SCANNED

PROJECT MANUAL

SPECIFICATIONS

For

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
OFFICE OF REGULATION SERVICES
04 110031
AC SD FLS DN SS JW
DATE NOV 24 2009
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SANTA ANA UNIFIED SCHOOL DISTRICT

SANTA ANA, CALIFORNIA

JOHN MUIR FUNDAMENTAL ELEMENTARYSCHOOL
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PREPARED BY

gkkworks

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DSA RE-SUBMITTAL **November 10, 2009**

JOHN MUIR FUNDAMENTAL SCHOOL

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PROJECT MANUAL

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SECTION 02100

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surveying requirements for the Work.

1.02 RELATED SECTIONS

A. Section 02310: Earthwork

B. Section 02740: Asphalt Pavement

C. Section 02750: Concrete Pavement

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 SUBMITTALS

A. CONTRACTOR shall submit the name and address of the State of California licensed surveyor to ARCHITECT and/or CONSTRUCTION MANAGER including any changes as they may occur.

B. At request of ARCHITECT and/or CONSTRUCTION MANAGER, CONTRACTOR shall submit copies of cut sheets, coordinate plots, data collector printouts, and other documentation as available to verify completeness and/or accuracy of field surveying Work.

3.02 LAYOUT OF THE WORK

A. CONTRACTOR shall employ a State of California licensed surveyor to lay out the entire Work, set grades, lines, levels, control points, vertical and horizontal control, elevations, grids and positions. Before the commencement of Work, surveyor shall, in conjunction with OWNER provided engineering survey of the Project site, locate all reference points and benchmarks, then lay out all lines, elevations, and measurements for the entire Work including but not limited to, buildings, grading, paving and utilities.

3.03 SURVEY REQUIREMENTS

A. Establish a minimum of two permanent horizontal and vertical control points on the Project site, remote from the building area, referenced to data established by the survey control points.

B. Indicate the reference points on the project record drawings with the basis of elevation being the established benchmarks.

C. Establish lines, grades, locations and dimensions by instrumentation. From time to time, verify the layout of all Work by the same methods.

D. Provide grade stakes and elevations to construct over excavation and re-compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.

E. Calculate and layout proposed finished elevations and intermediate control as required to provide smooth transitions between the spot elevations indicated in the Contract Documents.

F. Provide stakes and elevations for grading, fill, and topsoil placement.

G. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or AC surfaces at key locations such as BC's, EC's, grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.

H. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.

I. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.

J. Submit a certification signed by the surveyor confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured elevations on the completed sub-grade, recorded to the nearest 0.01'. Building pad tolerance will be +- 0.10'.

3.04 ESTABLISHMENT OF GRADES IN PAVING AREAS

A. All work shall conform to the lines, elevations, and grades shown on the Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Construction Manager. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

B. Areas having drainage gradients of 2% or more shall have elevation stakes, set with instrument, at grid intervals of 25 feet. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes. Grade stakes must be set at all grade breaks, grade changes, etc.

C. Areas having drainage gradients of less than 2 percent shall have elevation stakes, set with instrument, at 10 foot intervals. Grade stakes must be set at all grade breaks, grade changes, etc.

D. Protect and maintain stakes in place until their removal is approved by the District. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at the expense of Contractor.

3.05 RECORD DRAWINGS

A. Upon Substantial Completion, CONTRACTOR shall obtain and pay for reproducible transparencies of the as built survey drawings. Deliver to Construction Manager, final "record" drawings of the original drawings and completed Work within specified tolerances.

B. Record drawings shall indicate locations by coordinate of all utilities onsite with top of pipe elevations at major grade and alignment changes, rim grate or top-of-curb and flow line elevations of all drainage structures and manholes.

C. Completed record drawing transparencies shall be signed and certified as correct and within specified tolerances by the licensed surveyor.

D. Attention is called to other sections of the Contract Documents requiring verification or measurements of installed Work by survey. Surveyor shall perform and certify all such surveys or verification are completed in accordance with the Contract Documents.

END OF SECTION

SECTION 02310

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. The work of this section shall include excavation, unclassified cut, unclassified fill, removing existing unsatisfactory material, preparing areas to be filled, spreading and compacting of fill in the areas to be filled, and all other work necessary to complete the grading of the site. It shall be the Contractor's responsibility to place, spread, moisten or dry, and compact the fill in strict accordance with these specifications to the lines and grades indicated on project plans or as directed in writing by the Construction Manager. Included with this Work are the following:

1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.
2. Excavating, filling, backfilling, and compacting for Project site pavement, planting areas, buildings, and other structures.
3. Drainage and moisture-control fill course for slabs-on-grade.
4. Subbase course for walks and pavements.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches within buildings lines.
7. Excavating and backfilling for underground mechanical and electrical utilities and appurtenances.
8. Shoring plan guidelines.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Section 01090 - Reference Standards.

1.2 SYSTEM DESCRIPTION

A. General:

1. Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.
4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on buried utilities and pipelines.

1.3 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Subbase Course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and the surface of a pavement or walk.

E. Base Course: The layer placed between the subbase and surface pavement in a paving system.

F. Drainage Fill: Aggregate around perforated pipe: pea gravel containing no particles finer than a 3/4 inch sieve opening size.

