SECTION 31 22 19 FINISH GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, and Division 01 apply to this section.

B. Scope of work: The work under this section includes furnishing all labor, materials, and equipment and performing all operations in connection with Finish Grading, as indicated on the drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following:

1. Import top soil for finish grading.
2. Place and finish grade top soil.

1.02 DEFINITIONS

A. Definitions in this section include the following:

1. Fill: Soil materials used to raise existing grades.
2. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.
3. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.03 PROJECT CONDITIONS

A. Soils Report: A geotechnical investigation report was made for this project and is on file at the College and Architects Office. Soils Report No. LCI LE12220, updated 03/01/13. Landmark Consultants, Inc., 780 North 4th Street, El Centro, CA 92243. (760) 370-3000.

1. All General Contractors and Earthwork Sub-Contractors shall review the soils report prior to commencing any work.

B. It shall be the responsibility of the Contractor to examine the site of the work and to make all investigation necessary, both surface and subsurface, to determine the character of materials to be encountered and all other existing conditions affecting the work.

C. The School District shall obtain and pay for the services of a Soils Engineer, who shall be responsible for the review and testing of all import top soil. Contractor shall be responsible to notify Soils Engineer for testing of imported soil.

D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

PART 2 - PRODUCTS

2.01 GENERAL

A. Import top soil required for finish grading shall be provided by the contractor from areas outside the site at contractor's expense. Import top soil shall conform to the requirements herein specified. All import top soil shall be tested and approved by geotechnical engineer prior to being hauled to the site.

B. Imported top soil shall be fertile surface soil (predominantly silt), free from rocks, sticks, obnoxious weeds, roots or seeds, toxic amounts of either acid or alkaline chemicals or other foreign material. Imported top soil shall be approved by Owner's Soil Engineer. Before delivery of top soil, furnish Architect with statement giving location of properties from which top soil is to be obtained and furnish sample.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Before work is started, verify the location and existence of all bench marks, survey corners and monuments. Protect all bench marks, survey corners and monuments, and if any become displaced, covered or destroyed, employ a civil engineer or surveyor registered in the State of California to reset those points. Permanently reset corners at grade or a maximum of 3" below grade.

B. Existing Grades: Verify the accuracy of the existing grades as shown on the drawings and report discrepancies to the Architect for verification.

C. Existing Utilities: Existing utilities shown on the drawings are shown from the best possible information available and shall be verified prior to the start of any work.

D. Unknown Utilities: In the event that utilities are encountered which are not indicated on the drawings, the existence of which is not known at the date of contract, the Contractor shall give notice in writing to the Architect. The Contractor shall not proceed until adequate investigation has been made, the line identified, and instructions issued as to how to proceed.

E. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

3.02 PREPARATION OF EXISTING SOIL

A. Remove all loose or unsuitable soils. Remove all foreign material and any miscellaneous construction debris prior to finish grading.

3.03 FINISH GRADING

A. Grade the entire site to the required final grade elevations indicated on the drawings. Where no otherwise indicated, site areas shall be given uniform slopes between points for which finished grades are shown, or between such points and existing established grades. Perform cutting, filling, backfilling, and grading necessary to bring the entire area to grades shown on the drawings.

B. Finish subgrades shall allow for thickness and slopes of subsequent construction. Grade to provide uniform slope between elevation points or lines, or between such elevations and existing grades.

C. Grade Tolerance: The average plane of all graded areas shall conform to the grades indicated on the plans. Landscape and other large turf areas shall not very more than 0.1 feet from the specified grade. Cut and fill slopes shall not vary from the specified grade more than 0.5 foot measured at right angles to the slope.

3.04 EARTHWORK BALANCE

A. Provide and import additional select top soil material, if required, and remove from the site all excess and unsuitable soil.

3.05 CLEANING

A. Maintain the premises free from accumulation of debris, waste materials, unusable materials, together with excess equipment, tools and other implements of service resulting from operations under this contract.

B. Debris, waste, or unused construction materials shall not be left about the site, nor shall such refuse be used for fill or backfill.

3.06 PROTECTION OF EXISTING WORK

A. Protect existing paving, walks, trees, buildings and utilities from damage during installation of new work. Carefully examine the drawings and inspect the site to determine the proximity of such work.

END OF SECTION 31 22 19

SECTION 31 23 33 – TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, and Division One apply to this section.

B. Scope of Work: The work under this section includes furnishing all labor, materials, and equipment and performing all operations in connection with Trenching and Backfilling, as indicated on the drawings, specified herein, or reasonably required to complete the work. The work includes but is not limited to the following:

1. Excavation, backfill and compaction for utilities.

C. Related Section:

1. Section 33 11 16: Site Water Distribution Piping.
2. Section 33 31 00: Sanitary Sewerage Piping.
3. Section 33 51 13: Natural Gas Piping.

1.02 GENERAL PROVISIONS

A. Contractor is responsible for the accuracy of all layout work and grades. Erect sheeting, shoring and bracing as necessary for protection of persons, improvements, and excavations. Keep excavation free from water and other fluids until backfilling is completed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Backfill material shall be non-expansive granular soils that meet the USCS classifications of SM, SP-SM, or SW-SM, with a maximum rock size of 3 inches, and 5 to 20% passing the No. 200 sieve and a minimum sand equivalent of 20.

B. Select bedding sand shall be Class A screened fill sand with a maximum particle size of 1-1/2 inches, not to exceed 18 percent, free of expansive materials, debris, and organic matter.

PART 3 - EXECUTION

3.01 TRENCHING

A. Layout: Lay out route of each underground utility prior to trenching. Review drawings and coordinate with adjacent underground work to avoid conflicts.

B. Clearances: Maintain required horizontal and vertical depth clearances from structural footings or utility trenches running parallel to footings. Maintain area of footing bearing prism and in event that the utility cannot be relocated or its depth changed, proceed as directed by Architect. Where required, lowering of structural footings to maintain proper clearances for underground utilities trenching shall be accomplished as directed.

C. Excavate trenches for utilities to required lines, grades and elevations indicated on drawings and as specified. Hand trim changes in direction and bottoms of trenches. Provide shoring in trenches over 5 feet in depth and also in trenches where unstable soil conditions are encountered.

D. Pipe Trench Dimensions: Following requirements are considered minimal unless drawings indicate otherwise in order to provide adequate pipe clearances and bedding. Provide trenches wider than specified minimum where required to properly install particular type of piping. In event that utility company regulations, code requirements, or pipe manufacturer's recommendations differ from these provisions, most restrictive requirements shall take precedence. Pipe burial depth is from finish grade or pavement surface to top of pipe. Trench width shall be measured at top of pipe.

1. Pipe Burial Depths:

Sewer and Drainage:	24" + pipe O.D. + 3" bed
Gas:	30" + pipe O.D. + 4" bed
Water (Domestic)	
PVC:	30" + pipe O.D. + 4" bed

2. Trench Width:

Sewer & Drainage:	12" min., 18" max + pipe O.D. for 4" to 18" dia. pipe
Gas:	8" + pipe O.D.
Water (Domestic):	8" + pipe O.D.

E. Common Trench Requirements:

1. Copper piping or metal gas piping shall not be installed in a common trench with any other dissimilar.
2. Multiple parallel lines of piping in a common trench shall be separated a minimum of 12 inches, both horizontally and vertically, between individual pipes.
3. Domestic water piping shall not run parallel in a common trench with sewer of drainage lines.
4. Electrical power and communications conduit, etc. shall not be run in a common trench with sewer, drainage, water or gas piping.

F. Additional provisions for Underground Piping within Building Areas: Refer to applicable specification sections of Division 15 and as indicated on drawings.

G. Requirements for Underground Electrical and Communications Conduit, Ducts, etc.: Refer to applicable specification sections of Division 23 and as indicated on drawings.

3.02 BEDDING AND BACKFILLING OF TRENCHING

A. Bedding: Lay and bed pipe in compacted select bedding sand of thickness specified above, and backfill with same material to a height of 8” above top of pipe. Place in 8” layers and compact to a minimum relative density of 90 percent. Compact in a manner that will not displace or damage pipe.

1. Excavate under bell portions of the piping for uniform bearing.
2. Conduits and ducts which are laid in a single layer, parallel and in same horizontal plane and which are not concrete encased, shall have bedding as specified above. Select sand bedding for multi-layered banks of unencased conduit shall be water settled but not flooded to fill voids between conduits with sand.

B. Backfilling: Trenches above top of bedding, and concrete encased utilities, shall be backfilled with select backfill material at optimum moisture content, placed in 6 to 8 inch layers and compacted to a minimum relative density of 90 percent. Trench backfill in pavement or other areas where

compaction greater than 90 percent is required shall be compacted in accordance with those requirements to specified depth.

C. Do not backfill until installation has been approved. Promptly install pipe after trenching has been done to keep excavation open as short a time as possible.

D. Underground utility materials requiring special bedding and backfilling methods shall be installed as recommended in conjunction with these materials or as indicated on drawings.

3.03 PROTECTION OF WORK FROM FLOODING

A. Construct all temporary ditches and berms and supply and maintain adequate pumps, piping, and other equipment necessary to protect work, existing structures, and equipment, and to other property located on premises or adjacent thereto, from damage by flooding due to rain or subsurface water. Utility lines shall not be laid in trenches which contain water or that are muddy.

3.04 SITE CLEANUP

A. All excess and unsuitable excavated material shall be removed from site.

3.05 FIELD QUALITY CONTROL

A. Obtain Soils Engineer’s approval for excavation, fill materials, method of placing and compaction. Soils Engineer will perform tests to evaluate compliance with specifications.

END OF SECTION 31 23 33

SECTION 32 12 16.13 PLANT - MIX ASPHALT PAVING

1.1 GENERAL

A. Scope of work: The work under this section includes furnishing all labor, materials, and equipment, and performing all operations in connection with Hot-Mix Asphalt Paving, as indicated on the Drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following.

1. Hot-Mix Asphalt Paving as per drawings.

B. References:

1. ASTM C 131-96, Standard Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine
2. ASTM D 977-98, Standard Specification for Emulsified Asphalt
3. Caltrans Standard Specifications, April 2006 Edition
4. ASTM D 1188-96, Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
5. ASTM D 1559-89, Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
6. ASTM D 2027-97 Standard Specification for Cutback Asphalt (Medium-Curing Type)
7. ASTM D 2041-95, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
8. ASTM D 2397-98, Standard Specification for Cationic-Emulsified Asphalt
9. ASTM D 2726-96a, Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
10. ASTM D 3381-92, Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction

C. Submittals: Product Data, material certificates, and the following:

1. Mix design of asphalt concrete mixture. Hveem or Marshall Method
2. Copy of test results from tests conducted to assure compliance to contract documents.
3. Manufacturer’s application instructions for soil sterilant.

D. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

E. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work.

F. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:

1. Tack Coats: Minimum surface temperature of 60 deg F.
2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

1.2 PRODUCTS

A. Coarse Aggregate: Caltrans, Type A, ½" maximum, medium grading, sound; angular crushed stone; crushed gravel;

B. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, properly cured blast-furnace slag, or combinations thereof.

C. Asphalt Cement: PG70-10 Paving Grade

D. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

E. Soil Sterilant: Selective type pre-emergence control chemical containing 60 percent Trifluralin minimum.

1. Trflan or Spike 80W by Dow AgroSciences
2. Trific 60DF by Terra Industries Inc.
3. Equal

L. Hot-Mix Asphalt: Central plant hot mix

1. Central plant hot mix
2. Develop mix design according to Marshall Method (ASTM D1559) to achieve optimum asphalt content as shown by test data curves based on testing samples containing ½ percent increments of asphalt content. Samples shall include minimum of two with asphalt content above optimum and two with asphalt content below optimum.
3. Make tests in accordance with ASTM D 1559 and ASTM D 1075. (50 blow count Marshall)
4. Final Design by Hveem Method shall meet the following criteria:

a. Stability: 1200 lbs. minimum
b. Flow: 8 minimum, 18 maximum
c. Air voids: 2 percent minimum, 5 percent maximum
d. Voids in mineral aggregate: 15 percent minimum
e. Asphalt cement by weight of total: 5 percent minimum
f. Dry Strength: 200 psi
g. Index of Retained Strength: 75%

4. The following mix design shall mee the minimum requirements for this project
a. CALTRANS ¾" HMA Type A with 15% RAP
b. Asphalt Binder PG-70-10

1.3 EXECUTION

A. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

1. Before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

B. Soil Sterilant: Apply sterilant according to manufacturer's recommended rates and written application instructions.

1. Applicatoin shall be no more than one day before installation of paving
2. Take necessary precautions to protect adjoining property and areas designated for planting

D. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface. Allow tack coat to cure undisturbed before paving.

1. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

E. Place base and surface courses of hot-mix asphalt at temperatures between 250 and 325 deg F on prepared surface, spread uniformly, and strike off. Place asphalt with self-propelled laydown machine. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.

F. Promptly correct surface irregularities in paving course behind paver. Remove excess material and fill depressions with hot-mix asphalt.

G. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

H. Compact paving as soon as placed hot-mix asphalt will bear roller weight. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.
2. Compact to 95 percent minimum.
3. Begin breakdown rolling immediately after asphalt is placed when asphalt temperature is at maximum. Complete breakdown rolling befre mix temperature drops below 240 deg F.
4. Complete intermediate rollingas soon as possible after breakdown rolling and befroe mix temperature drops below 185 deg F. Do not roll paving for compaction purposes after asphalt temperature falls below 185 deg F.
5. Execute compaction so visibility of joints is minimized. Complete finish rolling to improve asphalt surface as soon as possible after intermediate rolling and while asphalt paving is still warm. Do not use vibration for finish rolling.

J. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt compacted by rolling to specified density and surface smoothness.

K. Surface shall be uniform with no “birdbaths”. Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed ¼”

L. Field Quality Control: When tested with 10 foot straight edge, surface of complete work shall not contain irregularities in excess of ¼”.

END OF SECTION 02511

SECTION 32 13 00 SITEWORK CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, and Division 01 apply to this Section.

B. Scope of work: The work under this section includes furnishing all labor, materials, and equipment, and performing all operations in connection with Sitework Concrete, as indicated on the Drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following.

1. Cast-In-Place concrete sidewalks.
2. Curbs and gutters.
3. Interior and exterior raised concrete planters and benches.
4. Concrete Pavers

C. Related Sections:

1. Section 31 23 00 Excavation and Fill
2. Section 31 22 19 Finish Grading
3. Section 32 13 13 Concrete Paving
4. Section 32 13 73 Concrete Paving Joint Sealants

1.02 REFERENCES

A. ASTM A185 – Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
B. ASTM A615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
C. ASTM C33 – Concrete Aggregates.
D. ASTM C94 – Ready-mixed Concrete.
E. ASTM C150 – Portland Cement.
F. ASTM C171 – Sheet Materials for Curing Concrete.
G. ASTM C979 – Pigments for Integrally Colored Concrete.
H. ASTM D1751 – Preformed Expansion Joint Fillers for Concrete, Paving and Structural Construction.
I. ASTM C309 – Liquid Membrane-Forming Compounds for Curing Concrete.
J. Chapter 19A, California Building Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 01 33 00, Submittal Procedures.

B. Layout Drawings: Provide layout drawing showing location of each type of pavement and construction, and dimensioned locations of expansion and control joints. Do not deviate from location of expansion joints and control joints shown on the drawings.

C. Design Mixtures: Provide design mix for each concrete mixture. Design mix shall include data substantiating the reliability of the proposed mix. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Each design mixture shall be stamped and signed by a registered professional engineer licensed in the state of California.
2. Indicate amounts of mixing water to be withheld for later addition at project site.

D. Product Data

1. Expansion material
2. Curing materials

E. Site Samples

1. Prepare samples indicating slab construction and finish, at the site, cast in the directed locations and orientations. Prepare a minimum 8 foot square sample of each texture and finish required for the project. Include a transverse expansion joint, control joints and edging. Where paving adjoins other material such as pavers, include one edge of sample constructed of the other materials.
2. Approved samples may be part of permanent construction if the sample meets all project requirements and is approved.

1.04 QUALITY ASSURANCE

A. Sitework Concrete work subject to the provisions of Section 01 45 24, Testing and Inspection Requirements, at the option of the Architect.

B. Maintain one copy of all records on site.

C. Acquire cement and aggregate from same source for all work.

D. Conform to Section 1905A.13, California Building Code, when concreting during hot weather.

E. Conform to Section 1905A.12, California Building Code, when concreting during cold weather. No pouring permitted below 40 degrees Fahrenheit.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of embedded sleeves, utilities and components which are concealed from view.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150 – Type V Portlant Type, one manufacturing plant only.

B. Aggregates: ASTM C33, single source for all materials.

C. Water: Clean, fresh and potable

2.02 ACCESSORIES

A. Expansion joints:

1. Expansion Joint Filler – ASTM D1751: Close cell bituminous saturated fiberboard, ½ inch thick; FIBER EXPANSION JOINT manufactured by The Burke Co., Montebello, CA, or approved equal.
2. Joint Devices: Integral extruded polystyrene plastic; ½ inch thick, with removable top strip exposing sealant trough; JOINT CAPS, manufactured by The Burke Company, or equal.

3. Sealant: Polyurethane two-component type, self leveling, for level surface application, UREXPAN NR-200, manufactured by the Pecora Corp., Harleysville PA, or equal. Color shall be selected by the Architect from manufacturer's standard list of colors.
4. Sealant Primer: As recommended by Sealant Manufacturer.

2.03 CONCRETE MIX

A. Mix and deliver concrete in accordance with Section 1905A, California Building Code.

1. 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.
2. Design Mix: Conform to 1905A.2 – 1905A.6, California Building Code.
3. A registered civil engineer with experience in concrete mix design shall select the relative amounts of ingredients to be used as basic proportions of the concrete mixes proposed for use under this provision.
4. Selection of Concrete Proportions: Concrete proportions shall be determined in accordance with the provisions of ACI 318, Section 5.2.
5. Quantities of Materials: Provide Weighmaster's Certificate for each load of concrete.
6. Do not exceed 0.45 water-cement ratio, by weight.
7. Concrete shall be mixed by transit mixers only.

B. Required Strength: Minimum 4,500 psi for sitework concrete.

2.04 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; 40 ksi yield grade; deformed billet steel bars, uncoated finish.

