interceptor

1.02 REFERENCES

A. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

B. SSPWC - Standard Specifications for Public Works Construction, Latest Edition.

C. APWA - American Public Works Association.

D. ANSI / ASTM D3034 – Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

1.03 REGULATORY REQUIREMENTS

A. Conform to Section 306, Standard Specifications for Public Works Construction, for materials and installation of Work of this Section.

1.04 SUBMITTALS

A. Shop drawings indicating dimensions, locations and elevations of manholes, cleanouts and sub-surface structures.

B. Product data for pipe and pipe accessories.

C. Project Record Documents
   1. Accurately record location of pipe runs, connections, manholes, cleanouts and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 - PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Plastic Pipe: ASTM D2751, acrylonitrile-butadiene-styrene (ABS) material; sizes; bell and spigot style solvent sealed end joints.

B. PVC pipe is for outside conditions.

C. Hub and Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A74, Service class, gray cast iron for gasketed joints. Include ASTM C564, rubber compression-type gaskets.

2.02 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene-ribbed gasket for positive seal.

B. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T", bends, elbows, cleanouts, reducers, traps and other configurations required.

C. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D3034, SDR 35, for solvent-cemented or gasketed joints.
1. Gaskets: ASTM F477, Elastomeric seals.

2.03 CLEANOUTS

A. Lid and Frame: Cast iron construction, removable lid, closed checkerboard grill lid design; nominal lid and frame diameter as required for pipe sizes. (APWA 304-0)

B. Manholes: American Public Works Association, APWA 321-1 Los Angeles County Department of Public Works Standard Drawing 2003-1.

2.04 FILL MATERIAL

A. Bedding and Fill: As specified in Section 31 23 17 - Trenching.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that trench cut or excavation base is ready to receive work, excavations, dimensions and elevations are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

C. Verify that existing invert elevations on site will allow proper tie in to new work with proper positive slope. Ascertain accuracy prior to trenching and installation of sanitary sewer system.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with approved fill material.

B. Remove large stones or other hard matter that could damage sewer pipe or impede consistent backfilling or compaction.

3.03 INSTALLATION - PIPE

A. Prior to commencing Work, Contractor shall pothole existing utilities at points of connection. Notify Architect in event of discrepancies.

B. Install pipe, fittings and accessories in accordance with Section 306, SSPWC and manufacturer's instructions. Seal joints watertight.

C. Place pipe on bedding as specified in Section 31 23 17 - Trenching.

D. Lay pipe to slope gradient noted on Drawings with maximum variation from true slope of 1/8 inch in 10 feet.

E. Do not displace or damage pipe when compacting.

F. Connect to site sewer outlet system through installed sleeves.

G. Do not cover joints until lines have been tested and approved.

3.04 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Establish elevations and pipe inverts.

C. Mount lid and frame level in grout secured to top cone section to elevation indicated.

3.05 PROTECTION

A. Protect pipe cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 31 00

SECTION 33 41 00 - STORM DRAIN SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Connection of building storm water drainage system to municipal campus storm drains.

C. Catch basins, paved area drainage, manhole access and site surface drainage.

1.02 REFERENCES

A. CPC - California Plumbing Code, 2022, Chapter 11.

B. ASTM A74 - Cast Iron Soil Pipe and Fittings.

C. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

D. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

E. ANSI/ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

F. ANSI/ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

G. ANSI A21.11 - Rubber Gasket Joints for Cast Iron and Ductile-Iron Pressure Pipe and Fittings.

H. SSPWC - Standard Specifications for Public Works Construction, Latest Edition.

I. APWA - American Public Works Association.

1.03 REGULATORY REQUIREMENTS

A. Conform to Section 306, SSPWC, code for materials and installation of the Work of this Section.

1.04 SUBMITTALS

A. Shop drawings indicating dimensions, locations and elevations of catch basins, manholes, cleanouts and subsurface structures.

B. Product data indicating pipe and pipe accessories.

C. Project Record Documents
   1. Accurately record location of pipe runs, connections, catch basins, manholes, cleanouts and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - STORM DRAIN PIPE MATERIALS

A. Products of the following manufacturers form the basis for design and quality intended.

1. Cast Iron Pipes
   a. Precast Products, Garden Grove, CA.
2. Reinforced Concrete Pipes, Manholes, Utility Structures
   a. Johnson Bateman Co., Ontario, CA.
   b. Precast Products, Garden Grove, CA.
   c. Jensen Precast, Fontana, CA.
3. PVC Pipe
   a. Diamond Plastic Corp., Grand Island, NE.
   b. Advanced Drainage Systems, Inc., Hilliard, OH.