G. Permeable Backfill: Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations.

H. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

J. Utilities include underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Imported Soils: A Geotechnical Engineer, retained by the Contractor as a Contractor Consultant, shall obtain initial product Sample for Testing in accordance with the terms as specified in Section 01440 – Environmental Soils Testing.

C. Product data for the following:

1. Each type of plastic warning tape.
2. Filter fabric.

D. Samples of the following:

1. 20-lb sample, sealed in air-tight container, of proposed drainage fill materials.
2. 12-by-12-inch sample of filter fabric.

E. Excavation support & protection (shoring) shop drawings for informational purposes: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.

F. Test Reports: In addition to test reports required under field quality control, submit the following to the Owner's Inspector:

1. Laboratory analysis of each soil material proposed for fill or backfill from borrow sources.
2. One optimum moisture-maximum density curve for each soil sample.
3. Report of actual unconfirmed compressive strength of each stratum tested.

1.5 QUALITYASSURANCE

A. Codes and Standards:

1. California Building Code, Appendix Chapter 33, latest Edition.
2. ASTM D422 - Method for Particle Size Analysis of Soils.
3. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54 kg) and 18-inch (457-mm) Drop.
5. ASTM D221 6 - Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
6. ASTM D2922 - Test Method for Density of Soil and Soil-Aggregate in Place by

Nuclear Methods (Shallow Depths).

7. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depths).
8. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
9. AASHTO T217 - Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Meter.
10. UBC Standard No. 18-2 - Expansion Index Test.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01440.

C. Pre-Grading Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1. Before commencing earthwork operations, meet with representatives of the governing authorities, Owner, Construction Manager, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.6 CONSTRUCTION MONITORING

A. All earthwork and foundation construction should be monitored by a qualified engineer/technician under the supervision of a Geotechnical Engineer, including;

1. Observation of all site preparations;
2. Observation of shoring installation, if needed:
3. Observation of all site excavations;
4. Test and approval of all import soil;
5. Observation of placement of all compacted fills and backfills;
6. Observation of all surface and subsurface drainage systems;
7. Observation of all foundation and pile excavations;
8. Observation of subgrade preparation for paved and building areas.

B. The Geotechnical Engineer employed by the contractor shall be notified at least three (3) days in advance of the start of construction. A joint meeting between the Contractor and Geotechnical Engineer is recommended prior to the start of construction to discuss specific procedures and scheduling. The Geotechnical Engineer shall be present to observe the soil conditions encountered during construction, to evaluate the applicability of the recommendations presented in the Soils Report to the soil conditions encountered, and to recommend appropriate changes in design or construction if conditions differ from those described herein. The Geotechnical Engineer shall inspect and approval all imported backfill material prior to its placement as backfill, approve the subgrade beneath all fills, fill placement and bottom of all foundation excavations before concrete or steel is placed.

C. The Geotechnical Engineer shall submit compaction reports to the Construction Manager and the Civil Engineer at the completion of the work, including test results and plot plans indicating the locations from which the tested samples of fill were taken. The Geotechnical Engineer shall keep the Construction Manager informed on the progress of the grading work.

1.7 PROJECT CONDITIONS

A. Information on Drawings or in soil investigation report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner

or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.

1. Provide a minimum 48-hours' notice to the Construction Manager and utility owners and receive written notice to proceed before interrupting any utility.

C. Where subsurface utilities are shown on the plans to be removed, the Contractor, at its option, may either completely remove or abandon said utility in place. However, the Contractor shall completely remove said utility beneath any proposed building or where said utility would interfere with any proposed improvement (including landscaping). Should the Contractor elect to abandon any utility in place he shall cap-off, de-energize and otherwise take out of service and completely backfill said utility with 1-1/2 sack sand-cement slurry mixture wherever it has been exposed. Coordinate with utility companies to shutoff services if lines are active.

D. Noise and Dust Abatement: Exercise all reasonable and necessary means to abate dust, dirt rising and undue noise. Perform necessary sprinkling and wetting of construction site to allay dust as required by applicable codes and ordinances.

2 PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: All soils materials to be used throughout the site shall be approved for use by the Contractor's Geotechnical Engineer. Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.No earthwork analysis has been completed with respect to the volumes of soils to be excavated, placed, or imported in order to provide the finished grades shown on the plans. <u>The Contractor is solely responsible for verifying the earthwork quantities necessary to complete the project.</u>

Furthermore, there has been no analysis to determine footing spoils and/or bulking or shrinkage during earthwork operations.

B. Satisfactory Soil Materials: Soils approved by the testing geotechnical engineer and free of rock or gravel larger than 3 inches in any dimension, debris, waste, vegetation and other deleterious matter and at least 80 percent of the material shall pass through a U.S. Standard 1/2 inch Sieve and no more than 40 percent shall pass through a U.S. Standard 200 sieve. Material swell shall be less than 2 percent and the sulfate content less than 0.2 percent on any imported fill. Expansion index of material shall be less than 20.

C. Borrow Fill Material: Satisfactory soil materials, as described above. Materials shall also conform to requirements specified in Section 01440 – Environmental Soils Testing and related sections. In addition, imported soil materials shall not consist of crushed concrete, asphalt, construction debris, or other deleterious materials.

D. Backfill and Fill Materials: Satisfactory soil materials, as described above. In addition, imported soil materials shall not consist of crushed concrete, asphalt, construction debris, or other deleterious materials.