B. Welded Steel Wire Fabric: Plain type, ASTM A185; in flat sheets; uncoated finish, 6 x 6 inch, No. 10 gage.

C. Tie Wire: Annealed steel, minimum 16 gage size.

D. Dowels: ASTM A615; 40 ksi yield grade, deformed steel, uncoated finish.

E. Fiber Reinforced Concrete

1. FIBERMESH 150: ASTM C 1116/C 1116M, Type III Fiber Reinforced Concrete. Manufactured by PROPOX CONCRETE SYSTEMS. 100% virgin homopolymer polypropylene multifilament fibers containing no reprocessed olefin materials. Provide 1.0 – 1.5 lbs. per cubic yard.
2. FIBERMESH 650: ASTM C 1116/C 1116M, Type III Fiber Reinforced Concrete. Manufactured by PROPOX CONCRETE SYSTEMS. Alloy polymer macro-synthetic fiber featuring e3 patented technology manufactured to an optimum gradation and highly oriented to allow greater surface area contact within the concrete resulting in increased interfacial bonding and flexural toughness efficiency. Provide a minimum of 3.0 lbs. per cubic yard

2.05 CURING MATERIALS

A. Polyethylene Film ASTM C171; 8 mil thick, clear, manufactured from virgin resin with no scrap or additives. POLYETHYLENE, No. 227, manufactured by The Burke Co., Montebello, CA, or equal.

B. Water: Potable and not detrimental to concrete.

C. Curing Compound: ASTM C309; wax resin base, WHITE PIGMENTED CURING COMPOUND, by The Burke Co., Montebello, CA, or equal.

2.06 COLORED CONCRETE

A. Provide colored concrete as marked on the AS (Architectural Site) Sheets. Colored concrete shall be as selected by Architect from the DAVIS COLORS color chart. Color Group: Standard.

2.07 PAVERS

A. Concrete Pavers shall be WAUSAU TILE Type 3, 24” x 24” x 2 ¾”. Provide (2) colors: FDX 5008 Tan and FDX 3008 Gray.

B. Pavers for ADA curb ramps shall be WAUSAU TILE ADA-1 Precast Concrete Truncated Domes, 24” x 24” x 2 ¾”. Color shall be Yellow 33538 per Federal Standard 595B.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify site concerns.

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. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer’s written instructions. Remove sharp projections.

3.03 PLACING CONCRETE (GENERAL)

A. Convey and deposit concrete in accordance with Section 1905A, California Building Code. 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. Ensure sub-base or base materials have been compacted or otherwise treated.

E. Install joint fillers, primer and sealant in accordance with manufacturer’s instructions.

F. Place concrete continuously between predetermined expansion joints.

G. 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.

H. 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.

I. 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.

J. 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 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: Gage sufficient to provide equivalent rigidity and strength.

C. Reinforcement: Unless indicated otherwise on the drawings, provide welded steel wire fabric, 6 inches by 6 inches, No. 6 gage at mid-height of sidewalks and ramps. Interrupt reinforcement at expansion joints.

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. Expansion Joint: Locate joint filler as shown on drawings or at maximum 60 feet centers and where slabs join vertical surfaces. Install vertically, full depth of concrete leaving plastic cap at ½ inch depth at top for sealant application.

1. Provide ½ inch diameter greased steel dowels, 12 inches long at expansion joints with one end of dowel lubricated to allow for longitudinal movement. Spacing: 16 inches on center maximum, 6 inches from edges.
2. Remove plastic caps. Prime both sides of joint and apply self-leveling sealant. Provide smooth concave surface.

F. Control Joints – Saw Cut: After floating and finishing, saw cut concrete to a depth of: depth of concrete/4. Curved or non-aligned joints not acceptable. Sealant application not required. Space joints 12 ft maximum oc both ways or as patterned on the drawings.

G. Finish:

1. Screed concrete to required grade, float to a smooth, flat, uniform surface. Edge all headers to ¼ inch radius. Edge expansion joints to ¼ inch radius. Steel trowel to hard surface.
2. Grades less than 6 percent: After final troweling, apply a medium hard broom finish transverse to centerline or direction of traffic.
3. Grades 6 percent or more: Apply slip resistant heavy broom finish and remark as necessary after final finish to assure neat uniform edges, joints and score lines.
4. Walkway grades in excess of five percent shall conform to Section 1133B.7, California Building Code.

H. 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 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.

3.05 RAISED PLANTER, BENCHES 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: Refer to drawings for size and spacing. 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 or thick rust and coatings.

C. Coordinate installation of conduits or other inserts.

D. Finish: Provide a smooth, straight, plumb and acceptable finish without burrs or form marks. Cement sacking is not acceptable.

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 sf 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 CURB AND GUTTER

F. Subgrade Preparation: Subgrade material, base material and compaction requirements as approved by the Geotechnical Engineer.

G. 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.

H. Reinforcement: Refer to drawings for size and spacing. Interrupt reinforcement at expansion joints.

I. 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 pipies to conform to curb batter.

J. Expansion Joints: Locate joint filler as shown on drawings, or at maximum 20 foot centers. Trim off excess filler material flush to finish surface. No sealant application required.

K. Finish: Trowel to a smooth and even finish with a fine hair broom applied parallel with the line of the work. Round all edges to ½ inch radius. No Contractor identification permitted.

L. 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.

END OF SECTION 32 13 00

SECTION 03 31 13 STRUCTURAL CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, and Division One apply to this section.

B. Scope of work: The work under this section includes furnishing all labor, materials, and equipment, and performing all operations in connection with Structural Concrete, as indicated on the drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following:

1. All cast-in-place concrete, including footings and slab on grade.
2. Concrete Mix Designs.
3. Equipment bases.
4. Setting anchor bolts, inserts, dowels, and accessories cast in concrete, which are specified under this and other sections.
5. Vapor barrier under interior floor slabs on grade.
6. Grout and drypack.
7. Formwork, shoring, bracing and anchorage.
8. Concrete reinforcement and accessories.

C. Related Sections

1. Section 01 45 24 Testing and Inspection Requirements for School Construction

1.02 DEFINITIONS AND REFERENCES

A. Definitions

1. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

B. References

1. ACI 318-2011 Specifications for Structural Concrete for Buildings.
2. ASTM A615 – Deformed and Plain Billet-Steel for Concrete Reinforcement.
3. ASTM C33 – Concrete Aggregates.
4. ASTM C94 – Ready-Mixed Concrete.
5. ASTM C150 – Portland Cement.
6. ASTM C309 – Liquid Membrane – Forming compounds for Curing Concrete.
7. Chapter 19A, California Building Code.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: Provide design mix for each concrete mixture. Design mix shall include data substantiating the reliability of the proposed mix. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Each design mixture shall be stamped and signed by a registered professional engineer licensed in the state of California.
2. Indicate amounts of mixing water to be withheld for later addition at project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.04 QUALITY ASSURANCE

A. Specified cement and aggregates shall be from single sources only.

B. Regulatory Requirements: Conform to Chapter 19A, California Building Code.

C. Tests: Testing and analysis of concrete will be performed under provisions of Section 01 45 24, Testing and Inspection Requirements for School Construction.

D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

E. Evaluation and acceptance of concrete shall conform to section 1905A.6, CBC. Samples for strength testing shall be taken at least once a day or not less than once for each 50 cubic yards of concrete or not less then once for each 2,000 square feet of surface area for slabs or walls.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Conform to Section 1903A, California Building Code.

B. Plywood Forms: Douglas Fir species; solid one side sound undamaged sheets.

C. Lumber: Douglas Fir species; construction grade with grade stamp clearly visible.

D. Form Ties: Removable metal of adjustable length, cone ends.

2.02 REINFORCING STEEL

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet steel deformed bars for No. 4 bars or larger, 40 ksi yield grade for No. 3 bars and smaller. Welded bars shall be ASTM A706, 60 ksi yield grade.

B. Welded Steel Wire Fabric: Plain type, ASTM A185; in flat sheets.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150, Type V, Portland Type, conforming to Section 1903A.1, California Building Code.

B. Aggregates: ASTM C33, conforming to Section 1903A.6, California Building Code.

C. Fly Ash: Shall conform to Section 1903A.5, California Building Code.

D. Water: Clean and not detrimental to concrete.

2.04 CONCRETE MIX

A. Mix and deliver concrete in accordance with Section 1903A, California Building Code.

1. Selection of Concrete Proportions: Concrete proportions shall be determined in accordance with the provisions of ACI 318, Section 5.2.
2. A registered civil engineer with experience in concrete mix design shall select the relative amounts of ingredients to be used as basic proportions of the concrete mixes proposed for use under this provision.
3. Do not exceed 0.45 water-cement ratio, by weight.
4. Concrete shall be mixed by transit mixers only.

B. Provide concrete to the following criteria:

Element	Min 28 day Strength PSI	Max Slump	Max Size Aggregate	Type
Foundation	4,500	4 inch	1 inch	Reg.
Slabs	4,500	4 inch	3/4 inch	Reg.

C. Admixtures may be added to the concrete to control the set, effect water reduction and increase in workability at the contractor's option, or at the request of the Engineer, but in either case at the expense of the contractor. Except as otherwise specified, such admixtures shall be a water reducing normal retarding admixture conforming to ASTM C 494 and may be either a hydroxylated carboxylic acid type or a hydroxylated polymer type, but shall contain no calcium chloride. The required quantities of cement shall be used. The quantity of admixture used and the method of mixing shall be in accordance with the manufacturer's printed instructions.

1. Superplasticizers shall not be used without permission of the Engineer. If used, superplasticizers shall conform to ASTM C, Type F or G; batch plant added using second or third generation only.
2. Admixtures shall be subject to the approval of DSA.

2.05 ACCESSORIES

A. Bonding Agent: Polyvinyl Acetate; HIBOND, manufactured by Lambert Corporation, Orlando, FL, LOCK BOND NO. 906, manufactured by MacklanBurg-Duncan Co., City of Industry, CA, or equal as approved in accordance with Section 01 25 00 for Substitutions.

2.06 REINFORCED VAPOR BARRIER

A. Manufacturer: Reef Industries, Inc. 9209 Almeda Genoa Road, Houston Texas 77075. Phone (800) 231 6074. Web Site www.reefindustries.com.

B. Reinforced Vapor Retarder under VCT and carpet: Griffolyn Type 85, 5-ply laminate, combing (3) layers of high density polyethylene and (2) high strength non-woven cord grids.

2.07 CURING MATERIALS

A. Water: Clean from a source suitable for domestic consumption.

B. Curing Compound: ASTM C309, SHUR-CURE manufactured by Paul M. Wolff Co. water based membrane forming concrete curing compound. White pigmented.

2.08 DRY PACK AND NON-SHRINK GROUT

A. Drypack: Field mixture of 1 part Portland Cenment to 2 ½ parts fine aggregate conforming to ASTM C-33 mixed to a damp consistency such that a ball molded in the hand will stick together and hold its shape. In lieu of field mixing Contractor may use factory mixed drypack material, EUCLID Dry Pack Grout or equal.

B. Non-Shrink Grout: EUCLID Hi-Flow Grout or equal.

C. Epoxy Grout: Mult-component, premeasured, fast-curing combination of thermosetting resins and inert fillers. EUCLID Euco High Strength Grout or equal.

PART 3 - EXECUTION

3.01 FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of Section 1903A, California Building Code.

B. Verify lines, levels and measurement before proceeding with formwork.

C. Hand trip sides and bottom of earth forms; remove loose dirt.

D. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

E. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

F. Align joints and make watertight. Keep form joints to a minimum.

G. Obtain approval before framing openings in structural members which are not indicated on Drawings.

3.02 REINFORCED VAPOR BARRIER

A. Install reinforced vapor retarders in accordance with ASTM E 1643 and manufacturer’s written instructions.

3.03 PROTECTION

A. Adequately protect staff, personnel and public from harm and accident during formwork. Conform to California Code of Regulations, Title 8, Subchapter 4, Construction Safety Orders.

3.04 REINFORCEMENT

A. Place, support and secure reinforcement against displacement.

3.05 PREPARATION FOR CONCRETE WORK

A. Weather Provisions: Make Provisions for weather conditions in accordance with ACI Specifications ACI 318 , the recommendation of the Testing Laboratory, and acceptable to the Architect

1. Hot Weather Requirements: Concrete to be placed during hot weather shall comply with the requirements of ACI Section 5.13.

B. Excavations: Before placing of concrete for foundations, insure that the excavations have been inspected and approved by the Soils Engineer. Remove loose dirt from excavations.

C. Before concrete is placed upon or against concrete that has taken its initial set or has hardened, remove encrustations from the forms and reinforcement, and mechanically roughen hardened concrete to minimum ¼ inch coarseness amplitude.

D. Prepare previously placed concrete by cleaning with sandblasting to remove laitance and expose clean aggregate.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, epoxy set 10 inch long No. 3 steel dowels at 18 inches oc.

3.06 PLACING CONCRETE

A. Place concrete in accordance with Section 1903A, California Building Code.

B. Notify Architect minimum 24 hours prior to commencement of operations. All excavations, forms and reinforcing shall be inspected and approved by the Architect prior to placement.

C. Ensure reinforcement, inserts, embedded parts and accessories are not disturbed during concrete placement.

D. When detailed on the drawings, separate slabs on grade from vertical surfaces with ½ inch thick joint filler.

E. Extend joint filler from bottom of slab to within ½ inch of finished slab surface using one-component polyurethane sealant as specified in Section 07 92 00.

F. Place concrete continuously between predetermined expansion, control and construction joints.

G. Do not interrupt successive placement; do not permit cold joints to occur.

H. 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.

I. Provide special mix prepared by the Testing Laboratory and approved by the Architect utilizing smaller aggregates in areas of reinforcing congestion to prevent the formation of rock pockets.

J. 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: 4 feet. Utilize trunks or additional chutes where doubt occurs.

K. Construction Joints: Wash surface of each joint shortly after pouring to expose clean, sound aggregate. Sandblast surface to remove laitance remaining or loose aggregate as approved by the Architect. Conform to Section 1903A, California Building Code. Apply bonding agent in accordance with manufacturer’s instructions.

3.07 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.

B. Provide smooth trowel finish at flat surfaces.

3.08 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

B. Maintain concrete with minimal moisture loss at above 50 degrees F temperature for period necessary for hydration of cement and hardening of concrete. Dusting with dry cement to absorb excess water is prohibited.

C. Cure only as specified herein and in accordance with Section 1903A, California Building Code. Membrane curing compound method not permitted for interior cast-in-place concrete slabs.

D. Moisture Cure: Spray water over floor slab areas and maintain wet for minimum of seven (7) days or spread polyethylene film over floor 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 minimum of seven (;7 days. Do not permit traffic over floor slabs during the seven (7) day curing period.

E. Vertical Surfaces: Spray water over surfaces and maintain wet for 10 days.

F. Quality Control: Proper curing of concrete surfaces shall be the responsibility of the Contractor under this section.

3.09 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Sections 01 45 24 Testing and Inspection Requirements for School Construction.

B. Provide free access to work and cooperate with Testing Laboratory.

3.10 PATCHING

A. Clean all exposed concrete surfaces and all adjoining work stained by leakage of concrete. Remove all fins, butts and projections by grinding. Patch voids, rock pockets, holes, cracks and similar imperfections by chipping loose concrete and exposing clean, sound aggregate.

3.11 DEFECTIVE CONCRETE

A. Remove concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Architect.

C. Do not patch, fill, touch-up, repair or replace exposed concrete except upon express approval of Architect for each individual area.

3.12 MOISTURE TEST FOR CONCRETE FLOORS

A. It shall be the Contractor's responsibility to provide a concrete floor slab meeting the maximum moisture vapor emissions herein specified and the contractor shall exercise care in all aspects of mixing, placing and curing the concrete floor slabs so that a minimum of mitigation treatment will be required.

B. Prior to ordering floor materials that are adhesive applied, contractor shall conduct Calcium-Chloride "Dome" tests to verify that concrete floor slabs are dry with maximum moisture vapor emissions of five lbs. Per 1,000 s.f. in 24 hours and that slabs exhibit negative alkalinity, carbonization or dusting. Apply the moisture test in four (4) different areas of each floor location, with at least one test for each 1,000 s.f. of floor area.

C. Should the moisture emissions exceed five lbs. Per 1,000 s.f. in 24 hours as specified herein at the time of installation of adhesive applied floor coverings, and the Petrographic Analysis, ASTM C856, confirms that the placement of concrete slabs was not in conformance with requirements of this section and that the water cement ratio exceeded 0.45 or the concrete was cured less than 7 days, the General Contractor, at no additional cost to the Owner, shall reduce the moisture emission level to that specified by use of a vapor emission treatment system.

3.13 DRY PACK AND GROUTING

A. Drypacking: Mix materials thoroughly with minimum amount of water. Install drypack by forcing and rodding to fill voids and provide complete bearing under plates. Finish exposed surfaces smooth and cure with damp burlap or liquid curing compound.

B. Non-Shrink Grouting: Mix grout material per manufacturer's instructions. Surfaces to receive the non-shrink grout shall be clean, and shall be moistened thoroughly immediately before placing the mortar. Before grouting, surfaces to be in contact shall be roughened and cleaned thoroughly, loose particles shall be removed and the surface flushed thoroughly with neat cement grout immediately before the grouting mortar is placed. Place fluid grout from one side only and puddle, chain, or pump for complete filling of voids; do not remove the dams or forms until grout attains initial set. Finish exposed surfaces smooth, and cure as recommended by grout manufacturer.

END OF SECTION 03 31 13

SECTION 06 10 00 – ROUGH CARPENTRY

1.1 GENERAL

A. Scope of work: The work under this section includes furnishing all labor, materials, and equipment, and performing all operations in connection with Rough Carpentry, as indicated on the Drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following.

1. Rough Carpentry.
2. Framing Hardware

B. References:

1. Chapters 7 and 23, California Building Code.
2. PS 1 - 09 – Construction and Industrial Plywood.
3. WWPA – Western Lumber Grading Rules 2011 Edition, by Western Wood Products Association.
4. APA – American Plywood Association Design/Construction Guide.
5. AQMD – Local Air Quality Management District Regulations.
6. AWPA – American Wood Preservers Association – Manual of Recommended Practice, C-1.
7. WCLIB – West Coast Lumber Inspection Bureau Standard Grading Rules No. 17.

C. Quality Assurance:

1. Rough Carpentry Lumber: Visible grade stamp on all products required.
2. Grade Stamp: Provide grade stamp per WWPA or WCLIB standards
3. Nailing guns and nails shall be approved by DSA.

D. Delivery, Storage and Handling:

1. Do not deliver rough carpentry items until site conditions are adequate to receive the work. Protect items from weather while in transit.
2. Protect items from weather while stored at job site.

1.2 PRODUCTS

A. Rough Carpentry Materials:

1. Structural and Framing Lumber: Douglas Fir Larch, surface four sides, graded in accordance with WCLIB standards, Grading and Dressing Rule No. 17.

    a. Moisture Content: The moisture content of all wood members shall not exceed 19% before installation. It shall be the responsibility of the inspector to verify that the contractor has uspplied lumber of the proper moisture content before installation. The use of a hand held moisture content meter is acceptable.
    b. All Framing Lumber shall be Grade Stamped No. 1 unless noted otherwise

2. Structural Plywood: Plywood shall be APA Rated as indicated on the Drawings in accordance with U.S. Product Standard PS 1-09, Structural 1 Rated Sheathing.
3. Nails, Spikes and Staples: All nailing shall conform to California Building Code.Table 2304.9.1, Nailing Schedule. Pre-drill all nails 20d and larger where required to prevent splitting.
4. Bolts, Nuts, Washers, Lags, Pins and Screws: Section 2304.9, CBC, sized as required on drawings to suit application, galvanized for exterior locations, high humidity locations and treated wood, plain finish for other interior locations.