B. Or equal as approved in accordance with Division 01, General Requirements for substitutions.

2.02 STORM DRAIN PIPE MATERIALS

A. Cast Iron Pipe: ASTM A74; service type; plain end joints.

B. Cast Iron Pipe Joint Device: ANSI A21.11, rubber gasket joint device.

C. Reinforced Concrete Pipe: ASTM C76, with wall Type B; mesh or bar reinforcement; plain end joints.

D. Reinforced Concrete Pipe Joint Device: ASTM C443, rubber compression gasket joint.

E. Plastic Pipe: ASTM D2729, polyvinyl chloride (PVC) material; bell and spigot style solvent sealed end joints.

F. Plastic Pipe: ASTM D3034, Type PSM, polyvinyl chloride (PVC) material; bell and spigot style solvent sealed end joints.

2.03 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

B. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required 'T', bends, elbows, cleanouts, reducers, traps, and other configurations required.

2.04 CATCH BASINS

A. Basin Lid and Frame: Welded steel grating construction conforming to ADA spacing requirements, hinged lid, linear grill lid design.
   1. Grid/Openings limited to 1/2 – Inch maximum with direction of grate slots perpendicular to path of travel.

B. Shaft Construction and Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female dry joints.

C. Base Pad: Cast-in-place concrete of type specified in Section 32 13 13; leveled top surface to receive concrete shaft sections, sleeved to receive pipe sections.

D. Accessories: Joint Sealant for gasketing of concrete sections flexible butyl resin sealant, ASTM C990, Concrete Sealants CS-102 and CS-202 by ConSeal by Concrete Sealants Inc., New Carlisle, Ohio. Or equal.

E. Provide catch basin unless otherwise indicated on Drawings.

2.05 MANHOLES AND CLEANOUTS

A. Lid and Frame: Cast iron construction, removable lockable lid, closed lid design; nominal lid and frame diameter of 26 inches; manufactured by Brooks Products, or equal.

B. Shaft Construction and Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female dry joints; cast steel ladder rungs into shaft sections at 12 inches; nominal shaft diameter of 48 inches; manufactured by Brooks Products, or equal.

C. Base Pad: Cast-in-place concrete of type specified in Section 32 13 13; leveled top surface to receive concrete shaft sections, sleeved to receive storm drain pipe sections.

D. Accessories: Joint Sealant for gasketing of concrete sections flexible butyl resin sealant, ASTM C990, Concrete Sealants CS-102 and CS-202 by ConSeal by Concrete Sealants Inc., New Carlisle, Ohio. Or equal.

E. Cleanouts: Iron body type; extra heavy bronze plugs; manufactured by Acorn Engineering Co., J.R. Smith Mfg. Co., or F.A. Zurn Mfg. as follows:
   1. Concrete areas: non-skid nickle bronze lid, set flush with surface; Acorn 120-11, Smith 4240, or Zurn Z-1326-10.
   2. Non surface and asphalt surface areas: Non skid extra heavy cast iron cover; Acorn 120-10, Smith 4240, Zurn Z-1326-10.

2.06 FILL MATERIAL

A. Bedding and Fill: Type specified in Section 31 23 17 - Trenching.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that trench cut or excavation base is ready to receive work.

B. Verify existing invert elevations for proper tie-in of new work prior to trenching and installation of storm drain system.

C. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with approved fill material.

B. Remove large stones or other hard matter that could damage drainage pipe or impede consistent backfilling or compaction.

3.03 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with Section 306, SSPWC. Seal joints watertight.

B. Place pipe on bedding as specified in Section 31 23 17 - Trenching.

C. Lay pipe to slope gradients noted on drawings, with maximum variation for true slope of 1/8 inch in 10 feet.

D. Install bedding at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches.

E. Place bedding in maximum 8 inch lifts, consolidating each lift.

F. Do not displace or damage pipe when compacting.

G. Connect to storm drain municipal system through installed sleeves. Do not cover joints until lines have been tested and approved.

3.04 INSTALLATION - CATCH BASINS, MANHOLES AND CLEANOUTS

A. Install per Standard Specifications for Public Works Construction.

B. Form bottom of excavation clean and smooth to correct elevation.

C. Form and place cast-in-place concrete base pad, with provision for storm drain pipe end sections.

D. Establish elevations and pipe inverts for inlets and outlets.

E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.05 FIELD QUALITY CONTROL

A. Request inspection by Geotechnical Engineer prior to placing cover over pipe.

3.06 PROTECTION

A. Protect pipe and filter aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 41 00