E. Engineered Fill: Satisfactory soil materials and crushed stockpiled materials as described above.

F. Bedding Material for Trenches:

1. Bedding sand shall be as defined by Standard Specifications for Public Works Construction, 2006 Edition (Green Book) Section 200-1.5, and shall be free of expansive material and organic matter. Bedding material for utility lines outside the property lines shall be as required by the agency having jurisdiction. <u>On-site soils are not considered suitable for bedding or shading of utilities.</u>

2. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour. All of the sand bedding shall be compacted to 90 percent of maximum density as indicated in the Contract Documents by mechanical means. Flooding and jetting shall not be permitted without prior written approval from the Engineer. Pipe bedding material shall be placed in horizontal layers not exceeding (8) eight inches. After the sand has been compacted the remainder of the trench shall be backfilled.

G. Backfill Material for Trenches:

1. The on-site soils may be used for backfilling utility trenches from one foot above the top of pipe to the surface, provided the material is free of organic matter and deleterious substances. Any soft and/or loose materials or fill encountered at pipe invert should be removed and replaced with properly compacted fill or adequate bedding material.

2. Where Construction Documents indicate areas of backfill requiring cement-sand slurry, the material requirements in Section 02750 – Concrete Pavement shall be followed.

H. Drainage Fill: Washed pea gravel containing no particles finer than a 3/4 inch sieve opening size.

I. Permeable Backfill:

1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations, which are identical to Caltrans Class 2 permeable material.

Sieve Size:	Percentage Passing:
1 inch	100
3/4 inch	90-100
3/8 inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

2. Permeable material shall have a Sand Equivalent value of not less than 75.

3. Provided backing for weep-holes shall consist of 3 cu. ft. of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.

4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system such as Miradrain by Mirafi, Inc., or equal, may be provided if reviewed by the Architect

2.2 ACCESSORIES

A. Warning Tape: Acid and alkali-resistant polyethylene film metallic warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.

1. Tape Colors: Provide tape colors to utilities as follows:

a. Red: Electric.
b. Yellow: Gas, oil, steam, and dangerous materials.
c. Orange: Telephone and other communications.
d. Blue: Water systems, with "Caution: Water Line Below."
e. Green: Sewer systems, with "Caution: Sewer Line Below."

B. Drainage pipe and fittings.

1. Perforated Polyvinyl Chloride Pipe: ASTM D 2729 or as described on Construction Documents.

2. Unless otherwise indicated, use perforated pipe at subdrainage system; unperforated through sleeved walls.

C. Filter Fabric: Manufacturer's standard nonwoven pervious geotextile fabric of polypropylene geotextiles, "Mirafi 140N" or approved equal.

1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:

a. Grab Tensile Strength (ASTM D 4632): 100 lb.
b. Apparent Opening Size (ASTM D 4751): #70 U.S. Standard sieve.
c. Permeability (ASTM D 4491): 135 gallons per minute per sq. ft.

2.3 EXCAVATION SUPPORT & PROTECTION – SHORING PLAN

A. The CONTRACTOR shall have at the Worksite, copies or suitable extracts of: Construction Safety Orders, Tunnel Safety Orders and General Industry Safety Orders issued by the State Division of Industrial Safety. The CONTRACTOR shall comply with provisions of these and all other applicable laws, ordinances, and regulations.

B. Before excavating any trench 1 .5m (5 feet) or more in depth, the CONTRACTOR shall submit a detailed plan to the SCHOOL DISTRICT showing the design of shoring, bracing, sloping, or other revisions to be made for the Workers' protection from the hazard of caving ground during the excavation of such trench. If the plan varies from the shoring system standards, the plan shall be prepared by a registered Civil Engineer. No excavation shall start until the DISTRICT has accepted the plan and the CONTRACTOR has obtained a permit from the State Division of Industrial Safety. A copy of the permit shall be submitted to the DISTRICT.

C. The INSPECTOR will provide a competent person trench/excavation certification form to the CONTRACTOR. It shall be completely filled out before any worker has access to trench or excavation and returned to the INSPECTOR before the end of the first working day. The CONTRACTOR shall certify by this form the name of the competent person administering the Work, the soil classification, and the type of excavation protective system provided and/or installed.

D. The CONTRACTOR shall completely fence all excavations to provided protection against anyone falling into the excavation and to the satisfaction of the INSPECTOR. The fencing shall be in place at all times except when workers are present and actual construction operations are in progress.

E. The fencing material shall be chain link fabric or welded wire fabric (6x6-W9xW9 minimum) and 1.5 m (5 feet) high, constructed according to one of the following:

1. Tensioned fencing material and have top and bottom tension wires securely fastened to driven steel posts or other equally rigid elements at a maximum spacing of 3.6m (12 feet); or

2. Untensioned fencing materials securely fastened to extended trench shoring elements at a maximum spacing of 2.4m (8 feet) and fastened to continuous top and bottom rails constructed of nominal 50mm x 100mm (2 in x 4 in) lumber or equally rigid material. Framed panels with suitable supporting elements fastened together to form a continuous fence may also be used.

F. Payment for performing all work necessary to provide safety measures shall be included in the prices bid for other items of work except where separate bid items for excavation safety are provided, or required by law.

3 PART 3 - EXECUTION

3.1 PREPARATION

A. Protect adjacent property and existing improvements and structures as necessary to prevent undermining, caving of cuts, and miscellaneous damage.