5. Fasteners: Expansion shield and lag bolt type or powder actuated type for anchorage to solid masonry or concrete. Refer to Section 01455 for acceptable types and required testing.
6. Stock Framing Connectors: Comply with CBC Section 2304.9, CBC Provide nails fully driven in all holes in each face of connector.

    a. Manufacturers: Simpson Strong Tie Co., Inc., San Leandro, CA, or approved equal.

7. Non-Stock Framing Connectors: As per details on drawings.
8. Preservative (pressure) Treated Lumber: Section 2303.1.8, California Building Code Conform to AWPA manual of recommended practice. Use preservative complying with LP-2 and LP-22. Conform to AQMD, Local Regulations.

    a. Douglas Fir or Western Hemlock, used as required by Section 2303.1.8, California Building Code, shall conform to the following:

        1.1 Lumber shall be WWPA or WCLIB grade stamped.
        1.2 Lumber shall be No. 1 grade or better.

1.3 EXECUTION

A. Framing:

1. All work shall be accurately and neatly cut and fitted, nailed and bolted in place in the best workmanlike manner.
2. Bearing surfaces on which wood structural members are to rest shall be finished to give true even support.
3. Erect wood framing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch.
4. Construct members of continuous pieces of longest possible lengths.
5. Construct and erect required headers and lintels.
6. Construct walls with studs of size and spacing indicated. Install single sill member at bottom and double plate at top unless otherwise detailed. Stagger upper and lower members of double plate with joints not less than 4 feet oc. Where sill or any wood member contacts concrete or masonry, install preservatively treated lumber.
7. Provide one row of solid blocking not less than 2 inch nominal thickness and same width of stud at mid height of wall. Fit snugly and attach with not less than two 16d nails at each end.
8. Install 3 studs at corners.
9. Conform to Section 2308.9.8, California Building Code where pipes penetrate sills or plates.
10. Cutting and Notching: Conform to Section 2308.9.10, California Building Code.
11. Bored Holes: Conform to Section 2308.9.11, California Building Code.
12. Notches and Holes: Conform to section 2308.10.4.2 CBC.

B. Subflooring:

1. Place floor sheathing with end joints staggered. Secure sheets over firm bearing. Maintain minimum 1/16 inch and maximum 1/8 inch spacing between joints of sheets. Place perpendicular to framing members.
2. Maintain surface flatness of maximum 1/8 inch in 10 feet.

C. Plywood Sheathing:

1. Thickness as indicated on the drawings.
2. Boundary Nailing: Not less than 3/8 inch from edge, spaced as specified on drawings.
3. Blocking: Panel edges shall bear on framing members and solid blocking.
4. Minimum Size Vertical Panel: 12 inches wide.

5. Minimum Size Horizontal Panel: 24 inches wide.

D. Foundation Framing, Plates, Sills and Sleepers:

1. Preservative treated wood required.

E. Horizontal Framing:

1. Bearing: 1-1/2 inch minimum on wood or metal, on masonry as detailed on drawings. Lay framing members with crown up.
2. Lateral Support: Use solid blocking or other approved means.
3. Lap joists a minimum of 3 inches when framed from opposite sides of a beam.
4. Openings: Double joists required for trimmer and headers for openings 4 ft. or larger.
5. Provide ties, purlins and blocking in conformance with Section 2308.8.5, California Building Code.

F. Backing:

1. Provide backing as indicated on drawings to support electrical fixtures, fixed equipment, cabinets, grab bars, door stops and plates. Fasten securely to framing.

G. Blocking:

1. Provide Fire Blocking as per CBC 7.7.2

END OF SECTION 06100

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, and Division One apply to this section.

B. Scope of work: The work under this section includes furnishing all labor, materials, and equipment and performing all operations in connection with Gypsum Board Assemblies, as indicated on the drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following:

1. Gypsum Board at ceilings.
2. Gypsum Board at walls.
3. Taped and sanded joint treatment.
4. Texture

1.02 SUBMITTALS

A. Submit product data for gypsum board, joint tape and fasteners as per Section 01 33 00.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Gypsum Wallboard: ASTM C 36, United States Gypsum Company, Sheetrock brand Gypsum Panels, 5/8” Type X, tapered edge.

B. Gypsum Wallboard Joint Treatment Materials: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

1. Joint Tape: Sheetrock Joint Tape, cross fibered paper.
2. Joint Compound: United States Gypsum Company, Sheetrock All Purpose Joint Compound Ready Mixed.

C. Gypsum Board Accessories:

1. Corner Bead: United States Gypsum Company, Sheetrock Brand Paper Faced Metal ¾” Bullnose.

PART 3 - EXECUTION

3.01 INSPECTION

A. Commencement of work constitutes acceptance of substrate. All framing members shall be true and straight. Any framing or furring member that varies more than 1/8” from the plane of adjacent framing or furring members shall be corrected under the rough carpentry section before gypsum wallboard is installed. Inspect all substrate and report all conditions which will jeopardize smooth satisfactory finish.

B. Tolerances: Maximum variation from true flatness shall be 1/8” in 10 feet in any direction.

3.02 INSTALLATION

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840, GA-216 and Section 2508 of The California Building Code.

B. Installing Gypsum Board Trim Accessories: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

1. Install cornerbead at external corners.
2. Install edge trim where edge of gypsum panels would otherwise be exposed.

C. Finishing Gypsum Board Assemblies: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

1. Prefill open joints and damaged areas using All Purpose Joint Compound.
2. Apply joint tape over gypsum board joints, including over trim accessories with flanges. Embed joint tape in joint compound.
3. Apply two coats of joint compound or finishing compound over all joints and dimples from fasteners. Sand between coats as required.

D. Apply Gypsum Board Texture Finishes as follows:

1. Provide texture as per finish schedule.

E. Ceilings: Provide minimum 5/8” gypsum board at ceilings.

F. Walls: Provide minimum 5/8” gypsum board full height of all walls, to bottom chord of truss, unless noted otherwise.

END OF SECTION 09 29 00

SECTION 09 91 00 PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, and Division 01 apply to this section.

B. Scope of work: The work under this section includes furnishing all labor, materials, and equipment, and performing all operations in connection with Painting, as indicated on the drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following:

1. Surface preparation.
2. Prime coat application.
3. Finish coat application.
4. Upon completion of work under this contract, all surfaces within the contract limits and within vision, shall have a painters finish on the interior and exterior except excluded items defined herein. Include all roof mounted mechanical and electrical equipment which do not have factory finish. The surfaces to be painted include, but are not limited to the following:

   a. Interior Gypsum Board
   b. Interior painted Concrete Masonry Units
   c. Interior clear Concrete Masonry Units
   d. Interior and Exterior Hollow Metal Doors and Frames
   e. Interior Architectural Woodwork
   f. Wood Handrail at Decorative Metal Railing
   g. Steel fence and gates
   h. Exterior Metals
   i. Water Repellent for Exterior Concrete Masonry Units

C. Related Sections:

1. Division 05 Sections for shop priming of metal substrates with primers specified in Division 05.

D. Work not included:

1. Surfaces not to be painted:

   a. Prefinished wall, ceiling and floor coverings.
   b. Items with factory-applied final finish.
   c. Concealed ducts, pipes and conduit.
   d. Glass, plastic laminate, ceramic tile, anodized aluminum.
   e. Steel items embedded in concrete.
   f. Surfaces specifically scheduled or noted on the drawings not be painted.
   g. Fire-rated labels on doors or frames.
   h. Exterior Plaster
   i. Pre-Finished Interior Wood Doors

1.02 REFERENCES

A. AQMD – Air Quality Management District, Local Regulations.

B. ASTM D4442 – Direct Moisture Content Measurement of Wood and Wood-Base Materials.

C. ASTM D4444 – Use and Calibration of Hand-Held Moisture Meters.

D. MPI – Master Painters Institute

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit samples on rigid backing, 8-1/2" x 11".
2. Step coats on samples to show each coat required for system.
3. Label each coat of each sample.
4. Label each sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on drawings and in schedules.
2. Printout of current "MPI Approved Product List" for each product category specified in Part 2, with the proposed product highlighted.

E. LEED Submittal:

1. Product Data for Credit MR 4 and MR 5: For products having recycled content and/or regional materials content, submit recycled content and regional materials documentation for each such product provided under work of this Section.
2. Product Data for Credit EQ 4.2: For paints and coatings, certify each interior field-applied paint and coating product meets the VOC requirements.

a. Include manufacturer's product data sheet and Material Safety Data Sheet (MSDS) highlighting VOC content for each product.

1.04 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of floor selections will be based on benchmark samples.

    a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

C. Regulatory Requirements: Materials shall comply with the current rules and regulations of the local air quality management district, with the rules regarding volatile organic compounds, and with FDA rules and regulations for dangerous materials in paint. Comply with governmental and local regulations for field applied products.

D. Coats: The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number of coats, apply such additional coats as are necessary to produce the required finish, at no additional cost to the Owner.

E. Employ coats and undercoats for types of finishes in accordance with the recommendations of the paint manufacturer whose products are used.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in unopened containers bearing manufacturer's name and product descriptions corresponding to designation on material list.

B. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area unless permitted otherwise by manufacturer's instructions.

C. Protection: Protect floors and adjacent surfaces from paint smears, spatters, and droppings. Cover fixtures not to be painted. Mask off areas where necessary. Exercise care to prevent paint from contacting surfaces not to be painted. During painting of exterior work, cover windows, doors, concrete, and other surfaces not to be painted.

1.06 PROJECT REQUIREMENTS

A. Environmental Requirements:

1. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes, unless permitted otherwise by manufacturer's instructions.
2. Do not apply exterior coatings during rain, or when relative humidity is above 50 percent, unless permitted otherwise by manufacturer's instructions.
3. Minimum application temperatures for Latex paints: 45 degrees F for interiors; 50 degrees F for exterior; unless permitted otherwise by manufacturer's instructions.
4. Minimum application temperature for Varnish and transparent finishes: 65 degrees F for interior or exterior, unless permitted otherwise by manufacturer's instructions.
5. Provide lighting level sufficient to conduct painting operations.

B. Hardware: Remove hardware before painting is started and replace only when paint finishes are thoroughly dry.

1.07 EXTRA STOCK

A. Provide a one gallon container of each color, type and gloss of paint used in the work.

B. Label each container with color, texture and room locations in addition to the manufacturer's label.

1.08 WARRANTY

A. Guarantee the painting work against peeling, fading, cracking, blistering or crazing for a period of two years from the Date of Substantial Completion.

B. Water Repellent: Provide 10 year warranty. A site visit shall be conducted by an agent of RAINGUARD and warranty application shall be completed by applicator.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manufacturers:

1. Products of the following manufacturer or supplier form the basis for design and quality intended.

a. ICI Paints, North America, Los Angeles, CA.

2. Equal products of the following may be submitted for approval:

a. Dunn-Edwards Corporation, Los Angeles, CA.
b. Frazee Paint and Wallcovering, Inc., City of Commerce, CA.
c. Sherwin Williams Paint Co.
d. Vista Paint

3. Or approved equal.
4. The Construction Specification Institure (CSI) shall be used to cross reference paint products from different manufacturers.

B. Materials:

1. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and iniformly dispersed to a homogeneous coating.
2. Colors and Glosses: The Architect will select color and hue to be used in the various types of paint specified and will be the sole judge of acceptability of the various glosses obtained from the materials proposed to be used in the work.
3. Undercoats and Thinners: Provide undercoat paint produced by the same naufacturer as the finish coat. Use only the thinners recommended by the paint manufacturer and use only to the recommended limits. Insofar as practicable, use undercoat, finish coat and thinner material as parts of a unified system of paint finish.
4. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.
5. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified of commercial quality.

C. Application Equipment:

1. For application of the approved paint, use only such equipment as is recommended by the manufacturer.

2. Compatibility: Prior to actual use of application equipment, use all means necessary to verify that the proposed equipment is actually compatible with the material to be applied and that the integrity of the finish will not be jeopardized by use of the proposed application equipment.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Measure moisture content of new surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.
2. Masonry, Concrete and Concrete Unit Masonry: 12 percent.
3. Interior Located Wood: 15 percent, measured in accordance with ASTM D4442 and ASTM D4444.
4. Exterior Located Wood: 19 percent, measured in accordance with ASTM D4442 and ASTM D4444.

D. Beginning of installation means acceptance of existing surfaces.

3.02 MATERIALS PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Store materials not in actual use in tightly covered containers.

C. Maintain containers used in storage, mixing and application of paint in a clean condition, free from foreign materials and residue.

D. Stir all materials before application to produce a mixture of uniform density and as required during the application of materials. Do not stir into the material any film which may form on the surface. Remove the film and strain the material before using.

3.03 PREPARATION

A. Remove plates, machined surfaces, and similar items already in place 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.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulates.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

C. 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.

D. Concrete Masonry Substrates: Remove 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.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. 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.

G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.04 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.05 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish. Number of coats specified is a minimum. Additional coats shall be applied at no extra cost, if coatings show evidence of uneven application, uneven pigmentation, brush strokes or otherwise unsatisfactory distribution of material.

D. Under coats shall be lighter and brighter in tint than finish coat.

E. Sand lightly between coats to achieve required finish.

F. Allow applied coat to dry before next coat is applied.

G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

H. Prime back surfaces of interior and exterior woodwork with primer paint.

I. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

J. Seal tops, bottoms and cutouts for hardware and accessories of wood or plastic laminate covered doors.

K. Split paint door frames to match color of walls on each side of opening.
L. The number of coats of each product specified in the finish schedule is the minimum required. Contractor shall provide additional coats as required to produce proper finish.

3.06 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

D. Replace identification markings on mechanical or electrical equipment when painted accidentally.

E. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers and grilles to match face panels.

F. Paint exposed conduit and electrical equipment occurring in finished area.

G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

H. Color code equipment, piping, conduit and exposed ductwork in accordance with requirements indicated. Color band and identify with flow arrows names and numbering, using stencils or other approved systems.

I. Replace electrical plates, hardware, light fixture trim and fittings removed prior to finishing.

3.07 FINISHING HOLLOW METAL DOORS AND FRAMES

A. Paint for hollow metal doors and window frames shall be applied with mechanical sprayer.

B. Paint shall be installed prior to installing finish hardware or hardware shall be installed, removed for painting and reinstalled after painting is complete.

3.08 WATER REPELLANT

A. Install exterior and interior water repellent as per manufacturer’s recommendations for a 10 year warranty.

3.09 PLANETARIUM DOME

A. All surfaces behind the planetarium dome shall be painted flat black.

3.10 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. 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.

3.11 CLEANING AND PROTECTION

A. At end of each work day, remove rubbish, empty cans, rags, and other discarded materials from project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage 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. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.12 PAINT FINISH SCHEDULE

INTERIOR SURFACE	COAT	PRODUCT
Metal Doors and Frames	1	SW Urethane ProCryl B66-310
	2 and 3	SW Acrolon 100 Water Based Urethane Gloss B65 Series
Gypsum Board	1	SW Promar 200 Zero VOC Primer B28W2600
	2 and 3	SW Promar 200 Zero VOC Egg-Shell B20-2600

EXTERIOR SURFACE	COAT	PRODUCT
Metal Doors and Frames	1	SW Urethane ProCryl B66-310
	2 and 3	SW Acrolon 100 Water Based Urethane Gloss B65 Series
Galvanized Metal	1	SW GLL Clean n Etch
	1	SW Procryl B66-310
	2 and 3	SW Shercryl HPA Semigloss B66-350
Existing Plaster	1	SW Loxon Primer A24W8300
	2 and 3	SW A 100 Exterior Latex Satin, A82 Series

END OF SECTION 09 91 00

SECTION 10 14 00 SIGNS

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, and Division 01 apply to this section.

B. Scope of work: The work under this section includes furnishing all labor, materials, and equipment and performing all operations in connection with Signage, as indicated on the drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following:

1. Room indentification signs.
2. Restroom signs
3. Occupancy signs
4. Accessibility signs

1.02 REFERENCES

A. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

B. ASTM A500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

C. FED-STD-595 – Colors used in Government Procurement.

D. ASTM D4802 – Poly (Methyl Methacrylate) Acrylic Plastic Sheet.

E. Chapters 10, 11B and 30 of California Building Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 01 33 00, Submittal Procedures.

B. Submit shop drawings listing sign styles, lettering and locations and overall dimensions of each sign.

C. Submit samples illustrating full size sample sign of each type, style and color specified.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. All Signage shall conform to CBC Section 1007.9 and 11B-703.
2. Tactile exit signage shall be provided per CBC 1011.3.
3. Raised characters shall comply with CBC Section 11B-703.2

a. Depth: It shall be 1/32 inch minimum above their background.
b. Tactile Character type. Tactile characters on signs shall be sans serif uppercase characters and be duplicated in Contracted (Grade 2) Braille.
c. Tactile Character size. Raised characters shall be a minimum of 5/8 inch and a maximum of 2 inches high based on the letter “I”. CBC Section 11B-703.2.5.
d. Finish and contrast: Contrast between characters, symbols and their backgounds 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. CBC Section 11B-703.5.1.

e. Proportions: Raised characters on signs shall shall be selected from fonts where the width of the uppercase letter “O” is 60% minimum and 110% maximum of the height of the uppercase letter “I”. Stroke thickness of the uppercase letter “I” shall be 15% maximum of the height of the character. CBC 11B-703.4 and 11B-703.6
f. Character Spacing: Spacing between individual tactile characters shall compy with CBC Section 11B-703.2.7 and 11B-703.2.8
g. Braille: It shall be contracted (Grade 2) and shall comply with CBC Section 11B703.3 and 11B-703.4. Braille dots shall have adomed and rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.

4. Mounting height: A tactile sign shall be located 48” minimum to the baseline of the lowest Braille cells and 60” maximum to the baseline of the highest line of raised characters above the finish floor or ground surface.
5. Mounting location: A tactile sign shall be located on the approach side, as one enters or exits rooms or spaces, and be reached within 0” of the required clear floor space per CBC Section and Figure 11B-703.4.2 as follows

    a. a clear floor space of 18”x18” minimum, centered on the tactile characters, shall be provided beyond the arc of any door swings between the closed position and 45 degree open position.
    b. On the wall at the latch side of a single door.
    c. On the inactive leaf of a double door with one active leaf.
    d. On the nearest adjacnet wall where ther is no wall space at the latch side of a single door or no space at the right side of a double door with two active leafs.

6. Visual characters shall comply with CBC Section 11B-703.5 and shall be 40” minimum above finish floor or ground.
7. Pictograms shall compy with CBC Section 11B-703.6
8. Symbol of accessibility shall comply with CBC Section 11B-703.7

PART 2 - PRODUCTS

2.01 GENERAL

A. Room Identification Signage: Provide room identification signs where indicated. Install on wall adjacent to door latch, on latch side, 60 inches above finished floor to bottom of tactile lettering.

1. Materials: Laminated acrylic Plastice Sheet, ASTM D4802, ¼ inch thick

    a. Upper Layer: Non-glare clear acrylic, 1/8 inch thick.
    b. Lower Layer: Opaque acrylic, 1/8 inch thick.

2. Fasteners: stainless steel mechanical mounting, vandal / tamper resistant.
3. Color: As selected by Architect
4. Lettering Type Style: Helvetica Medium, caps only

B. Restroom Signage: Doorways leading to restrooms shall be identified with sign as detailed on drawings.

1. Materials: Laminated acrylic Plastice Sheet, ASTM D4802.
2. Male Restroom Signage: As per detail on drawings.
3. Female Restroom Signage: As per detail on drawings.

4. Unisex Restroom Signage: As per detail on drawings.
5. Fasteners: stainless steel mechanical mounting, vandal / tamper resistant.
6. Color: As selected by Architect.
7. Lettering Type Style: sans serif, caps only.

C. Occupant Load Sign: Provide maximum occupancy load signs where indicated.

1. Materials: Laminated acrylic Plastice Sheet, ASTM D4802, clear ¼ inch thick.

a. Upper Layer: Non-glare clear acrylic, 1/8 inch thick.
b. Lower Layer: Opaque acrylic, 1/8 inch thick.

2. Fasteners: stainless steel mechanical mounting, vandal / tamper resistant.
3. Color: As selected by Architect.
4. Lettering Type Style: Helvetica Medium.
5. Obtain occupant load number from Architect.

D. Accessibility Sign: Provide at each accessible building entrance.

1. Sign shall be visible to persons along approaching pedestrian ways. Provide additional directional signs as indicated on drawings.
2. Fasteners: stainless steel mechanical mounting, vandal / tamper resistant.

E. Parking Area Signs:

1. Materials:

a. Post mounted and wall mounted signs shall be fabricated from 16 guage enameling iron with porcelain enamel finish.
b. Mount signs to post with minimum two 3/16 inch diameter round head bolts with tamperproof nuts, galvanized.
c. Posts: 2” diameter galvanized steel pipe weighing a minimum of 3.65 lbs per foot and conforming to ASTM A53, Schedule or 2 inch x 2 inch galvanized steel tubing, weighing a minimum of 4.32 lbs per foot and conforming to ASTM A500, Grade B, 3/16 inch wall thickness.

2. Traffic Entry Warning Signs: As per drawings.
3. Parking Stall Signs: As per drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

A. Locate signs where indicated, using mounting methods specified. Install level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

1. Post mounted signs: Set post in concrete base minimum 12 inch diameter and 18 inches deep. Signs set in paving shall be mounted in core drilled holes minimum 8 inch diameter and 18 inches deep with top of concrete fill flush to paving.
2. Wall mounted signs shall be installed after painting of wall surface.

3.03 CLEANING

A. After installation, clean soiled surfaces. Protect units from damage until acceptance by the Owner.

END OF SECTION 10 14 00

SECTION 13 12 50 – PRE-ENGINEERED METAL BUILDING SYSTEMS

1.1 GENERAL

Scope: These specifications cover the material and the fabrication of proposed metal building.. These specifications are an outline of performance to insure that the contractor understands the basis for design, manufacture and application of the manufacturer's metal building system.

A. Building Description: Rigid frame, clear span, continuous frame building with a standard roof slope of 1:12 consisting of tapered columns and rafters. Continuous sidewall girts by-pass the columns. Simple Span endwall girts flush in the column line.

B. Design: Contractor shall meet the minimum design requirements of the drawings and specifications. Contractor shall be responsible to design and coordinate all details and provide all materials and accessories for a complete finished project. Contractor design shall include, but not limited to the following items.

1. Metal building system.
2. Bracing of all interior walls, mechanical equipment and accessories.

C. Drawings and Certifications: As follows:

1. Drawings: Manufacturer shall furnish complete erection drawings for the proper identification and assembly of all building components. These drawings will show anchor bolt settings, transverse cross-sections, sidewall, endwall and roof framing, flashing and sheeting, and accessory installation details.

2. Certifications: Standard drawings and design analysis shall bear the seal of a registered professional engineer licensed in the State of California. Design analysis shall be furnished by manufacturer for Architect review.

3. Contractor shall furnish drawings and details for submittal and approval by the City of El Centro Building Department. Drawings and details required shall include, but not limited to following:

a. Metal building system.
b. Concrete foundation
c. Bracing of all interior walls, mechanical equipment and accessories.

D. Structural Steel Design: As follows:

1. Provide complete design including structural drawings and calculations stamped by licensed engineer as required to secure a building permit.

2. General: The building manufacturer shall use standards, specifications, recommendations, findings and/or interpretations of professionally recognized groups such as AISC, AISI, AAMA, AWS, ASTM, MBMA, Federal Specifications. Structural mill sections or welded up plate sections will generally be designed in accordance with AISC's "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings". Cold-formed steel structural members will general be designed in accordance with AISI's "Specification for the Design of Cold-formed Steel Structural Members".

3. Design Loads: Design loads shall be as specified on Drawings. Design loads shall include dead load, roof live loads, wind loads, seismic loads, collateral loads, auxiliary equipment loads, and /or other applied or specified loads.

1.2 PRODUCTS

A. Primary Framing Steel: Steel for hot rolled shaped shall conform to the requirements of ASTM Specifications A-36, with minimum yield of 50 psi. Steel for built-up sections shall generally conform to the physical requirements of ASTM D570, ASTM 572 or ASTM A36 as applicable, with minimum yield of 55,000 psi. Steel for endwall 'C" sections shall generally conform to the physical requirements of Republic Steel's P-55 or equivalent, and have a minimum yield of 55,000 psi.

B. Secondary Framing Steel: Steel used to form purlins, girts, eave struts and "C" sections shall be Republic steel P-55 or equivalent, comparable to the requirements of ASTM A607 Grade 55. Minimum yield shall be 55,000 psi.

C. Roof and Wall Panel Material: As follows:

1. Roof panel material as specified shall be 26 gauge galvanized steel, coating designation G-90, or galvalume as manufactured by Bethleham Steel Corporation , or equal, conforming to the requirements of ASTM A446 Grade E or Grade D. Minimum yield stress shall be 80,000 psi for Grade E and 50,000 psi for Grade D. Factory applied primer/paint.

2. Wall panel material as specified shall be 26 gauge galvanized steel, coating designation G-90 or galvalume, conforming to the requirements of ASTM A446 Grade D or Grade E. Minimum yield stress shall be 50,000 psi. Factor applied primer and paint.

D. Structural Framing:

1. General: All framing members shall be shop fabricated for field bolted assembly. The surfaces of the bolted connections shall be smooth and free from burrs or distortions.

2. Primary Framing:
   a. Rigid Frame: All rigid frames shall be welded, built-up "I" sections. The columns and the rafters may be either uniform depth or tapered. Flanges shall be connected to webs by means of a continuous fillet weld on one side.
   b. Endwall Frames: All endwall roof beams and endwall columns shall be cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.
   c. Plates, Stiffeners, etc.: All base plates, splice plates, cap plates, and stiffeners shall be factory welded into place on the structural members.
   d. Bolt holes, etc.: All base plates, splice and flanges shall be shop fabricated to include bolt connection holes. Webs shall be shop fabricated to include bracing holes. Connections for secondary structural (Purlins and girts) shall be by means of welded clips.

3. Secondary Framing:
   a. Purlins and Girts: Purlins and girts shall be Cold-formed "Z" sections with stiffened flanges. They shall be prepunched at the factory to provide for field bolting to the rigid frames. They shall be simple or

continuous span as required by design. Connection bolts will install through the webs, not flanges.

b. Eave Struts: Eave struts shall be unequal flange cold-formed "C" sections.

c. Base Angle: A base member will be supplied by which the base of the wall covering may be attached to the perimeter of the slab. This member shall be secured to the concrete slab with ram-sets, expansion bolts, or equivalent anchors as shown on the drawings.

4. Bracing:

a. Diagonal Bracing: Diagonal bracing in the roof and sidewalls shall be used to remove longitudinal loads (wind, crane, etc.) from the structure. This bracing will be furnished to length and equipped with bevel washers and nuts at each end. It may consist of rods threaded each end or galvanized cable with suitable threaded end anchors. If load requirements so dictate, bracing may be of structural angle and/or pipe, bolted in place.

b. Flange Braces: The compression flange of all primary framing shall be braced laterally wit angles connecting to the webs of purlins or girts so that the flange compressive stress is within allowable limits for any combination of loadings.

E. Miscellaneous Material Specifications:

1. Sealants and Closures:

a. Closure Strips: The corrugations of the roof and wall panels shall be filled with solid or closed-cell, preformed rubber, neoprene or polyethylene closures along the eave, ridge and rake when required for weather tightness.

b. Sealants: Roof panels shall be sealed as indicated on the Erection Drawings with 3/22" X 3/8" wide tape sealer. The material shall be a Butyl base elastic compound with a minimum solid content of 99%, Shnee-Moorehead # 5525 or equal.

c. Caulk: All gutter and downspout joints, rake flashing laps, ridge flashing laps, doors, windows, and louvers shall be sealed with white or burnished slate pigmented caulk or butyl rubber base.

2. Gutter, Flashing, and Downspouts:

a. Gutters and Flashing: All standard exterior gutters are 26 gauge galvanized or galvalume steel, with painted finished in white or burnished slate. Standard rake "custom" flashing in white or burnished slate. In no case shall flashing be less than 26 gauge galvanized steel.

b. Downspouts: All downspouts shall be 26 gauge galvanized steel with color coordinated finish, rectangular in shape.

F. Painting

1. Structural Painting: All uncoated structural steel shall be 1 mil. thick, factory primed with red oxide primer.

2. Painted Steel Panels: Base metal shall be 26 or 24 gauge galvanized or galvalume steel.

a. Prime Coat: The base metal shall be pre-treated and then primed with an epoxy type primer for superior adhesion and superior resistance to corrosion, 0.20 – 0.25 mil. thickness

b. Top Coat: Top coat paint shall be epoxy type finish, resistance to ultraviolet rays, peeling, chalking, and fading, 0.70 – 0.90 mil. thickness.
c. Painted Panel Warranty: Vertical panels for 10 years. Horizontal panels for 5 years.
d. Interior Finish: The interior finish shall have a white or parchment top coat over epoxy primer or an epoxy base coat, white or parchment, with a clear polyester top coat.

G. Accessories:

1. Windows: as per window schedule

2. Personnel Doors: as per door schedule

3. Overhead Doors: Overhead door shall be manufactured by PORVENE DOORS. Therm-master 415 Series. . Doors shall be provided with the following accessories:
a. Insulation: ¾" tufcote polyether urethane foam with a 2.5 mil SBR adhesive with a 5 mil carrier. Overall efficiency rating of R=3.00, (U=0.333).
b. Flat slats.
c. Equipped for future Electric Operator,

4. Ventilators/Wind Turbines: Provide 16" diameter sealed ball bearing shaft, aluminum, galvanized steel, or factory primed/painted. Provide roof mounting device compatible with roof panel design.

5. Insulation: Fiberglass blanket insulation shall have a density of 0.6 pcc and shall be 4" thickness. Fiberglass insulation facings shall be laminated on one side with PFK – 10 reinforced Kraft face. Install with tight joints, wrinkle free, continuous full length or height.

1.3 EXECUTION

A. Erection and Installation: The erection of the metal building and the installation of accessories shall be performed in accordance with erection drawings by a qualified erector using proper tools and equipment. In addition, erection practices shall conform to Section 5, MBMA "Code of Standard Practices". There shall be no field modifications to primary structural members except as authorized and specified by the manufacturer.

B. Building Anchorage and Foundations: The building anchor bolts shall be designed to resist the maximum column reactions resulting form the specified combinations of loading. These designs and sizes shall be specified by the manufacturer. Foundations shall be adequately designed by a qualified foundation engineer to support the building reactions and other loads which may be imposed by the building use. The design shall be based on the specific soil conditions of the building site.

C. Installation of Porvene doors shall be by Porvene Doors authorized representative according to Porvene Doors standards and instructions.

END OF SECTION 13125

SECTION 22 00 00 PLUMBING

PART 1 – GENERAL

1.01 SUMMARY

A. The drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, shall govern the work in this section the same as though written herein in full. It is the intent to provide a complete, tested, and operating plumbing system.

B. Scope of Work: The work to be done under this heading shall include furnishing all labor, materials, fixtures and services together with the demolition, installation, testing and adjusting necessary to the acceptable completion of all the plumbing work shown on the drawings or as herein specified.

C. Description Of Work

1. The following list is intended to generally describe the various plumbing systems to be installed, but shall not be considered as a limit of the work to be performed under this section of the specifications:

a. Connection to site water, sewer piping systems as shown including sawcutting and haul-away.
b. Sanitary soil, waste and vent systems.
c. Domestic hot and cold water systems.
d. Air conditioning condensate drain systems.
e. Plumbing fixtures and equipment.
f. Rough-in and final connections for all fixtures and equipment.
g. Insulation.
h. Sterilization and tests of domestic water systems.
i. Trenching and Backfill per Section 31 23 33.

D. Related Work not in this Section

1. The following work will not be furnished under this section of the Specifications, but will be included in other specification sections:

a. All line voltage wiring (regardless of voltage) and all miscellaneous wiring devices and all connections thereto and all line and low voltage conduit. All electrical disconnects and starters not integral to equipment scheduled and / or specified. All timeclocks and miscellaneous “on-off” control devices.
b. Final painting.
c. Joint sealants.

1.02 SUBMITTALS

A. The Plumbing Contractor shall provide submittal data for all fixtures and material being furnished by him to the Architect for approval. Submit the following according to the Conditions of the Contract and Division 1 Specifications Sections: 01 33 00.

1. Product data for:

a. Plumbing fixtures including floor drains, floor sinks
b. Water heaters
c. Pumps

d. Pipe, fittings, valves, specialties
e. Insulation

2. Pipe penetrations:

a. Fire proofing material and sleeves

B. Each submittal brochure shall contain all of the items listed above and shall be bound with covers, indexed with tabs and have a table of contents. Submittals shall indicate make, specific model and size, accessories, dimensional drawings, diagrams and other pertinent information. Submit all items at one time. Partial submittals are not acceptable. Substitutions of materials and fixtures from that specified herein, noted on the drawings or as outlined in the General or Supplementary Conditions shall be clearly identified as substitutes. Deviation data to clearly demonstrate equivalency and comparisons between specified items and proposed substitutions shall be provided by the Plumbing Contractor unless prior arrangements are made to compensate the Architect for researching this data. "Equivalent" submittals lacking this information will be returned "not reviewed". Approval of substitutions shall in no way relieve the Plumbing Contractor from the responsibility of complying with the plans and specifications and installation in the space available.

C. The following submittals for closing out the job shall be a prerequisite to the issuance of Final Certificate of Payment.

1. Certificates of water quality
2. Reproducible "As-built" (record) drawings
3. Approved inspection reports
4. Guarantee

1.03 QUALITY ASSURANCE

A. Work of the contract shall satisfy the requirements of:

1. IAPMO, ASME, ANSI, ASTM, CISPI standards for base materials.
2. N.F.P.A.- 13
3. American Gas Association (A.G.A.)
4. 2016 California Building Code (CBC) Title 24, Part 2, CCR
5. 2016 California Electric Code (CEC) Title 24, Part 3, CCR
6. 2016 California Mechanical Code (CMC) Title 24, Part 4, CCR
7. 2016 California Plumbing Code (CPC) Title 24, Part 5, CCR
8. SMACNA Seismic Restraint Manual, latest edition.

B. All brazers and welders shall be qualified with the brazing and welding procedures set forth in ASME Boiler and Pressure Vessel Code – current edition. If the work of any welder or brazer creates a reasonable doubt as to his skill, the Architect/Engineer may require the welder to be requalified.

C. Provide manufacturer's certificate that materials and fixtures meet or exceed minimum requirements as specified.

D. Where these drawings and specifications call for or describe materials or construction of a better quality or larger sizes than required by all laws, codes ordinances, regulations and orders of any public authority bearing on the performance of the work, the drawings and specifications shall take precedence.

E. Testing and Inspections: Contractor shall arrange for inspections required by authority having jurisdiction and deliver any certificates of such inspections to the Owner. Owner shall pay for all inspections required.

F. Permits: Owner shall apply and pay for all permits required by any public authority having jurisdiction.

1.04 PRODUCT AND FIXTURE DELIVERY, STORAGE AND HANDLING

A. Exercise care in transporting and handling to avoid damage to and contamination of materials and fixtures.

B. Materials and fixtures kept at the job site shall be stored in enclosures or under protective covering. Material and fixtures shall be stored above grade in manufacturer's original, unopened protective packaging and kept as clean and dry as possible.

C. Damage to materials and/or fixtures due to negligence in handling, storage or delivery shall be cause to reject and replace all such damaged material and/or fixtures at the Contractor's own expense with no additional cost to the Project.

1.05 PROJECT CONDITIONS, SUPERVISION AND WORKMANSHIP

A. The Plumbing Contractor shall examine the complete project drawings and make a preliminary examination of the site. The Plumbing Contractor shall also examine in advance methods for installation, means to be provided for getting fixtures and equipment into place, routing of piping and any other requirements of the work. This shall include verification that all systems and all fixtures will fit spaces allotted. Work shall be installed so that indicated ceiling heights are maintained, with no portion of the work requiring excessive furring.

B. The Plumbing Contractor must consider and include any additional cost involved in verifying and coordinating the work with existing conditions and points of connection. If situations arise where the work cannot be installed as intended, the Owner's representative must be informed to assist in resolving the problem.

C. Fixtures shall be located within rooms as indicated on Architectural and Plumbing drawings. In the event these drawings do not indicate locations by exact dimension, such locations shall be obtained from the Architect prior to installation. Should the Plumbing Contractor elect to install such fixtures without prior instruction, he shall be subject to removal and reinstallation of such fixtures at the discretion of the Architect without additional cost to the project.

D. The Plumbing Contractor shall provide all the rigging, scaffolding, tools, tackle, hoist, personnel safety equipment, labor, etc., necessary to complete the installation of fixtures and materials in accordance with the intent of this specification.