B. Provide cribbing, sheeting, and shoring necessary to safely retain the earth banks and protect excavations and adjoining grades from caving and other damage resulting from excavating together with suitable forms of protection against bodily injury to personnel employed on the work and the general public. Be responsible for the design, installation, and maintenance of required cribbing and shoring and shall meet the approval of the State Division of Industrial Safety and local governing agencies requirements.

C. Utility lines and structures shown shall be protected and treated as indicated. Where work not shown is encountered, report it to the Architect before proceeding with excavation. Encase active lines in sleeves where they pass through concrete; remove inactive lines as directed, and plug the remaining ends. Bear the costs for repairs to damaged or broken utilities and any damages related thereto.

D. An on-site, Pre-grading Meeting with the Architect, the General Contractor, and Geotechnical Engineer, Inspector and the Utility Line and Earthwork Subcontractor(s) is required prior to all grading related operations. The Pre-Job Conference will immediately follow the Pre-Construction Conference. Attendance is mandatory. City Inspection representatives and Utility Company representatives may also attend.

E. Protect existing improvements and adjacent properties from storm damage and flood hazard originating on this project until final acceptance by the Owner. Prevent silt run-off from the limits of work in accordance with governmental requirements.

F. A 6 foot high, temporary chain link fence and gates, (pair 26' wide, minimum) shall be erected prior to any grading operations at the construction limits perimeter. Coordinate the exact location with Architect and Inspector.

3.2 DEWATERING

A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Any water entering an excavation shall be immediately pumped out and the exposed excavation allowed to dry.

B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.3 GRADE STAKES

A. The Contractor's Surveyor will set grade stakes. The Surveyor shall be a California registered land surveyor or licensed Civil Engineer. The Surveyor shall be hired and paid by the Contractor, and shall be subject to the approval of the District. Contractor shall notify the District at least 48 hours before staking is to be started. The District will determine if work is ready for staking.

B. All work shall conform to the lines, elevations, and grades shown on the Construction Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

C. Protect and maintain stakes in place until their removal is approved by the District. Grade or location stakes lost or disturbed by the Contractor, shall be reset by the Surveyor at the expense of Contractor.

D. Grades for underground conduits will be set at the surface of the ground. The Contractor shall transfer them to the bottom of the trench.

3.4 EXCAVATION

A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork", except as modified herein.

B. Strip vegetation- Site Clearing and Section "C", page 15, of the Geotechnical Report. This material shall be disposed off site in a legal manner.

C. All unsupported sides of excavations shall have a slope no greater than 1 (horizontal) to 1-1/2 (vertical). Where due to site conditions, it is not possible to maintain this minimum ratio the sides of the excavation (whether for building foundation, utility trench or cut back) shall be supported by engineered shoring.

D. Excavate to the depths, lines and grades indicated on the approved Grading Plan. Excavate sufficiently over-size to permit installation and removal of concrete forms and other required work. Should soil of inadequate density and bearing capability be encountered at the elevations indicated on the drawings, or where new fill is to be placed upon existing loose fill material exposed by excavation, the excavation shall be carried to the depth required to attain soil of bearing quality as determined by the Geotechnical Engineer.

E. Footing pads, if poured neatly, may be excavated to the net pad widths plus two-inches if approved by the Architect. Approval shall not be given until the completed excavation has been inspected.

F. Should footing excavations exceed required dimensions or should sloughing occur, fill such extra space with concrete at no additional cost to the contract. If unsuitable material is found at the indicated depths, immediately notify the Architect.

G. Notify the Inspector 48 hours before foundation excavations are ready for inspection.

H. The bottoms of footings shall be free of loose material, debris, and water before concrete is placed.

I. Cut banks shall be neatly trimmed to the required finish surface as the cut progresses, or the Contractor shall have the option of leaving the cuts full and finish grading by mechanical equipment which shall produce the finish surfaces as shown on the Drawings.

J. Surplus earth not needed for filling and grading shall be disposed of in a legal manner off the site.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.10 foot. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.

B. Excavation for Footings, Foundations and Slabs: Soil under all building footings, foundations and slabs shall be over-excavated and the soil replaced as engineered fill as described below. Refer to Geotechnical Report for more information. Temporary unsupported excavations shall not exceed 1.5:1 (horizontal:vertical) to a maximum depth of 4 feet without prior authorization from the testing geotechnical engineer.

1. Over-Excavation Below Footings:

a. All existing onsite fill within the building areas shall be removed.

b. In addition, the following parameters are to be followed:

1) The depth of soil overexcavation and recompaction beneath footings should be to the minimum depth of two feet below footing bottoms. The overexcavations should extend laterally beyond footing edges to a distance equivalent to the depth of

overexcavation below footings, and to a minimum of five feet beyond building perimeters, where possible. The overexcavations should be backfilled with granular fill materials compacted to a minimum 90 percent relative compaction.

2) The bottom of overexcavated areas should be reworked to a minimum six-inch depth and recompacted to a minimum 90 percent relative compaction to a uniform near optimum moisture condition prior to backfilling with approved soils.

3) The depth of soil overexcavation should be reviewed by Geotechnical Engineer during the actual construction. Any subsurface obstruction, buried structural elements, and unsuitable material encountered during grading, should be immediately brought to the attention of Geotechnical Engineer for proper exposure, removal and processing, as recommended.