E. The Plumbing Contractor must coordinate all areas of the work required with the Owner's Representative as they relate to material, storage, trash removal, hours of work, job site office, telephone, sanitary facilities, electrical power, drinking water, hoisting, temporary barriers, safety measures, etc., including cost of such items.

F. The Plumbing Contractor is responsible to coordinate demolition and reconstruction (cutting and patching) of walls, floors, and ceilings required for the performance of the work of this Section of the Contract. Other appropriate Contractor is responsible for the actual demolition and reconstruction of walls, floors and ceilings. The Plumbing Contractor is responsible for demolition and reconstruction of existing hardscape as required for performance of work under this Section of the Contract.

G. The Plumbing Contractor shall have a competent Job Superintendent and/or Foreman on site or available at all times by phone ("pager") during project progress with authority to act on the Contractor's behalf and to supervise the installation of the work under this section. Superintendent

shall also be responsible in conferring with other trades as to the proper execution and conduct of the work under this section so that work may be carried on as rapidly as possible and still maintain coordination with the other trades in progress at the same time.

H. All workmanship shall be first class in every respect and shall be performed only by skilled mechanics recognized as such in each of their respective trades.

1.06 DRAWINGS AND SPECIFICATIONS

A. Drawing and specifications are intended to complement each other and are required to be taken together to provide all associated items of work, materials and equipment necessary for a complete installation.

B. A set of plumbing drawings will accompany these specifications showing the arrangements and sizes of piping systems and principal connections to the plumbing fixtures. Drawings and specifications are intended to complement each other to the extent that all associated items of work and materials necessary to the completion of the installation of the systems shall be provided whether or not mentioned in the specifications or shown on the drawings.

C. Discrepancies between Architectual and Plumbing drawings: the drawings showing the greater number of fixtures shall govern. Where fixtures are indicated on the Architectual plan, but not similarly shown on the Plumbing drawings and where such items are covered by specifications, all such items together with the necessary appurtenances and services shall be provided. Discrepancies as described above are inadvertent and it shall be the Plumbing Contractor's responsibility to comply with the intent of this paragraph and the Contract.

D. Plumbing work, as laid out, is to some extent, diagrammatic and locations thereon are drawn to scale where possible. It is not the intention of the drawings to show all the offsets, fittings, and accessories. Locations indicated shall be adhered to as closely as possible; reasonable deviations therefrom shall be made at no additional expense.

1.07 AS-BUILT DRAWINGS

A. On a set of contract drawings kept at the site during construction, the Plumbing Contractor shall mark all work as it is completed with sufficient dimensions including depths of below floor or finish grade to locate all work installed. Mark all work inside, outside and beneath the building.

B. The marked drawing shall be kept current as the work progresses and shall be available for inspection upon request. At the close of construction The Plumbing Contractor shall transfer all markings to a set of reproducibles and deliver these drawings to the Architect.

C. The correct and completed "As-Built" drawings are a pre-requisite to final contract payment in conformance with Paragraph 1.6.C.

1.08 GUARANTEE

A. All work shall be guaranteed for a minimum period of one year from either the official date of completion or from the official date of acceptance by the Owner whichever is the later date.

B. Certain items shall be guaranteed for a longer period, as stated in the specification for those items.

C. Should any trouble develop during this time due to defective material, faulty workmanship, or non-compliance with plans, specifications, codes, or written directions of the Owner, Architect, or Inspector the Plumbing Contractor shall furnish all necessary labor and materials to correct the trouble without additional charges.

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials shall be new, of commercial quality, and shall be standard current products of manufacturers regularly engaged in the production of plumbing products. Unless indicated otherwise, all fixtures, and equipment shall conform to the same requirements as “materials”. Use the same brand of manufacture for each class of fixtures, equipment, or material.

2.02 PIPING SYSTEMS MATERIALS

A. Soil, Waste and Vent Systems (above grade): ASTM A-74 cast iron soil pipe with “No-hub” fittings and joints. Alternate: Use DWV copper with solder joints for vertical vent piping. Alternate: Use DWV copper with solder joints for above grade waste in congested areas as required.

B. Soil, Waste and Vent Systems (interior, below grade): ASTM D2751 ABS pipe and solvent cement fittings.

C. Soil, Waste (exterior, below grade): ASTM D2751 ABS pipe and solvent cement fittings.

D. Domestic Water Systems (above grade and connections to existing below grade): ASTM B-88 Type L hard drawn copper tubing with wrot copper solder fittings. Solder with 95-5 tin-antimony or approved lead free solder.

E. Domestic Water System (exterior, below grade): Schedule 80 PVC Pipe with solvent cement fittings.

F. Domestic Water Systems (interior, below floor): ASTM B-88 Type L soft copper tubing with no joints below slab. Solder above grade connections to hard drawn tubing with 95-5 tin-antimony or approved lead free solder.

G. Air Conditioning Condensate Systems: ASTM B-88 Type M (insulated) hard drawn copper tubing with wrot or cast solder fittings. Solder with Harris “Stay-Safe 50”, or equivalent lead-free solder.

H. Indirect Drains: Type DWV copper tubing and fittings or Type M hard drawn copper tubing with wrot or cast solder fittings. Solder with Harris “Stay-Safe 50”, or equivalent lead-free solder. Insulate refrigerated drains.

I. Fuel Gas Systems (exterior, above grade): ASTM A-53, Schedule 40 galvanized steel pipe with malleable 150 lb. screwed fittings for up through 2” and butt welding fittings for 2-1/2 “ and larger.

J. Fuel Gas Systems (interior, above grade): ASTM A-53, Schedule 40 steel pipe with malleable 150 lb. screwed fittings for up through 2” and butt welding fittings for 2-1/2” and larger.

K. Fuel Gas Systems (exterior, below grade): SDR II polyethylene (PE) pipe with manufacturer’s recommended heat fusion fittings, approved PE-to-steel transition riser, tracer wire and warning tape.

2.03 VALVES AND SPECIALTIES

A. Domestic Water (shut-off): Stockham #255 Series (or equivalent by Apollo or Nibco) full port brass body ball valves, 600CWP/150SWP, solder or threaded ends.

B. Domestic Water (check): Stockham #309Y/319Y (or equivalent by Apollo or Nibco) swing type, bronze body, bronze disc.

C. Gas (2” and smaller): Crane #1228 (or equivalent by A.Y. McDonald) gas cock.

D. Gas (2-1/2” and larger): Rockwell Figure 142/143 plug valve.

E. Trap Primers: Precision Plumbing Products “Prime-Rite”, installed per manufacturer’s recommendations, or equivalent.

F. Water Hammer Arrestors: Precision Plumbing Products, or equivalent, P.D.I. sizing.

G. Access Panels: Milcor, or equivalent, minimum 10” x 10” size, stainless steel, key locks, vandal resistant.

H. Pressure Gauges: Weiss Instruments (or equivalent by Trerice), #TL25, 21/2” dial, utility gauge, 0-100 psig (0” – 30” for vacuum) range.

I. Thermometers: Weiss Instruments (or equivalent by Trerice) bimetal or industrial type with 0° to 160° range.

J. Dielectric Fittings: Victaulic “Clear Flow” dielectric waterway.

K. Floor Cleanouts (F.C.O.): J.R. Smith #4810 cover with U.P.C. bronze plug.

L. Wall Cleanouts (W.C.O.): Terri, prime-coated, with U.P.C. bronze plug in no-hub test tee.

M. Cleanout-to-Grade (C.O.T.G.at soil): Concrete yard box with C.I. lid marked “SEWER”.

N. Cleanout-to-Grade (C.O.T.G. at site concrete): Zurn #1400

O. Expansion Tanks (at water heaters): Amtrol Therm-X-Trol #ST series, sized as shown on drawings

2.04 HANGERS AND SUPPORTS

A. Provide hangers as specified herein, or equivalent galvanized or cadmium plated hangers by Elcen, Fee & Mason, or B-Line. Perforated strap is not approved for this project.

B. Adjustable Hangers: B-Line #B3690. Provide shields at insulated piping.

C. Trapeze Hangers: B-Line #B22 channel with pipe clamps and guides as required. Provide shields at insulated piping.

D. Riser Clamps: B-Line #B3373 (steel, C.I.), 3B3373 CTC (copper).

E. Offset Pipe Clamps: B-Line #B3148.

F. Water Pipe Isolators: Include felt lining at each hanger.

G. Hanger Rods: Galvanized, threaded, minimum 3/8” diameter.

H. Upper Attachments: Galvanized steel for type of surface involved and for supported load.

I. Seismic Restraints: B-Line OSHPD approved system or approved equivalent.

2.05 INSULATION

A. Hot Water Supply/Return and Chilled Drinking Water Supply: 1" thick preformed fiberglass pipe insulation with all service jacket (ASJ) and fitting covers.

B. Air Conditioning Condensate: 3/8" thick wall cellular plastic, Rubatex, Armaflex, or equivalent.

C. Refrigerated Indirect Drains: 3/8" thick wall cellular plastic, Rubatex, Armaflex, or equivalent.

D. Lavatory Traps and H.W. Supplies: Truebro #101 "Handi LAV-GUARD" insulation kit, or equivalent, grey color.

E. Insulation shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50.

2.06 PLUMBING FIXTURES

A. Fixtures shall be as scheduled on the drawings. Equivalent models by other manufacturers including Kohler or Eljer (for water closets, urinals and lavatories), Elkay (for stainless steel sinks), Oasis (for water fountains and remote chillers) and J.R. Smith, Wade or Josam (for drains) may be approved by the Architect.

B. Provide all necessary angle stops, risers, escutcheons, 17-guage CP traps, sealant, etc. as required for fixtures. All fixtures shall be white unless otherwise scheduled.

C. Accessibility Requirements:

1. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6
2. Heights and location of all accessible fixtures shall be mounted according to CBC Section 11B-602 through 11B-612.
3. Fixture controls shall comply with CBC Section 11B-601.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for children's water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.
4. Accessible sinks shall not exceed 6-1/2" in depth, Sinks shall be mounted with the front of the higher rim and counter surface 34" maximum above the finish floor or ground.
5. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.

PART 3 – EXECUTION

3.01 DEMOLITION

A. The Plumbing Contractor shall notify the Architect immediately upon encountering unknown existing utilities or piping arrangements that may require protection or relocation. Any discovery of this type shall require a decision from the Architect as to the final disposition of such a disclosure. Contractor shall not proceed in these areas until written approval has been given by the Architect or his representative.

3.02 EXCAVATING AND BACKFILLING

A. Provide all excavating, trenching, and backfilling required to install the work of this Section of the Contract. All excavating, backfilling and materials shall meet all requirements of Section 31 23 33 Trenching and Backfilling and as specified herein.

B. Excavate to dimensions and depths indicated or necessary for work to be installed. Cut a minimum of 6" below required grade and place a 6" compacted sand bed to provide uniform grade and bearing for piping throughout its entire length. Excavations that are carried to unnecessary depths shall be refilled to the proper level with sand fill and thoroughly compacted to the density specified in the above referenced section.

C. Shore and brace pipe trenches by members of suitable size and arrangement as required by OSHA and C.P.C. to provide against injurious caving and erosion during construction work, pipe laying and backfilling. Provide constant grade level watch personnel whenever workmen are in trenches over 5 feet in depth. Remove shoring, bracing and sheeting as excavation is backfilled. Provide suitable means to keep excavation free of water during all operations.

D. All piping shall have a 6-inch neutral sand base and covered with 6-inch of neutral sand to form an envelope around the pipe.

E. Backfill as rapidly as construction and testing will permit in a manner that will not disturb the pipe. Fill shall be placed by hand in 6-inch layers to a point 1-foot above top of pipe and shall be uniformly and thoroughly hand tamped. Backfill in well compacted 12-inch layers for the remaining portion of the work. All backfill shall be brought to grade and surplus dirt removed. All backfill shall be compacted as per drawings and specifications.

F. No excavation below level of , or adjacent to, foundation or footings shall be made except in manner approved by the Architect.

3.03 STRUCTURAL MEMBERS

A. There shall be NO cutting of building structural members without prior written approval from the Architect or his representative.

B. Where pipes are placed in partitions necessitating cutting of any non-structural member, metal ties shall be provided in accordance with applicable structural code.

3.04 INSTALLATION OF PIPING, FIXTURES AND EQUIPMENT

A. All piping shall be so routed and installed to clear beams, plates, footings and structural members. All piping shall be run in a neat and orderly fashion, generally level, free of traps or unnecessary bends and arranged to conform to building requirements.

B. No piping shall be run exposed unless specifically indicated. Piping inside the building shall be run in partitions, furred ceiling spaces, over ceilings or in roof structure.

C. Piping indicated to be exposed shall be parallel with or perpendicular to, as applicable, supporting wall, beam, or ceiling. Where various exposed runs of pipe are routed in the same general direction, such runs shall be routed and supported to form a pipe grouping.

D. All piping shall be so graded and valved as to provide for the complete drainage, control and service of the systems. No piping shall be installed so as to cause unusual noise with the flow of water therein under normal conditions.

E. Water Hammer Arrestors shall be installed as shown on drawings and at all quick close valves. Provide access panel large enough to remove water hammer arrestor.

F. Air conditioning condensate shall slope toward drain point at 1/8" per foot minimum, ¼" per foot where space permits.

G. Indirect drains from miscellaneous equipment shall slope toward drain point. Insulate all refrigerated drains with material as specified herein in Paragraph 2.05.

H. Provisions shall be made for expansion and contraction of all piping as required and necessary whether specifically shown or not. Expansion joints and the required guides thereto shall be so installed and located that the pipeline will be properly guided and anchored to force the joints to compensate for expansion and contraction.

I. Equipment, fixtures, piping and accessories shall be individually mounted and/or hung from the structure and shall not be supported from ductwork, other piping, conduit or equipment. Approved hangers, mounts and supports shall be provided as specified in Part 2 of this specification section. Piping shall be supported at intervals specified in Paragraph 3.05 to keep it in alignment, carry weight of pipe and contents and prevent sagging.

J. Plumber's tape or perforated metal strap are not acceptable for any type of hanger or support.

K. All equipment and fixtures, floor and wall mounted, shall be securely bolted or sealed to the structure to prevent movement during seismic disturbances.

L. Cast iron pipe shall be supported and anchored in accordance with Cast Iron Soil Pipe Institute, Cast Iron Soil Pipe and Fittings Handbook, Chapter 4; except that pipe hangers, clamps, rods, angle iron, concrete attachments shall be used; strap iron, wire staples, plumber's tape and wood are not acceptable.

M. Pipe hangers and supports for insulated piping shall be sized to permit installation of insulation to pass unrestricted through them. Insulation shall be protected by insulation shields of size and weight required by service.

N. Piping isolation: All uninsulated piping shall be provided with not less than ¼- inch of soft sound-deadening material at all points of suspension and supports. It is intended that bare piping shall also be isolated from the structure at all points of contact, in addition to suspension and support points specified.

O. Only self-drilling Phillips Drill Co. "Red Head" (ESR-3699) or Hilti "KB-TZ" (ESL-1067) anchors of type and proper size for service required shall be approved for use in concrete. No other type anchorage will be permitted unless approved by the Architect or his representative.

P. Approved friction type wrenches shall be used in making up joints on all brass pipe. Marked or crushed pipe caused by wrenches, vices or machine chucks will be replaced at no additional expense.

Q. Ends of all threaded pipe shall be reamed out smooth full size with long tapered reamer so as to be partially bell-mouthed and perfectly smooth. All threads of pipe shall be cut with new, clean dies, full thickness of die and so that no more than two threads are left exposed on pipe when joint is made up with approved pipe dope on male fitting only. Copper tubing shall be cut true and filed smooth and reamed to eliminate all burrs.

R. Piping shall be full lengths except at ends of runs where necessary to make a cut-to-fit. Reducing fittings shall be used where changes in pipe sizes occur. Reducing bushings will not be permitted.

S. Rough-in for and make final domestic water, distilled water, and drain connections and interconnections to Laboratory Fixtures and Laboratory Equipment including the installation of all loose controls furnished with equipment for remote installation, shut-off valves, floor drains and floor

sinks. Install exterior acid waste tank, vault and remote monitoring equipment as shown on the drawings and as per manufacturer's written installation instructions. Obtain detailed written manufacturers' written rough-in/final connection data for all Laboratory fixtures and Equipment prior to installation of piping services.

T. Where two or more fixtures are located in a row or battery, water supply header shall be continued full size extending past the last branch outlet.

U. Keep inside of piping dry and free of dirt, cutting burrs and other foreign substances.

V. Escutcheon plates shall be provided at all exposed piping passing through walls, floors or ceilings. Plates shall be solid or split ring type, chrome-plated.

W. All piping to be used in this project shall be thoroughly cleaned inside and out before installation. Piping shall be capped for storage. Plumbing fixtures shall have all labels and protective coverings removed and finally cleaned with a cleaning agent approved by the Architect or his representative.

X. Materials and equipment shall be provided with adequate protection when installed where damage may result by further construction, painting or plastering. If damage is incurred during construction, all damaged equipment shall be repainted, repaired or replaced as directed by the Architect.

Y. Floor cleanouts shall be brought up to finished floor level, where shown on the drawings.

Z. All vents shall be offset as necessary to miss beams and other structural members. No structural member shall be cut, bored or notched without specific written permission by the Architect. Vents shall be collected into single connections in attic spaces or walls where practicable so roof will be penetrated as few times as possible. Size all combined vents per CPC, Table 7-5

AA. Pipe, Valve and Equipment I.D.: Piping: Seton, or equivalent, pressure sensitive labels applied per ANSI A13.1-1981, with directional arrows. Apply labels at all valve locations in addition to ANSI requirements. Valves: Seton, or equivalent, 1" diameter brass valve tags with jack chain. Provide valve chart in Owner's Operation and Maintenance Manuals. Equipment: Bakelite nameplates, permanently attached to equipment, engraved with item designator, i.e., "WH-1", etc.

BB. Polyethylene (PE) gas piping, fittings, tracer wire and warning tape shall be installed in accordance with IAPMO IS-93.

CC. Polypropylene distilled water piping and socket fusion valves and fittings shall be installed only after receiving instruction in fusion connection techniques from Harrington Industrial Plastics, San Diego. Call for information at (858) 278-9311. Include this service as a part of the plumbing contract.

DD. Provide dielectric waterway fittings as specified herein wherever dissimilar metals are interconnected

3.05 PIPING HANGERS INSTALLATION

A. Unless shown otherwise on drawings, install hangers for horizontal runs of ferrous piping with the following maximum spacing:

1. Pipe up to and including 1 inch.....6 feet
2. Pipe 1-1/4 inches to 3 inches.....10 feet
3. Pipe 3-1/2 inches and 4 inches.....13 feet
4. Pipe 5 inches to 8 inches.....16 feet
5. Cast iron soil pipe.....4 feet

B. Note that hanger spacing is based on beam strength characteristics of pipe; provide closer spacing as required to interface with building structure.

C. Unless shown otherwise on drawings, install hangers for horizontal runs of copper piping with the following maximum spacing:

1. Pipe up to ½ inch in size.....5 feet
2. Pipe ¾ inch to 1-1/2 inches.....6 feet
3. Pipe 2 inches.....8 feet
4. Pipe 2-1/2 inches and larger.....10 feet

D. For all piping, install a hanger within 2 feet of each elbow or tee. Install additional supports for valves and strainers. Install not less than one hanger per length of cast iron pipe and as required by CPC. Support vertical risers by riser clamps as specified herein at each floor.

E. Galvanized hanger rod sizes shall meet requirements of the following schedule:

1. Pipe up to and including 2 inches.....3/8 inch rods
2. Pipe 2-1/2 inches to 3-1/2 inches.....1/2 inch rods
3. Pipe 4 inches and 5 inches.....5/8 inch rods
4. Pipe 6 inches and larger.....3/4 inch rods

3.06 PIPE SLEEVES AND FLASHINGS

A. Provide pipe sleeves made of No. 22 gauge galvanized steel, properly secured in place with approximately ¼ inch space between each sleeve and pipe surface and insulation passing through the sleeve for pipes which pass through concrete floors, roofs and masonry walls. Install pipe sleeves in place as walls and floors are built up. Provide sleeves for insertion into structural building parts. Make space between sleeves and pipes passing through concrete floors, exterior walls and roofs watertight and fire resistant with approved non-hardening mastic material. Sleeves through pipe chase floors shall project a minimum of 1 inch above floor and shall be galvanized steel. Use Link-Seal “Century-Line” thermoplastic sleeves or Schedule 40 galvanized steel for sleeves through foundation walls.

B. Restore fire rating of floors or walls at all pipe penetrations by packing with fire-safing, grouting, or other approved means.

C. Pipe Flashings: Semco or R.K. Industries, 4 pound lead, 8” skirt, with counter flashing sleeve at sanitary vents.

D. Provide dielectric waterway fittings as specified herein wherever dissimilar metals are interconnected.

3.07 TESTING

A. The type of test, the test pressure and the duration of each test for each of the piping system shall be made in accordance with the following:

B. Piping: Each piping system shall be tested as specified below in sections or upon completion of systems or both. However, piping shall not be concealed until it has been tested, inspected and approved. Test time will be accrued only while full test pressure is on system. Tightening of flange joints under pressure is permissible. It shall be the responsibility of Contractor to remove during test anything on system that will not withstand pipe test pressure called below and replace same on completion of testing. All equipment damage resulting from negligence is the responsibility of Contractor.

C. SPECIAL NOTE: Testing of systems covered by local, State or national codes shall be tested as herein noted or in accordance with the applicable codes, whichever is the most stringent.

System	Medium	Pressure	Duration	Tolerance
Soil, waste, Storm	Water	Top of highest Vent or (10') head of water	4-hours	No joint sweat
Domestic Water lines	Water	150 psi	4-hours	None, except temp. change
Natural Gas	Air	60 psig	1-hour	None, except temp. change

NOTE: Air for testing shall be oil-free.

3.08 INSULATION

A. All piping shall be pressure tested as in paragraph "Tests," thoroughly cleaned and approved before the application of any insulation.

B. Insulation adhesives shall have no flash point wet or dry.

C. Domestic hot water supply and return, chilled drinking water supply, air conditioning condensate drains, refrigerated equipment drains shall be insulated as specified herein installed in accordance with insulation manufacturers' recommendations.

3.09 VALVES AND SPECIALTIES

A. All valves and specialties throughout the plumbing systems shall be as specified in Paragraph 2.3 and installed in accordance with manufacturer's recommendations.

B. Valves shall be provided where shown on plans and as specified herein.

3.10 PLUMBING FIXTURES AND MISCELLANEOUS EQUIPMENT

A. All fixtures shall be anchored and set level with relation to walls and floor lines in a neat and workmanlike manner using equal spacing and neat grouping.

B. Fill all joints between plumbing fixtures and walls or floors or cabinets with Dow-Corning 780 Sealant or Sonolastic Sealant, color to match fixtures. Sealant shall be applied as recommended by the manufacturer, workmanship subject to approval of Architect or his representative.

C. Wall mounted fixtures shall be securely attached to 3/8-inch thick x 6-inch wide steel wall plate extending one stud beyond the fixture mounting points and bolted to each stud it passes with two 3/8-inch bolts or welded. Plates may be welded to steel studs. Drill and tap plate for installation of fixture. Lavatory arm carrier shall be bolted or welded to the 3/8 inch thick x 6 inch steelplate.

D. All fixtures shall be covered and protected until completion of the work. Fixtures shall be cleaned and all fittings shall be polished. Metal parts shall be polished chrome plated brass unless otherwise indicated. All exposed piping and fittings shall be polished chrome plated.

3.11 VIBRATION ISOLATION REQUIREMENTS FOR THE PLUMBING SYSTEM

A. General: There shall be absolutely no rigid contact between any domestic cold water line, hot water supply or return line, waste, vent or storm drain pipe within the occupied building area and the building structure (the building structure includes slabs, ceilings, studs, drywall, ductwork, conduit etc.) except as follows:

1. At the connection to the plumbing trim or fixtures.
2. Through an approved vibration isolator.

B. Seal all fixture water supply and drain pipe penetrations of finished walls with acoustical sealant.

3.12 STERILIZATION

A. The Plumbing Contractor shall provide feed and flush nipples near point of connection of new piping to building hot and cold water system to facilitate systems flushing and chlorinating.

B. Provide the services of a commercial disinfecting/chlorinating company to perform standard commercial water systems sterilization, Atlantis Chlor, Walsh Enterprises or equivalent.

C. Flush out all new water piping to thoroughly remove all dirt and debris.

D. Chlorinate all new water piping up to points of connection to existing building systems.

E. Flush solution with clear water and until residual chlorine levels are equal to level of incoming City water supply.

F. Obtain test samples of flushed out systems and test to verify that total plate count of bacteria/c.c. of sample is less than 100 or equal to the supply and for negative coliform organisms per ANSI/AWWA C651-92. Testing shall be performed by a State of California approved water testing laboratory.

G. Repeat the above procedure until results in paragraph F above are obtained.

H. Provide certificates of final satisfactory test results as part of close out requirements.

END OF SECTION 22 00 00

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SUMMARY

A. Scope Of Work: The work under this division includes furnishing all labor, material, and equipment necessary for the installation and placing into operation of the electrical systems as indicated on the drawings. The work includes, but is not necessarily limited to, furnishing and installing the following:

1. Complete power and lighting, distribution board, generator and all accessories, transformers, panels, switches, feeders, branch circuits, lighting fixtures, lamps, controls and accessories.
2. Motor and power wiring for all motor and/or equipment furnished under the contract. Except as otherwise specified to be furnished by or under other divisions of this specification, all wiring devices, conduit, feeders, and final connections to all equipment shall be furnished under this section.
3. Install electrical control wiring for all equipment, except as described in 1.24, "Mechanical/Electrical Coordination Requirements".
4. All equipment and materials specified in this division.
5. Empty conduit systems as indicated on the drawings.
6. All other items and/or work indicated on the drawings.
7. Extension of the existing power and communications systems.

B. This division of the specification outlines the provisions of the contract work to be performed under this division. This section applies to and forms a part of each section of specifications in Division 26 and all work performed under the electrical and communications contracts. In addition, work in this division is governed by the provisions of the bidding requirements, contract forms, general conditions, supplementary conditions, and all sections under general requirements.

C. 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.

D. Where the word '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.

E. 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.

1.02 DEFINITIONS

A. Concealed: Hidden from sight, as in trenches, chases, hollow construction, or above furred spaces, hung ceilings B 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.

B. 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'.

C. Finish Space: Any space ordinarily visible, including exterior areas.

1.03 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings and all data in accordance with Section 01 33 00 for all equipment provided under this division.
2. Shop drawings submittals processed are not change orders: the purpose of shop drawings submittals by the contractor is to demonstrate to the Architect that the Contractor understands the design concept. He demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods of material and equipment he intends to use. If deviations, discrepancies, or conflicts between submittals and specifications are discovered either prior to or after submittals are processed, the design drawings and specifications shall control and shall be followed.

B. 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.

C. Index all submittals and reference to these specifications. All submittal items shall be assembled and submitted in a single complete binder. Partial submittals will not be reviewed.

D. Project Closeout: Prior to completion of project, compile a complete equipment maintenance manual for all equipment supplied under sections of this division, as described below.

1. Equipment Lists and Maintenance Manuals:

a. 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:

2. Name, model, and manufacturer
3. Complete parts drawings and lists
4. Local supply for parts and replacement and telephone number.

5. 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.

6. 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.

1.04 QUALITY ASSURANCE

A. 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. National Electrical Code
2. National Fire Protection Association

3. Underwriters' Laboratories, Inc. (UL)
4. Certified Ballast Manufacturers' Association (CBM)
5. National Electrical Manufacturers' Association (NEMA)
6. Institute of Electrical & Electronics Engineers (IEEE)
7. American Society for Testing & Materials (ASTM)
8. National Board of Fire Underwriters (NBFU)
9. National Board of Standards (NBS)
10. American National Standards Institute (ANSI)
11. Insulated Power Cable Engineers Association (IPECS)
12. Electrical Testing Laboratories (ETL)
13. National Electrical Safety Code (NESC)
14. California Electrical Code Title 24, Part 3
15. California Building Code
16. Americans with Disability Act (ADA)

B. Comply with all applicable laws, ordinances, rules, regulations, codes, or rulings of governmental units having jurisdiction as well as standards of NFPA, and serving utility requirements.

C. Owner shall pay all permit fees and inspections required by any public authority having jurisdiction. Contractor shall coordinate work and arrange inspections with any public authority having jurisdiction.

D. Installation procedures methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Act (OSHA).

E. 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.

1.05 DRAWINGS AND SPECIFICATIONS

A. Drawings and specifications are intended to complement each other. Where a conflict exists between the requirements of the drawings and/or the specifications, request clarification.

B. The Architect shall interpret the drawings and the specifications, and his decision as to the true intent and meaning thereof and the quality, quantity, and sufficiency of the materials and workmanship furnished there under shall be accepted as final and conclusive.

C. In case of conflicts not clarified prior to Bidding deadline, use the most costly alternative (better quality, greater quantity, or larger size) in preparing the Bid. A clarification will be issued to the successful Bidder as soon as feasible after the Award and if appropriate, a deductive change order will be issued.

D. All provisions shall be deemed mandatory except as expressly indicated as optional by the word “may” or “option”.

1.06 EXAMINATION OF PREMISES

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

1.07 WORK AND MATERIALS

A. Unless otherwise specified, all materials must be new and of the best quality. Perform all labor in a thorough and workmanlike manner, to the satisfaction of the Architect.

B. 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.

1.08 SUBSTITUTIONS

A. Substitutions will be allowed only in strict conformance with the General Conditions of the Contract and Division.

1. Whenever in specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name or by name of manufacturer such specification shall be deemed to be used for the purpose of facilitating description of material, process, or article desired and shall be substantially equal or better in every respect to that so indicated or specified. If material, process, or article offered by Contractor is not, in opinion of architect, substantially equal or better in every respect to that specified, then Contractor shall furnish material, process or article specified. Burden of proof as to equality of any material, process, or article shall rest with Contractor. Contractor shall submit request together with substantiating data for substitution of an “or equal” item within thirty-five (35) days after award of contract. Provision authorizing submission of “or-equal” justification data shall not in any way authorize an extension of time for performance of this contract.

1.09 EQUIPMENT PURCHASES

A. 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.

B. Provide all materials of similar class or service by one manufacturer.

1.10 COOPERATIVE WORK

A. 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.

B. 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.

1.11 VERIFICATION OF DIMENSIONS

A. 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 properly fitting equipment and materials together and to the structure in spaces provided.

B. 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 clean, and maintain proper clearances.

1.12 CLEANUP

A. 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.

B. Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.

C. During the progress of the work, keep the premises clean and free of debris.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 CUTTING AND PATCHING

A. Cut existing work and patch as necessary to properly install new work. As the work progresses, leave necessary openings, holes, chases, etc., in their correct location. If the required openings, holes, chases, etc., are not in their correct locations, make the necessary corrections at no cost to the Owner. Avoid excessive cutting and do not cut structural members without the consent of the Architect and DSA.

3.02 CONCRETE

A. Where used for structures to be provided under the contract such as bases, etc., concrete work, and associated reinforcing shall be as specified under architectural. See architectural drawings for details.

B. See other sections for additional requirements for underground vaults, cable ducts, etc.

3.03 PAINTING

A. Paint all unfinished metal with one coat of rust-inhibiting primer. (Galvanized and factory painted equipment shall be considered as having a sub-base finish.)

B. Finished painting is specified Under "Finishes".

C. Furnish all connections to electrical services furnished under other sections except as otherwise specifically designated. Provide all necessary connections, etc., required to properly connect all services and equipment.

D. General: Painting requirements of this section are supplementary to other Painting Sections.

E. Switchboards, panels, terminal cabinets, equipment enclosures, wireways, boxes, conduit, etc.: Standard gray or galvanized manufacturers' finish unless otherwise noted herein.

F. Exceptions in public areas:
1. Flush panels and cabinets: Fronts shall have factory applied primer and field applied oil base semi-gloss enamel finish coat (except metal plated parts) to match adjacent wall surfaces.

2. Surface panels, cabinets and wireways: Same as “1. Flush Panels” above except also paint the enclosure (can) using the same paint as is on adjacent surface in lieu of semi-gloss paint. Apply etching compound (galvanized surfaces) and undercoater prior to finish coat.
3. Surface and flush boxes: Paint to match adjacent surfaces as described in “2. Surface panels” above.
4. Exposed conduit: Paint to match adjacent surfaces as described in “2. Surface panels” above.
5. Ferrous metal miscellaneous parts (except stainless steel): Galvanized in accordance with ASTM A123 or A153.
6. Lighting fixtures in public areas: Standard manufacturers’ finish except as modified by the LIGHTING section, including Fixture Schedule. Exception: Paint the trims of recessed fixtures to match adjacent wall or ceiling surface if so directed by Owner’s representative.
7. Wiring devices, device plates and floor boxes in public areas: As specified in WIRING DEVICES and DEVICE PLATES Sections.

3.04 UTILITY SERVICES

A. Upon notification of award of contract, notify the serving power, telephone utilities of the following:

1. Name and address of Contractor.
2. Estimated times of construction start, completion and required service connections.
3. Project service voltage, phase load, and service size.

3.05 TEMPORARY LIGHTING AND POWER

A. Contractor shall provide on-site generation, labor, materials and/or any required utility fees associated with the installation and maintenance of a temporary power source for Contractor’s equipment or field offices during the period of construction.

B. Building and site shall be sufficiently illuminated so that construction work can be safely performed. Lights shall be controlled by switches located with consideration for safety, security, and convenience.

3.06 RECORD DRAWINGS

A. The Electrical Division shall maintain record drawings as specified in Section 01 78 39.

B. 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. Drawing changes shall not be identified only with referencing COR's and RFI’s, the drawings shall reflect all the actual changes made.

C. Two sets of reproducible as-built drawings shall be delivered to the Architect. See Section 01 78 39 for additional requirements.

3.07 EXCAVATION AND BACKFILL

A. 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. Remove all excess excavated materials from the site, or as otherwise directed by the Architect.

B. 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.

C. Trenching and backfilling shall be done as per Section 31 23 33. No stones or coarse lumps shall be laid directly on conduit or conduits.

D. Provide pumps and drainage of all open trenches for purposes of installing electrical duct and wiring.

3.08 ACCESSIBILITY

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

B. All required access doors or panels in walls and ceilings are to be furnished and installed as part of the work under this section.

C. Provide doors which pierce a fire separation with same fire ratings as the separations.

D. Refer to 'Finish Schedule' for types of walls and ceilings in each area and the architectural drawings for rated wall construction.

E. Coordinate work of the various sections to locate specialties requiring accessibility with others to avoid unnecessary duplication of access doors.

3.09 FLASHING

A. Flash and counterflash all conduits penetrating roofing membrane.

3.10 IDENTIFICATION OF EQUIPMENT

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

B. General:

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.
2. All auxiliary systems, including communications, shall be labeled to indicate function.
3. All labels, tags, and stamps shall use the owner room designation and room numbering system.
4. Provide nameplates for safety switches, switchboards, breakers mounted in switchboards, relay cabinets, signal terminal cabinets, individually mounted enclosed breakers, panelboards, starters, time clocks, remote control switches and similar items. Nameplates shall be laminated black-white-black backlit or phenolic plastic with ¼-inch high lettering engraved through the outer covering except where specifically described otherwise. Affix with self-tapping machine screws (no rivets or glue). The screws shall not project beyond the backside face of enclosure doors or panels.

C. Conduits and outlet boxes for all special systems including emergency power, fire alarm, and communications systems shall be color coded for identification throughout. Conduits shall be spray painted with the system color code at 3-foot intervals. Outlet and junction boxes shall be spray painted with the system color code on the exterior of the box, except boxes which are flush mounted in walls, ceilings, or floors shall be painted on the inside of the box. System color codes shall be as follows:

1.	Emergency Power Systems	Orange
2.	Fire Alarm System	Red

3.	Nurse Call System	Blue
4.	Music/Paging System	Yellow
5.	Intercom System	Pink
6.	Telephone System	White
7.	Data System	Gray
8.	SMATV/Radio Program System	Brown
9.	Miscellaneous Signaling Systems	Violet

D. Lighting and Local Panelboards Transformers:

1. Panel identification shall be with white and black micarta nameplates. Emergency power distribution panels shall be identified with red and white micarta nameplates. Letters shall be no less than 3/8" high.
2. Circuit directory shall be 2-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.
3. The circuit directory shall reference the building number and room number as designated by the school directory. Circuit directories which reference the building number and room number as designated on drawings are not acceptable.

E. Distribution Switchboards and Feeders Sections, Motor Control Centers, Automatic Transfer Switches:

1. Identification shall be with 1" H 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. Emergency power distribution panels shall be identified with red micarta nameplates and white lettering. Letters shall be no less than 3/8" high.
2. Circuit breakers and switches shall be identified by number and name with 3/8" H 1-1/2" laminated micarta nameplates with 3/16" high letters mounted adjacent to or on circuit breaker or switch.

F. Disconnect Switches, Motor Starters and Transformers:

1. Identification shall be with white micarta laminated labels and 3/8" high black lettering.
2. Emergency equipment shall be identified with red labels and 3/8" high white lettering.