4) All overexcavated areas must be observed by the testing geotechnical engineer prior to recompaction to insure that a suitable foundation bottom has been achieved.

c. Existing onsite granular fill may be used for engineered fill after the removal of deleterious material, as directed by the geotechnical engineer, and the aeration of overly moist or wet material.

d. Soft, wet and compressible soils encountered at bottom of overexcavation shall be removed to a depth of 2 feet and a 2 foot deep course of 3/4 inch to 1 inch gravel or crushed rock shall be placed for supporting structural fill material.

2. Over-Excavation below slabs: 4.0 feet minimum below existing grade or pad grade, whichever is lower, and to a distance of at least 5.0 feet outside their exterior perimeter footing walls. The exposed over-cut surface should then be scarified to an additional depth of at least 6 inches, watered or aerated as required, thoroughly mixed to a uniform near optimum moisture condition, and re-compacted to at least 90 percent of the ASTM D-1557 laboratory test standard. Back fill with selected and segregated granular non-expansive native materials and/or approved imported non-expansive soils. All backfill should be moisture conditioned and compacted by mechanical means in approximate 6 inch thick lifts. The degree of compaction obtained should be at least 90 percent of the ASTM D-1557 laboratory test standard.

3. Side Transition Slope of Excavations: All unsupported side slopes (at either the perimeter of the interior of the excavation) shall be cut at a minimum 1 (vertical) to 1-1/2 (horizontal) ratio.

4. Below slab base course: Below all building on-grade slabs there shall be a 4 inch course of free draining material and impervious membrane constructed as follows: 2 inches of clean, coarse sand over the engineered fill, a continuous 8 mil polyethylene impervious membrane sheet, with edges taped, and 2 inches of clean, coarse sand over the impervious membrane. The building slab shall be founded directly on the exposed base course layer.

5. No underground obstructions or questionable material should remain within the building areas. Depressions or cavities created as a result of the removal of these materials should be filled with engineered fill.

6. Care should be taken during foundation construction to maintain moisture contents of the exposed native subgrade soils at footing bottoms to near existing in-situ soil moisture conditions, or to not less than 3 percent points above optimum moisture content, and should be confirmed by additional testing prior to foundation construction.

3.6 EXCAVATION FOR CONCRETE FLATWORK

A. Excavate surfaces under concrete walks 2.5 feet minimum below existing grade or finished subgrade surface, whichever is lower, and to a distance of at least 2.0 feet beyond the lateral limits. The exposed over-cut surface should then be

scarified to an additional depth of at least 6 inches, watered or aerated as required, thoroughly mixed to a uniform near optimum moisture condition, and re-compacted to at least 90 percent of the ASTM D-1557 laboratory test standard. Back fill with selected and segregated granular non-expansive native materials and/or approved imported non-expansive soils. All backfill should be moisture conditioned and compacted by mechanical means in approximate 6 inch thick lifts. The degree of compaction obtained should be at least 90 percent of the ASTM D-1557 laboratory test standard. Subgrade soils should exhibit a firm, unyielding surface in addition to the recommended compaction.

3.7 EXCAVATION FOR ASPHALT PAVEMENTS

A. Excavate surfaces under asphalt pavements 2.5 feet minimum below existing grade or finished subgrade surface, whichever is lower, and to a distance of at least 2.0 feet beyond the lateral limits. The exposed over-cut surface should then be scarified to an additional depth of at least 6 inches, watered or aerated as required, thoroughly mixed to a uniform near optimum moisture condition, and re-compacted to at least 90 percent of the ASTM D-1557 laboratory test standard. Back fill with selected and segregated granular non-expansive native materials and/or approved imported non-expansive soils. All backfill should be moisture conditioned and compacted by mechanical means in approximate 6 inch thick lifts. The degree of compaction obtained should be at least 90 percent of the ASTM D-1557 laboratory test standard. Subgrade soils should exhibit a firm, unyielding surface in addition to the recommended compaction.

3.8 EXCAVATION, BACKFILL & COMPACTION FOR UTILITIES

A. Field conditions may require deviations from information indicated on Drawings. Such changes in work shall be covered by a Change Order, indicating an increase or decrease in the Contract sum.

B. Before excavation, Contractor shall contact the "Underground Service Alert of Southern California" (USASC) for information on buried utilities and pipelines.

C. When connections are to be made to any existing pipe, conduit, or other appurtenances, the actual elevation or position of which cannot be determined without excavation, the Contractor shall excavate for, and expose, the existing improvement before laying any pipe or conduit. The Engineer shall be given the opportunity to inspect the existing pipe or conduit before connection is made. Any adjustments in line or grade which may be necessary to accomplish the intent of the plans will be made, and the Contractor will be paid for any additional work resulting from such change in line or grade.

D. Trenches, ditches, pits, sumps, and similar items which are outside the barricaded working area shall be barricaded to conform to Cal OSHA standards.

E. Trenches over 5'-0" in depth shall conform to the Construction Safety Orders of the California Division of Industrial Safety, see Section 2.3 EXCAVATION SUPPORT & PROTECTION – SHORING PLAN.

F. Safe and suitable ladders, which project 2 feet above the top of the trench, shall be provided for all trenches over 4 feet in depth. One ladder shall be provided for each 50 feet of open trench, or fraction thereof, and be so located that workers in the trench need not move more than 25 feet to a ladder.