3.11 CONSTRUCTION FACILITIES

A. 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.

B. Temporary power and lighting for construction purposes shall be provided under this section. Refer to 'temporary facilities' for description of work.

3.12 GUARANTEE

A. 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 proving 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.

3.13 PATENTS

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

3.14 MECHANICAL / ELECTRICAL COORDINATION REQUIREMENTS

A. All electrical work performed for this project shall conform to the National Electrical Code, to Local Building Codes and in conformance with Division 26 of these specifications whether provided under the Mechanical or the Electrical sections of the specifications. Where the mechanical contractor is required to provide electrical work, he shall arrange for the work to be done by a licensed electrical contractor using qualified electricians. The Mechanical Contractor shall be solely and completely responsible for the correct functioning of all mechanical equipment regardless of who provided the electrical work.

B. The Mechanical Contractor shall provide the following:

1. All motors required by mechanical equipment.
2. All starters for mechanical equipment which are integral to equipment scheduled and / or specified.
3. All wiring interior to packaged equipment furnished as an integral part of the equipment.
4. All control wiring for mechanical systems.
5. All control systems required by mechanical equipment.
6. 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 and other components required for the proper operation of the equipment.
7. Motor starters supplied by Mechanical shall be fused combination type minimum size 1, and conform to appropriate NEMA standards for the service required. Provide NEMA type 3R/12 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 1/2 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 Westinghouse.

C. The Electrical Contractor shall provide the following for mechanical equipment:

1. All power wiring.
2. Electrical disconnects as shown on the electrical drawings.
3. All starters not integral to equipment scheduled and / or specified and all starters forming part of a motor control center.

D. All power wiring and conduit to equipment furnished under Mechanical Division shall be provided under Electrical Division. Control wiring, whether line voltage or low voltage, shall be provided under the division which furnishes the equipment.

E. Conduit for wiring for all HVAC and plumbing control shall be furnished and installed under Electrical Division.

F. 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.

G. 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 under the Electrical Division.

H. Electrical Division shall make all final connections of power wiring to equipment furnished under this division.

I. Wiring diagrams complete with all connection details shall be furnished under each respective section.

3.15 EQUIPMENT ROUGH-IN

A. 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. The exact rough-in locations for manufactured equipment must be determined from large scale certified drawings. 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 drawings.

3.16 OWNER-FURNISHED AND OTHER EQUIPMENT

A. 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.

3.17 EQUIPMENT FINAL CONNECTIONS

A. Provide all final connections for the following:

1. All equipment furnished under this Division.
2. Electrical equipment furnished under other sections of the specification.
3. Owner-furnished equipment as specified under this Division.

3.18 INSERTS, ANCHORS, AND MOUNTING SLEEVES

A. Inserts and anchors must be:

1. Furnished and installed for support of work under this Division.
2. Adjustable concrete hanger inserts installed in new concrete work shall be as manufactured by Grinnell or approved equal.
3. Installed in location as approved by the Architect. Expandable lead type anchors installed in existing concrete with minimum surface damage, as manufactured by Ackerman-Johnson, Pierce, Diamond, or Hilti.
4. Toggle Bolts, or "Molly-Anchors" where installed in concrete block walls.
5. Complete with 3/16" or heavier steel back-up plate where used to support heavy items. Thru-bolts for back-up plate shall be concealed from view, except as otherwise indicated. Refer to drawings for details of supports at post-tension concrete slab.
6. 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.

B. Furnish and install all sleeves as required for the installation of all work under all sections of this division. Sleeves through floors, roof, and walls shall be as described in conduit section.

3.19 SEISMIC RESTRAINTS

A. Provide the work in compliance with the most stringent seismic requirements for site specific, of applicable Codes including the Title 24 and California Code of Regulations (CCR) Uniform Building Code, but with the requirements herein as minimum standards. Provide seismic restraints for materials and equipment of this Division, including (but not limited to) the items listed below. The attachments shall resist forces applied to the center of gravity of the components. Criteria shall be the operating weight of the item times .5g for horizontal forces and .33g for vertical forces. Design for the horizontal force to be applied in any direction. Wall mounted or suspended components shall, in addition, resist a downward force of 200 pounds minimum added to the operating weight.

B. All switchgear and other free standing electrical equipment shall be anchored to withstand seismic forces in this area.

C. Switchboards, transformers, and all free-standing panels or cabinets and similar equipment.

D. Suspended lighting fixtures.

E. Lighting fixtures integral with ceiling or directly mounted to ceiling.

F. Suspended conduit hangers and trapezes.

G. Suspended electrical conduit, 2-1/2" nominal size and larger, shall have individual hangers not longer than 12" from the top of the pipe to the bottom of the support for the hanger. If a longer hanger is used, Contractor shall apply seismic restraints. Supporting calculations and details shall be submitted for Title 24 compliance review.

H. Four #9-12 gauge hanger wires shall be provided to each recessed troffer one located at each diagonal corner. In addition troffers shall be fastened with two self tapping screws at each end of fixture through housing to main runners of the T-bar grid. Installation of these screws shall in no way deform the fixture housing. Provide spacers between the fixture housing and the T-bar grid where required.

I. Provide bracing and anchorage of conduit hangers and trapezes in accordance with SMACNA published "Guidelines for Seismic Restraints of Mechanical Systems".

J. Pendant, suspended, or stem mounted lighting fixtures shall have approved earthquake resistant hangers if code required and have movable joints at ceiling and fixture when more than one stem is used per fixture. In addition, fixtures shall have steel stranded aircraft cable attached to the structure and to the fixture at each point of support, in addition to the fixture hanger. Cables shall be installed slack and shall be capable of supporting four times the vertical load. The fixture shall be capable of swinging 45° in any direction. Where a 45° swing would cause the fixture to strike a wall or other object, suitable cables or other means of bracing shall be added to prevent the fixture from swinging against the other object.

K. Carefully review the space available to insure that the restraint systems proposed will not impair the required equipment clearance, working space or access.

L. Submit details of the seismic anchorages and receive approval of the IOR and EOR prior to installation. Details shown on the drawings are for reference only and may not be suitable for the actual equipment to be installed. Exception: Details for seismic anchorage may be omitted for equipment installed on a floor or roof and weighing less than 400 lbs. but the installation shall be subject to the approval of the Owner's representative.

3.20 RUSTPROOFING

A. Rust proofing must be applied to all ferrous metals as follows:

1. Hot-dipped galvanized shall be applied after forming of angle-iron, bolts, anchors, etc.
2. Hot-dipped galvanized shall be applied after fabrication for junction boxes and pull boxes cast in concrete.

3.21 GENERAL WIRING

A. 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.

B. In those isolated instances in which construction conditions will not permit staggered outlet boxes, provide "Flamesafe" FSD 1077 fire stopping pads or approved equal, over the outlet box.

C. 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.

D. Provide proper size and type of feeds from proper sources for all such items indicated, checking drawings of all trades to ensure inclusion of all items.

3.22 SEPARATE CONDUIT SYSTEMS

A. 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, emergency system, sound system, control system, fire alarm system, etc.

B. 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.

3.23 SPECIAL CONDUIT REQUIREMENTS

A. The electrical contractor shall furnish and install all conduits for the total and complete conduit for the following communication systems.

1. Clock and Bell

B. The fire alarm system shall be in conduit at all areas.

C. Conduit for all low voltage systems, including fire alarm and clock and bell located above suspended ceiling shall be installed below gypsum board on bottom chord of truss, exposed.

D. Provide a pull chord in all spare conduit and where conductors are installed by others.

END OF SECTION 26 05 00

SECTION 26 05 13 – POWER CONDUCTORS

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, Division One, and Section 26 05 00 Common Work Results for Electrical apply to this section.

B. Scope of Work: The work under this section includes furnishing all labor, materials, and quipment and performing all operations in connection with Conductors, as indicated on the drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following:

1. Furnishing and installing wire and cable for branch circuits and feeders.

1.02 SUBMITTALS

A. Submit manufacturer's data for the following items:

1. 600 volt cables

PART 2 - PRODUCTS

2.01 WIRE AND CABLE RATED 120 VOLT TO 600 VOLT

A. All wire and cable shall be new, 600 volt insulated copper, of types specified below for different application.

1. Conductor Material: Copper
2. All conductor sizes shall be designated by American Wire Gauge (AWG) or Thousand Circular Mills. (kcmil).
3. Wire used as feeders to switchboards, panleboards, motor control centers or other major electrical components shall be type XHHW-2.
4. All underground conductors shall be Type XHHW-2.
5. Wire and cable larger than #6 AWG shall be type XHHW-2
6. Wire #6 AWG and smaller shall be type THHN.
7. Conductors for branch circuit lighting, receptacle, power and miscellaneous systems shall be a minimum of No. 12 AWG.
8. 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.
9. Wire indicated to be larger than No. 12 must be increased the entire length of the circuit.
10. Wire sizes No. 14 through No. 10 shall be solid. No. 8 and larger shall be stranded.

B. All wire and cable shall bear the UL label and shall be brought to the job in unbroken packages.

C. Wire insulation shall be color as specified herein.

2.02 WIRE AND CABLE FOR SYSTEMS BELOW 120 VOLTS

A. All low voltage and communications systems cable shall be plenum rated.

PART 3 - EXECUTION

3.01 SYSTEMS 600 VOLT OR BELOW

A. 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.

B. All connections and joints in wires shall be made as noted below:

C. Connections to outlets: Wire formed around binding post of screw.

D. No. 8 wire and larger - Burndy "Quick-Lug" type QDA, or approved equal, round flange, solderless lug.

E. Fixture Connections: Circuit wiring connections to fixture wire shall be made with pressure type solderless connectors, Buchanan, Scotchlock, Wing Nut, or approved equal.

F. Joints in Wire: No. 6 wire and larger, Burndy or approved equal.

G. No. 8 wire and smaller - Buchanan, Scotchlock, Wing Nut, or equal pressure type solderless connectors.

H. Uninsulated solderless connectors shall be insulated as follows: Tape and covering of rubber tape, equal in thickness in the insulation. This shall be followed with an outer covering of vinyl tape in two layers.

I. All wiring throughout shall be color-coded as follows:

	480-Volt System	208-Volt System
A Phase	Brown	Black
B Phase	Orange	Red
C Phase	Yellow	Blue
Neutral	Grey	White
Ground	Green	Green

J. 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.

K. 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.

L. At all terminations of control wiring, the wiring shall have a numbered T & B or Brady plastic wire marker.

M. 120 volt control wiring may be installed with the power conductors when insulated at the same voltage level as the power conductors. All other control and instrumentation wiring must be installed in a separate conduit.

N. 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.

O. Wire and cables when installed in underground pull boxes shall not be spliced. All wire and cable in underground pull boxes shall be continuous.

P. Wire and cable when installed in underground pull boxes shall be neatly strapped / looped together and anchored to side walls of junction box. The wire and cable shall be neatly strapped to the side walls of junction boxes to keep the floor of the junction box open.

END OF SECTION 26 05 13

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, Division One, and Section 26 05 00 Common Work Results for Electrical apply to this section.

B. The scope of work under this section includes furnishing all labor, materials, and equipment and performing all operations in connection with Grounding, as indicated on the drawings, specified herein, or reasonably required to complete the work. The work includes, but is not limited to the following:

1. Furnish and install grounding and grounding conductors.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GROUNDING

A. All panelboard cabinets, equipment, enclosures, and complete conduit system shall be grounded securely in accordance with pertinent sections of Article 250 of CEC. 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 Article 250 CEC. All ground connections shall have clean contact surfaces. Install all grounding conductors in conduit and make connections readily accessible for inspection. Furnish and install grounding electrodes as described on the drawings.

B. 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 grounds bus in the panelboard to the conduit grounding bushings.

C. Except for connections which access for periodic testing is required, make grounding connections which are buried or otherwise inaccessible by exothermite type process.

D. Equipment Grounding Conductors:

1. Provide copper THWN insulated equipment grounding conductors in all raceways.
2. The grounding conductors shall be provided whether scheduled or shown on the drawings or not, and, if necessary, the conduit size shall be increased to accommodate them. These grounding conductors shall be connected to the ground terminals on the device or enclosure at each end of the installation and shall be interconnected with the other ground terminals and conductors to form a continuous wired grounding system throughout the electrical wiring system.

E. Ground Rods: 3/4" diameter × 8-feet copper clad steel. Drive full length into earth with the top 3-inch minimum below grade or underside of slab. Where ground rods cannot be driven vertically to the desired depth below grade, they shall be driven at an angle away from or parallel to the exterior wall. When driven parallel to the wall, the angle shall not exceed 45degrees. The rod shall penetrate to a depth of permanent ground moisture. When ground rods cannot be driven because of bedrock at

less than 4 feet below grade level, a counterpoise ground electrode shall be used in place of rods. The counterpoise system shall consist of not less than 50 feet of No. 2 AWG bare tinned copper wire, buried to a depth of at least 18" below grade, for each ground rod shown. The wires shall be run in a straight line. Each pad-mounted transformer and vacuum interrupting sectionalizing switch shall be grounded using the methods indicated herein.

F. Connections: Connection to inaccessible ground rods below ground shall be made using exothermic welding devices. Above ground and accessible connections shall be made using exothermic devices. Multiple bolt silicon bronze connectors, Burndy or O.Z. Electric; or exothermic welded, Burndy, Erico Cadweld products, or equal.

G. Test each grounding electrode for resistance at the connection point before connecting any wires. Resistance at the grounding electrode shall not exceed the following:

1. Service Equipment, 25 ohms
2. Interior Electrical Systems, 25 ohms
3. Exterior Transformers, 10 ohms
4. Junction Boxes and Manholes, 10 ohms

H. If the above values are not achieved with the installed system, notify the Owner's representative.

I. Each ground electrode shall be tested using a ground resistance meter, or other suitable instrument, in conformance with the manufacturer's directions. Submit a report listing as a minimum the date of testing, name of tester, instrument used, location and type of ground electrode, and resistance in ohms. Submit within five (5) days after testing is completed.

END OF SECTION 26 05 26

SECTION 26 05 33 – RACEWAY AND BOXES

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General and Supplementary Conditions, Division One, and Section 26 05 00 Common Work Results for Electrical apply to this section.

B. Scope of Work: The work under this section includes furnishing all labor, materials, and equipment and performing all operations in connection with Raceway and Boxes, as indicated on the drawings, specified herein, or reasonably required to complete the work.

1.02 SUBMITTALS

A. Submit manufacturer's data on the following:

1. Conduit
2. Fittings
3. Fire Seal Material

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with CEC.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.

4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel or aluminum.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (including all types and flexible and liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, set-screw or compression type.

2.02 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. Certain Teed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise noted.

C. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

2.03 BOXES

A. Boxes shall be as manufactured by Steel City, Appleton, Raco, or approved equal.

B. 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.

C. Boxes generally shall be hot dipped galvanized steel with knockouts. Boxes on exterior surfaces or in damp locations shall be corrosion resistant, cast aluminum. Boxes 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. Bodies shall

have threaded hubs for rigid conduit and neoprene gaskets for their covers. Bodies shall be Appleton Unilets, Crouse-Hinds, or the approved equal. Where recessed, boxes shall have square cut corners.

D. 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.

E. All light, switch, receptacle, 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.

F. 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 3/4" past boxes all around. Covers for 4" square and 4" ganged boxes shall extend 1/4" past box all around.

PART 3 – EXECUTION

3.01 CONDUIT INSTALLATION – GENERAL

A. Continuously check the work previously installed to prevent any interference between the various installations. Should structural difficulties or other work prevent the routing of conduit as indicated on the drawings, make necessary deviations there from as directed by the Owner's representative.

B. Route conduit so as to clear beams, plates, footings and structural members, whether or not indicated on the plans. Do not run conduit through any structural member of the building, except as specifically directed by the Owner's representative. Under no circumstances run conduits through column footings or grade beams.

C. Concrete Slabs on Grade: Conduit shall not be installed in slab on grade.

D. Where conduit penetrates a fire-rated separation, any of the following packing methods may be used to restore the integrity of the separation if Code approved: cement, mineral fiber sprayed with a flame retardant coating, or Dow Corning 3-6548 RTV silicon foam, 3M caulk #CP25, 3M putty #303, or equal. Seal shall be water-tight and shall be accomplished prior to wire pulling.

E. Where a conduit enters building through the concrete foundation wall or floor below ground water level, a watertight entrance seal shall be used. These seals shall be 0.Z. Type “FSK” or “WSK”, or as equal.

F. Do not run conduit closer than 6 inches to any uninsulated hot water or steam pipe, heater flue or vent. If pipe is insulated, the clearance may be reduced to 2-inch. Provide condulets for exposed runs of conduit where junction, bends or offset are required, whether such condulets are indicated on the plans or not. No bends are permitted around corners, beams, wall or equipment. No running threads are permitted. Run a die over factory threads to ensure that they are clean and free from all coating material and that good metallic contact with the fittings is obtained. Paint the exposed portion of field-cut threads with a suitable zinc-rich paint.

G. Upon completion of each run of conduit, test the run and clear it of all obstructions. Plug each conduit end with conduit pennies and bushings or manufacturers' seals until ready for pulling wire.

Provide a 200-pound test nylon or polypropylene pull rope in each empty conduit, tie off rope at each end, and provide an identification tag on rope at each end.

H. All branch circuits shall be installed in void spaces and not in concrete floor slabs unless for floor receptacles.

I. Conduit sizes for various numbers and sizes of wire shall be as required by the CEC, but not smaller than 3/4-inch.

J. 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 NEC. If because of bends or elbows a larger conduit size is required, the Contractor shall so furnish without further cost to the Owner.

K. Flexible conduit shall be used as shown on drawings and only to connect motors, transformers, and other equipment subjected to vibration. Flexible conduit shall not be used to replace EMT in other locations.

L. Flexible metal conduit shall be ferrous, in lengths not exceeding 6 feet. Installation shall be such that considerable slack is realized. The conduit shall contain separate code sized grounding conductor.

M. Liquid tight flexible conduit shall be used in conformance with NEC in lengths not to exceed 4 feet. 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 in possible corrosive areas, e.g. kitchens and outside areas.

N. 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.

O. 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.

P. All conduits shall be concealed wherever possible. All conduit runs may be exposed in mechanical equipment rooms, electrical equipment rooms, and electrical closets. No conduit shall be run exposed in finished areas without the specific approval of the Architect.

Q. 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. Baling wire shall not be used to support conduit.

R. Where possible, all conduits for wiring within stud or movable partitions shall enter the partition from above.

S. 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.

1. Water and waste piping not less than 3-inch.

2. Steam and condensate lines not less than 12-inch.
3. Radiation and reheat lines not less than 6-inch.

T. 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.

U. All empty conduits shall be provided a 1/2-inch polypropylene plastic pull cord and plastic plugs over the ends.

V. 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.

3.02 CONDUIT INSTALLATION – ABOVE GRADE

A. All conduits above grade or inside of a structure shall be metallic, except in masonry and concrete walls Schedule 40 may be used.

B. Run conduit concealed, except as otherwise indicated.

C. Run exposed conduit parallel with or at right angles to walls or as directed by the Owner's representative.

D. Where conduits are placed in partitions necessitating cutting of any structural member, provide supports as directed by Owner's representative in accordance with applicable structural requirements.

E. Locate conduit so as not to obstruct access or service to equipment.

F. Conduit Passing Through the Roof: Flash and counterflash and/or provide a pitch pocket. Method shall be compatible with roofing system and acceptable to the Owner's representative.

G. Conduit 1-inch and smaller over metal channel for lath and plaster or acoustical ceilings shall be tied to the supporting channels with 12 gauge galvanized tie wire spaced at a maximum of 10-feet intervals. Conduits shall not obstruct accessibility of ceiling or removal of panels. Do not use ceiling wires for support. Support exposed conduit 1-inch and smaller from building with T & B, or equal, pipe straps spaced at a maximum of 10-feet intervals. Attach supports with machine screws, nets and lock washers in metal; wood screws in wood; and expansion shields or inserts in masonry or concrete. Perforated strap iron shall not be use. Conduits larger than 1-inch shall be suspended on pipe racks with Grinnell No. 107B, or equal, split-ring hangers and rods from concrete inserts.

H. RSC shall be installed in interior wet locations, exposed exterior locations, and wherever specifically shown. Where installed in exterior locations, RSC and fittings shall be encased in PVC coated for corrosion protection. Conduit, from slab to bottom of surface-mounted panelboards, distribution panels, device outlet boxes, terminal cabinets, where exposed, shall be RSC. Conduit concealed in wall from slab to flush-mounted panels, distribution panels, terminal cabinets, and all device outlet boxes for all systems shall be EMT except to devices mounted at 36" or less in which case flexible conduit may be used. Contractor shall be allowed a dimension of 3 inches above slab to make transition from PVC to EMT, flex or rigid steel as allowed above.

I. All above grade metallic conduit shall be EMT, unless noted otherwise

J. Rigid steel conduit or IMC shall be used at thefollow locations:

1. Exposed exterior locations.

2. Emergency feeders routed overhead.

3.03 CONDUIT INSTALLATION – UNDERGROUND

A. Bury underground conduit (except under buildings) to a 30-inch minimum depth below finish grade to top of conduit. Deeper burial depths shall be as indicated on drawings, or as required to meet minimum spacing from other utilities' lines and obstructions.

B. Plastic conduit shall be used only for all exterior underground systems, in slab, not on grade, and below slab, on grade. Install bell ends at all conduit terminations in manholes and pull boxes.

C. Risers to grade shall be PVC-coated rigid galvanized steel unless otherwise noted.

D. The ends of all underground conduits entering buildings and equipment shall be capped or sealed with acceptable compound, such as Crouse Hinds “Chico A”, or equal, after installation of wire. Cap empty conduit stubouts at both ends. In landscaped areas, terminate in a waterproof J-box.

E. Provide a plastic warning tape in the backfill over the ductlines approximately 12 inches below grade. Tape shall be run continuously along the entire length of the underground utility lines. Tape shall be polyethylene plastic manufactured specifically for warning and identification of all buried utility lines. Tape shall be of the type provided in rolls, 6-inches minimum width, color-coded for electric lines (red), and communications (orange) with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Tape shall consist of top and bottom layers of B-721 polyethylene or polyester with a center metallic foil core suitable for locating by a conventional detector at the specified depth. Tape shall be by Thor Enterprises, Brady, Seton, or equal. Submit data sheets as specified under “SUBMITTALS”.

F. Conduit Location Markers: Conduits stubbed or capped-off underground shall have their location identified with a concrete marker 6" × 6" × 12" high with a flush brass plate set in the 6" face. Identification of the conduit shall be stamped or engraved into the plate and the marker set flush with finished grade. Show exact location of markers and identification markings on as-built drawings. Submit data sheets as specified under “SUBMITTALS”.

G. Excavated materials not required or unsuitable for backfill shall be removed from the project site. Provide sheeting and shoring as necessary for protection of work and safety of personnel. Remove water from excavations by pumping or other approved method.

H. Backfill shall be placed in layers not more than 6" thick and each layer shall be compacted. Backfilling shall progress as rapidly as the construction, testing and acceptance of the work permits. Backfill shall be free from roots, wood, scrap material, and other vegetable matter and refuse. Compaction of backfill shall be to 95 percent of maximum density. 80% of ASTM D method “D” maximum density.

I. Backfill around underground structures such as manholes or handholes shall consist of sand and gravel, free from large clods of earth or stones over one inch size. Backfill materials shall be placed symmetrically on all sides in loose layers not more than nine inches deep. Each layer shall be moistened and compacted with mechanical or hand tampers to 90% compaction.

3.04 CONDUIT BENDING

A. 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 NEC requirements.

B. Not more than four 90 degree bends will be allowed in one raceway run. Where more bends are necessary, a pull box shall be installed. All bends in 1-inch and smaller shall be made with a conduit bender and all larger sizes shall have machine bends.

3.05 CONDUIT SUPPORTS

A. Conduit shall be supported at intervals as required by the National 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.

B. 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-inch diameter minimum. Each conduit shall be clamped to the trapeze hanger with conduit clamps.

C. 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.

D. Openings through fire-rated floors and fire and/or smoke walls through which conduits or cables pass shall be sleeved and sealed by fire stop material to seal off flame, heat, smoke and fire gases. Fire-seal material shall have an hourly fire rating equal to or higher than the fire rating of the floor or wall through which the cable or conduit pass. Sleeves provide for communication system cable shall be filled with fire-seal material.

3.06 CONDUIT FITTINGS

A. Bushings and Lock Nuts: Where conduits enter boxes, panels, cabinets, etc., they shall be rigidly clamped to the box by lock nuts on the outside, and a lock nut and bushing on the inside of the box. All conduits shall enter the box squarely.

B. Furnish and install insulated bushings as per CEC on all conduits. The use of insulated bushings does not exclude the use of double lock nuts to fasten conduit to the box.

C. Couplings and connectors for rigid steel or IMC conduit shall be steel or malleable iron, threaded, rain- and concrete-tight. Transition from plastic to steel conduits shall be with PVC female threaded adaptors. Couplings and connectors exposed, installed in hollow construction or above ceilings must be threaded, or compression type.

D. Couplings and connectors for EMT shall be compression, watertight. Set screw connectors are not acceptable, except for systems below 120 volts.

E. Connectors for flexible metal conduit shall be steel or malleable iron with screw provided to clinch the conduit into the adapter body.

F. Install approved expansion fittings for conduits passing through all expansion and seismic joints.

3.07 BOXES

A. Boxes shall be installed where required to pull cable or wire, but only in finished areas 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.

B. 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.

C. 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.

D. All cabinets and boxes shall be secured by means of 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.

E. Boxes with unused punched-out openings shall have the openings filled with factory made knockout seals.

F. Where emergency 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.

G. All outlet boxes and junction boxes for Fire Alarm and Emergency systems shall be painted red.

END OF SECTION 26 05 33

SECTION 26 50 00 – LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of General Conditions, Supplementary Conditions, and Division One apply to this section.

B. Scope of Work: The work under this section includes furnishing all labor, materials, and equipment and performing all operations in connection with Lighting, as indicated on the drawings, specified herein, or reasonably required to complete the work.

1.02 SUBMITTALS

A. Comply with requirements of Section 01 33 00 – SUBMITTALS.

B. Material List including reflector type and each type of lamp and ballast.

C. Catalog cuts for each fixture and pole including complete photometric data in IES format.

D. Electronic ballast warranty.

1.03 GENERAL REQUIREMENTS

A. Provide U.L. listed and labeled lighting fixtures complete with lamps at light outlets indicated on the drawings. Each fixture shall bear the U.L. label, and shall comply with Code Requirements. Exterior fixtures shall be U.L. approved for damp locations in soffits and for wet locations elsewhere and shall be so labeled.

B. Design (including the frames) of recessed fixtures shall be compatible with the ceiling construction. Verify the type of ceiling and suspension method prior to ordering fixtures. Architect's favorable review of the shop drawings for both the ceiling system and the lighting fixtures, with "No Exception Taken" or "Approved" on the Architect's stamp, will not relieve the Contractor of the ceiling/lighting fixture compatibility requirement.

C. Fixtures are listed and described in the Fixture Schedule and in the following paragraphs. Fixture catalog numbers are to be used as a guide only and shall be understood to be followed by the words "except as modified by the total fixture description both text and pictorial". Provide accessories, features and adaptations necessary to meet the requirements of the description.

D. If the fixture designation is omitted from a light outlet, assume a fixture of the type used in similar areas in preparing the bid. Confirm type with Architect prior to ordering.

1.04 ACCEPTABLE MANUFACTURERS

A.	Electromagnetic	Advance, Valmont Electric
B.	Ballasts	Jefferson, Universal, Sola or equal
C.	Electronic Ballasts	Magnetek-Universal, Motorola, EBT or equal
D.	Lamps	Sylvania, General Electric, N.A. Phillips, Osram or equal

1.05 LAMP REPLACEMENT

A. Replace lamps which burn out after Owner's use or acceptance of the project (or of an area in the case of beneficial occupancy).

B. Lamps (except incandescent) which burn out with 120 days.

C. Incandescent lamps which burn out after usage which is less than 80% of rated life.

PART 2 - PRODUCTS

2.01 FINISH

A. Treat surface mounted fixtures and exposed trim of recessed fixtures with a rust-inhabitant process. This process shall be Bonderlite or Oakite Cryscoat or equal zinc phosphate bonding process. Refer to PAINT, FINISHES AND COLORS sections.

2.02 OPTICAL SYSTEMS

A. Lighting fixtures for use with HPS lamps shall have the optical system specifically designed for a clear HPS lamp of the wattage indicated.

2.03 BALLAST WIRING

A. Where multiple level switching of fluorescent fixtures is indicated on the drawings, wire ballasts for symmetrical grouping of lamps. For example in three lamp tandem fixtures, two inner and four outer lamps shall be switch controlled.

2.04 EXIT SIGN FIXTURES

A. Emergency exit sign fixtures with illumination by LED's (Light Emitting Diodes), fully enclosed within aluminum housing and providing even illumination of letters through an optical diffuser to meet or exceed requirements of NFPA Life Safety Coded 101 and the OSHA code. The power supply shall be dual input 120/277V 60 Hz. All components shall be solid state, with surge protection and short circuit protection and each LED shall be individually driven such that failure of one will not affect another.

2.05 BALLASTS

A. Emergency battery pack ballasts for fluorescent lighting fixtures shall consist of an automatic power failure device, test switch, pilot light, and fully automatic solid-state charge in a self-contained power pack furnished by the fixture manufacturer as an integral part of the fixture. Charger shall be either trickle, float, constant current or constant potential type, or a combination of these. Battery shall be no maintenance nickel cadmium type with capacity to supply power to one lamp for each fixture for 90 minutes minimum. Unit shall be capable of operating a dead fluorescent lamp.

B. Fluorescent HID ballasts and emergency battery pack ballasts shall be guaranteed for 3 years.

2.06 LAMPS

A. Provide lamps as listed below unless specifically indicated otherwise in the Lighting Fixture Schedule.

B. Incandescent General Service Lamps: Inside frosted, standard life, 130V.

2.07 FLUORESCENT LAMPS

A. Compact Fluorescent; 3500K degree color for interior locations.

B. 40 watt “Biax”; 3500K.

C. Rapid-start lamps; 3500K.

D. High Intensity Discharge (HID) Lamps:

1. Metal halide light fixtures that utilize a horizontal lamp configuration shall be provided with a clear lamp rated for horizontal operation.

E. Each type of lamp by only one manufacturer color consistency.

2.08 LIGHT TRANSMITTING PLASTICS

A. All plastic shall be 100% virgin acrylic. Pattern #12 lenses shall be minimum .125-inch thick overall with .08-in. prism depth.

2.09 LIGHTING CONTROL SYSTEM – MOTION SENSING

A. Motion sensing lighting control system shall be installed where shown to switch lighting fixtures ON when a room or area is entered and OFF after a preset time delay after sensing no motion or occupancy.

B. System shall consist of motion sensor units, switchpacks, wiring, and miscellaneous electrical hardware. Ceiling mounted sensing and switchpack units shall be manufacturers by Novitas, Watt-Stopper or equal. Wall switch type unit shall be provided by Novitas or equal.

2.10 EMERGENCY INVERTER SYSTEMS

A. Furnish and install interruptible 3600 VA emergency AC inverter system manufactured by Chloride, Emerg-Lite, Exide, Lithonia, or equal capable of serving a 2400 VA 277 volt 60 Hz connected load for a period of 90 minutes to 87.5 percent of output voltage. System shall be listed to UL Standard 924.

B. The entire system, including inverter, battery charger, transfer equipment and battery, shall be designed for maximum reliability in emergency service and shall be designed with modular construction for easy field replacement. System transfer time to emergency mode shall be no more than 50 milliseconds. All solid-state components shall be conservatively rated. Electronics shall carry a one year warranty.

C. The system shall be designed to operate from 277 volt 1-phase 60 Hz input voltage and supply the normally ON loads at 277 volts single phase 60 Hz.

D. Supply normally ON loads at 277 volts single-phase 60 Hz and also supply normally OFF loads at 120 volts single-phase 60 Hz, at Building.

E. Inverter:

1. The DC to AC inverter shall be of the solid state type with ferroresonsant output transformer to provide 120/277 volt 1-phase 60 Hz sine wave output such that the output voltage is regulated to within ± 5% from 10% load to full load at unity power factor and the frequency is regulated within ± 1 Hz. Total harmonic distortion of the output shall be approximately 5% at full resistive load and nominal input.

2. System efficiency shall be at least 90% in the standby mode to minimize power consumption. Inverter efficiency shall be greater than 80% in emergency mode to insure maximum utilization of battery capacity and to minimize space.
3. To minimize power consumption, inverter shall not operate continuously; however, low level logic stage shall operate when AC supply is available to minimize interruption of power to load.
4. Self-protective features shall include short circuit protection, failsafe startup, automatic low battery shutdown, reverse input polarity protection and 5-minute operation at 130% of unit rating. The input power and control circuitry shall be separately fused.

F. Charger:

1. The battery charger shall be a solid state, constant voltage, current limited device incorporating internal red visual indicators to signal float and high charge mode. Charger shall be equipped with timed automatic equalize charge to periodically bring batteries up to full capacity. Charger shall be capable of recharging batteries in accordance with the requirements of UL 924.

G. Battery:

1. The Battery shall be sized to power the fully-loaded inverter for 90 minutes in accordance with UL requirement and shall be sealed, maintenance free lead calcium requiring no addition of water during service life. Expected service life shall be 10 years and warranty shall be a total of 10 years consisting of 1 years full replacement plus 9 years prorated replacement.

H. Controls:

1. Instrumentation and controls shall be suitable to determine that the system is operating in a satisfactory manner. As a minimum, these shall include utility power indicator, inverter bypassed indicator, DC battery voltmeter, AC output voltmeter, DC battery ammeter, system test switch, high-charge indicator.

I. Enclosure:

1. System electronics shall be enclosed in a free standing, 14-gauge, NEMA 1 sheet steel enclosure painted with key-lock hinged doors. Battery enclosures of similar construction shall be supplied as required. All electronics shall be mounted on easily removable modules with quick disconnect inter-wiring. All potentially hazardous components shall have safety covers and be properly marked with tags to indicate safe handling.

J. Accessories:

1. Inverter units shall be provided with output circuit breakers.
2. AC ammeter.

PART 3 – EXECUTION

3.01 FIXTURE MOUNTING

A. Provide fixture supports. Design (including the frames) of recessed fixtures shall be compatible with the ceiling construction. Verify the type of ceiling and suspension method prior to ordering fixtures. Architect favorable review of the shop drawings for both the ceiling system and the lighting fixtures, with “No Exception Taken” or “Approved” on the Owner’s representative’s stamp, will not relieve the Contractor of the ceiling/lighting fixture compatibility requirement.

B. Mount pendant fixtures at the heights indicated on the drawings, unless otherwise directed by Architect.

C. Verify the ceiling or wall construction, voltage, and the mounting requirements of each fixture and provide plaster frames, special flanges, concrete pour housings, boxes, brackets, adapters, hangers, stems, canopies, special ballasts or lenses, and other materials necessary to properly purchase and mount the fixture.

D. Attach surface fixtures mounted on accessible panel type suspended ceilings to a main runner with a positive clamping device made of minimum 12 gauge steel. Rotational spring catches will not be permitted. Mount fixtures which are on combustible ceilings on spacers as required by Code unless Code approved for mounting directly on ceiling.

E. See “Seismic Restraints” under Section 26 05 00 – Common Work Results for Electrical.

3.02 FIXTURE LOCATIONS

A. Locate fixtures installed in Mechanical Equipment Rooms after ducts and piping are in place for maximum working space coverage. Connect with exposed conduit. Provide conduit with condulet fittings for boxes and offsets. Support fixtures from the structure independently of ducts or piping.

3.03 FIXTURE INSTALLATION

A. Provide outlet boxes for recessed fixtures in a manner approved by the Code. In non-accessible ceilings provide access to junction boxes, ballast, transformers, and battery packs through fixture apertures: no access panels in ceiling. Provide appropriately temperature rated insulation for branch wires to recessed fixtures.

B. Install lighting fixtures securely, level, plumb, aligned, and in straight rows. Lighting fixtures must be installed so they do not shift during relamping or adjustment.

C. Recessed Fixtures:

1. Supports: Provide seismic clips and bracing per Code. Refer to Section 26 05 00 Common Work Results for Electrical.
2. Holes for Recessed Fixtures
3. Minimum-width fixture trims are specified for this project. Cut holes to follow fixture housing exactly so no gaps will be visible after trims are installed.
4. Round holes in acoustic tiles: Pre-cut in center of tiles, using adjustable-diameter cutter on slow-speed drill press.
5. Install bottom of housing aligned with finished ceiling.
6. Keep ceiling insulation at least 3” away from fixture.
7. Install trims after painting of spaces. Install trims tightly, with no gaps, or light leaks. For exterior fixtures provide seals and gasketing to prevent insect entry into the fixtures. If soffits recessed fixtures are not available with a sealed housing, provide effective gasketing for the lens and for the lens trim/soffit surface interface.

D. Ceiling-Mounted and Pendant Fixtures:

1. Supports: Provide support for outlet boxes so fixtures can be installed securely, including seismic supports and restraints per Code.
2. Fixture weight less than 50 lb. at each suspension point: hang from strap or stud on outlet box.

END OF SECTION 26 50 00