G. Where indicated and/or required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.

H. All trenches should be backfilled with approved fill material compacted to relative compaction of not less than 90 percent of maximum density determined in accordance with ASTM D 1557. Backfill shall be placed in layers not exceeding 8" (inches) in thickness

I. Backfill over excavations to the required elevations with earth, gravel, sand, or

concrete and compact as required. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. Slope adjacent grades away from excavations to minimize entry of water.

J. Do not excavate trenches parallel to footings closer than 18" from the face of the footing or below a plane having a downward slope of 2 horizontal to one vertical, from a line 9" above bottom of footings.

K. Unless otherwise indicated on Drawings, depth of excavations outside the buildings shall allow for a minimum coverage above top of pipe, tank or conduit measured from adjoining finished grade, as follows:

a.	Steel Pipe	- 24" below finished grade
b.	Copper Water Tube	- 24" below finished grade in non-traffic bearing areas - 30" below finished grade in traffic bearing areas
c.	Ductile-Iron Pressure Pipe	- 36" below finished grade
d.	Copper Pipe (domestic water)	- 24" below finished grade
e.	Plastic Pipe (domestic water)	- 30" below finished grade
f.	Plastic Pipe (fire)	- 36" below finished grade
g.	Tanks or other structures	- 36" below finished grade
h.	Soil, sewer & storm drain	- minimum 12" below finished grade, and as required for proper pitch and traffic load.

L. Unless indicated otherwise, excavate trenches to the required depths for utilities, such as pipes, conduit and tanks, with minimum allowances of 6 inches at the bottom and 6 inches at the sides for bedding of unprotected piping or as required for concrete encasement of conduits as indicated on Drawings. Maximum allowances at the sides for trenching shall be 12 inches. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before installing sand bedding or concrete encasement.

M. Where portions of existing structures, walks, paving, etc. must be removed or cut for pipe or conduit installation, replace the material with equal quality, finished to match adjacent work.

N. Provide a minimum clear dimension of 6 inches from sides of wall excavation to outer surfaces of buried pipes or conduits installed in the same trench or outside surfaces of containers and/or tanks.

O. Install warning tape directly above sewer & water pipes, 12 inches above top of pipe, where applicable.

P. DO NOT place backfill until the bedding and pipe work installed has been inspected, tested and approved by the District Inspector. Remove excavated rocky material unsuitable for backfill from the site prior to final backfilling.

Q. If materials excavated from the Project site are not permitted for trench backfill in paved areas or as specified in Contract Documents, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grade plus one inch.

R. Bedding zone shall be defined as the area containing the material specified that is supporting, surrounding, and extending to 12 inches above the top of pipe. Compaction requirements in this area must meet 90%.

S. Bedding material shall first be placed on a firm and unyielding subgrade so that the pipe is supported for the full length of the barrel. There shall be 6" (inch) minimum of bedding below the pipe barrel and 1" (inch) clearance below a projecting bell for sewer, storm drain and water pipe. The material in the bedding zone shall be placed and densified by mechanical compaction only.

T. Mechanically compacted backfill shall comply with section 306-1.3.2 of the Standard Specifications for Public Works Construction, 2006 Edition.

U. All electrical conduit shall be encased in concrete. Provide a 6" mat of concrete, per electrical, to elevation for installing conduit. Secure conduit in place to prevent displacement during completion of the concrete cover.

V. Upon completion of the installation of the conduit, complete the concrete cover as specified. All encasement concrete shall be colored as specified for marker tapes.

W. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings.

X. If soft, spongy, unstable, or other unsuitable material is encountered upon which the bedding material or pipe is to be placed, this material shall be removed to a depth ordered by the Engineer and replaced with bedding material suitably densified. Additional bedding so ordered, over the amount required by the Plans or Specifications, will be paid for as provided in the Bid. If the necessity for such additional bedding material has been caused by an act of failure on the part of the Contractor or is required for control of groundwater, the Contractor shall bear the expense of the additional excavation and bedding.

Y. Fill voids with approved backfill materials as shoring bracing and sheeting is removed.

3.9 INSPECTION & TESTING AT TRENCHES

A. Pipe will be inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be subject to rejection. Any corrective work shall be approved by the Engineer and shall be at NO cost to the Owner.

B. The Inspector or Geotechnical Engineer will inspect all subgrades and excavations prior to placing bedding & backfill materials.

C. DO NOT place backfill until the bedding and pipe work installed has been inspected, tested and approved by the District Inspector. Remove excavated rocky material unsuitable for backfill from the site prior to final backfilling.

D. Utility backfill compaction test shall be performed in accordance with ASTM D1557, method "C".

E. Utility backfill in place density test per ASTM D 1556 (sand cone) or ASTM D 2937 (drive tube).

F. Pressure tests shall be done only after backfill has been placed and final compaction has been achieved.

3.10 APPROVALOFSUBGRADE

A. Notify Geotechnical Engineer when excavations have reached required over-excavation subgrade.

B. When Geotechnical Engineer determines that unforeseen unsatisfactory soil is present, continue work only after receiving direction from the Contracting Officer.

C. Reconstruct subgrades damaged by rain, accumulated water or construction activities as directed by the Soils Engineer.

3.11 UNAUTHORIZED EXCAVATION

A. Fill of unauthorized excavation below bottoms of foundations or wall footings will be

engineered fill.

B. Fill unauthorized excavations under other construction as directed by the Soils Engineer.

C. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Geotechnical Engineer.

3.12 STORAGE OF SOIL MATERIALS

A. After the site has been stripped of all debris, vegetation and organic materials, excavated on site soils may be reused for engineered fill provided the organic content does not exceed 3 percent. High in-site moisture contents will require aeration prior to placement as engineered fill. Rocks or chunks of concrete or asphalt greater than 3 inches in any dimension shall not be incorporated into engineered fill. The Expansion Index value should not exceed a maximum of 20, essentially non-expansive.

B. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees. Cover to prevent wind-blown dust.

3.13 PLACEMENT OF ENGINEERED FILL

A. General:

1. It is recommended that the upper 4.0 feet of soils below any building interior slab on grade construction consist predominantly of granular material (expansion index less than 20), compacted to minimum 90 percent relative compaction at near optimum moisture contents. Prior to placement of the above recommended granular fill layer, the upper 6 inches of exposed native subgrade should be reworked to 90 percent relative compaction near optimum moisture contents.

B. Preparation of the bottom of the excavation:

1. Wherever engineered fill is to be placed, the upper 6 inches of subgrade should, after stripping or over-excavation be scarified and re-compacted to a minimum 90 percent relative compaction before any fill materials are placed.

C. Placing Spreading and Compacting Fill Material:

1. The general fill materials shall be placed by the Contractor in horizontal layers not greater than 6 inches thick, measured before compaction. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain uniformity of material and moisture in each layer. On-site and import materials shall be moisture conditioned to near optimum moisture contents for granular soils, and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method D1557. When the moisture content of the fill material is too high, the fill materials shall be aerated by the Contractor by blading, mixing, or other satisfactory methods until the moisture content is as specified.
2. After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to the specified density. Final moisture conditioning, rolling, and compaction confirmation testing should be performed immediately prior to placing the overlying rock base or concrete slab. Compaction shall be accomplished by sheepsfoot rollers; vibratory rollers; multiple-wheel, pneumatic-tired rollers; or other types of acceptable compacting equipment. Equipment shall be of such design that it will be able to compact the fill to the specified density. Compaction shall be continuous over the entire area, and the equipment shall make sufficient passes to obtain

the desired density uniformly. Jetting, puddling and hydroconcolitation techniques shall not be used.

3. When backfilling and compacting behind retaining walls and flexible retaining structures, the Contractor shall use lightweight compaction equipment such as hand-operated equipment, shoring, or other means to avoid over-stressing structural walls. When using lightweight compaction equipment, the fill materials shall be spread in horizontal layers not greater than 6 inches thick, measured before compaction.

D. Observation and Testing: The Geotechnical Engineer's representative shall observe the excavation, filling, and compacting operations and shall make density tests in the fill material so that he can state his opinion as to whether or not the fill was constructed in accordance with the specifications. If the surface is disturbed, the density tests shall be made in the compacted materials below the disturbed zone. When these tests indicate that the density or moisture content of any layer of fill or portion thereof does not meet the specified density or moisture content, the particular layer or portions shall be reworked until the specified density and moisture content have been obtained.

3.14 BACKFILL - GENERAL

A. Backfill excavations promptly, but not before completing the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Testing, inspecting, and approval of underground utilities.
4. Concrete formwork removal.
5. Removal of trash and debris from excavation.
6. Removal of temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.15 SUBSURFACE DRAINAGE BACKFILL

A. General: Subsurface drains consisting of plastic pipe shall be installed as shown on the plans and in accordance with these specifications.

B. Protect in-place membrane waterproofing during installation of foundation drainage systems.

C. Drainage Fill at Footings: After concrete footings have been cured and forms removed, place drainage fill material on top of the footing bottom. Place and compact drainage fill to dimensions indicated on Construction Drawings.

D. Place a layer of filter fabric around perimeter of drainage trench. Place supporting layer of filtering material over compacted subgrade where drainage pipe is to be laid to depth indicated or, if not indicated, to a compacted depth of not less than 6".

1. After testing drain lines, place additional filtering material to a 6" depth around sides and top of drains.

E. Laying Drain Pipe: Lay drain pipe solidly bedded in drainage fill materials. Provide full bearing for each pipe section throughout its length, to true grades and alignment, and continuous slope in direction of flow.

1. Lay perforated pipe with perforations down and joints tightly closed in accordance with pipe manufacturers recommendations. Provide collars and couplings as required.

F. Testing Drain Lines: Test or check lines before backfilling to assure free flow. Remove obstructions, replace damaged components, and retest system until satisfactory.

G. Drainage Fill: Place remaining drainage fill over drain lines after satisfactory testing. Completely cover drain lines to a width of at least 6" on each side and 18" above top of pipe. Place a layer of filter fabric over drainage fill prior to placing permeable backfill.

Place permeable backfill in layers not exceeding 6" in loose depth and compact each layer placed.

H. Connect all foundation drain pipe to storm drain system.

3.16 FILL - NON-ENGINEERED

A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.

1. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so
fill material will bond with existing surface.

B. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.

C. Place fill material in layers to required elevations for each location listed below.

1. Under grass, use satisfactory excavated or borrow soil material.
2. Under walks and pavements, use satisfactory excavated or borrow soil material.
3. Under footings and foundations, use engineered fill.

3.17 GRADING

A. Remedial Grading: Perform remedial grading per Geotechnical Engineer's Report and recommendations, as if they were repeated herein.

B. Rough & Fine Grading: Rough grade area sufficiently high to require cutting by fine grading.

C. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between existing adjacent grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
3. Grade area for paving to a depth below finish grades indicated, equal to base and pavement thickness to be constructed.
4. Cut banks neatly to required finish grades as cut progresses, or leave cuts full and finish grading by mechanical equipment, which will produce finish grades indicated on Drawings.
5. Grade filled banks full and compact beyond grade of finish bank so that when trimmed to finish grades, soil is compacted to density specified for final slope face.
6. Bring areas to be graded to approximate finish grades and then scarify, moisten and roll to obtain required density. Scarify, moisten and roll resulting high and low areas to obtain required finish grades by cutting and filling.
7. Grade future planting areas so that, upon cultivation and fertilization, they will conform to finish grades indicated for planting areas.
8. Protect all utilities.

D. Site Grading: Slope grades to direct water away from buildings and to prevent ponding.
Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 0.10 foot.

2. Walks: Plus or minus 0.10 foot.
3. Pavements: Plus or minus 1/2 inch.

E. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 BASE COURSES

A. Under pavements, place base courses per Section 02740 – Asphalt Pavement.

3.19 FIELD QUALITY CONTROL & INSPECTION

A. The Geotechnical Engineer, retained by the Contractor as a Contractor Consultant, will sample imported fill materials from their designated source and submit all samples to the independent approved testing laboratory before delivery to the Project site as specified in Section 01440 – Environmental Soils Testing.

B. A Geotechnical Engineer designated by the Owner will be engaged to perform continuous inspection of the placing and compacting of all fills and backfills within the limits of grading of this project. All work shall be done in accordance with the approved plans and these specifications and as recommended and approved by the Geotechnical Engineer. Revised recommendations relating to conditions differing from the approved soils engineering and engineering geology reports shall be submitted to the district, inspector, and the civil engineer. Costs for all such inspections and tests shall be paid by the Owner. The Contractor shall be responsible for notifying the Geotechnical Engineer in advance so that he may be present to perform his services as needed.

C. The Geotechnical Engineer shall submit compaction reports to the Construction Manager and the Civil Engineer at the completion of the work, including test results and plot plans indicating the locations from which the tested samples of fill were taken. The Geotechnical Engineer shall keep the Construction Manager informed on the progress of the grading work.

D. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), orASTM D 2937 (drive cylinder method), as applicable.

a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.

b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Architect.

2. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

3. Foundation Wall Backfill: In each compacted backfill layer, perform at

least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.

4. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

F. DSA will inspect foundation excavations when completed and ready for forms, after forms are in place, and before first placement of concrete.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace material to depth directed by the Architect; reshape and recompact at optimum moisture content to the required density.

C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION

SECTION 02315

GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General exterior grading, cutting and filling, including grading for paving, planting areas, banks, walls and foundations.

1.2 RELATED SECTIONS

A. Section 02310 – Earthwork.

B. Section 02320 –Excavating and Backfilling of Utilities.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 GRADE STAKES

A. The Contractor's Surveyor will set grade stakes. The Surveyor shall be a California registered land surveyor or licensed Civil Engineer. The Surveyor shall be hired and paid by the Contractor, and shall be subject to the approval of the District. Contractor shall notify the District at least 48 hours before staking is to be started. The District will determine if work is ready for staking.

B. Protect and maintain stakes in place until their removal is approved by the District. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at expense of Contractor.

3.2 VERIFICATION OF GRADES

A. No credit allowances will be given for any discrepancy between existing grades and grades indicated on grading plan, unless such discrepancies are called to attention of surveyor at time grades are set.

3.3 REMEDIAL GRADING

A. Perform remedial grading per Geotechnical Engineer's Report and recommendations, as if they were repeated herein.

3.4 ROUGH AND FINE GRADING

A. Rough grade area sufficiently high to require cutting by fine grading.

1. Grade area for paving to a depth below finish grades indicated, equal to base and pavement thickness to be constructed.

2. Cut banks neatly to required finish grades as cut progresses, or leave cuts full and finish grading by mechanical equipment, which will produce finish grades indicated on Drawings.

3. Grade filled banks full and compact beyond grade of finish bank so that when trimmed to finish grades, soil is compacted to density specified for final slope face.

4. Bring areas to be graded to approximate finish grades and then scarify, moisten and roll to obtain required density. Scarify, moisten and roll resulting high and low areas to obtain required finish grades by cutting and filling.

5. Grade future planting areas so that, upon cultivation and fertilization, they will

conform to finish grades indicated for planting areas.

6. Tolerances: Completed grades shall be within a tolerance of 0.05 of 1 foot above or below grades indicated. Variation of tolerances shall be compensating, so that average grade indicated is met.

7. Protect all utilities.

B. Base or Subgrade:

1. After subgrade has been brought approximately to required grades scarify to a depth of not less than 6".

a. After scarifying, work loosened material to a finely divided condition and bring moisture content to optimum by addition of water, by addition and blending of dry, suitable material or by drying of existing material. Compact material by approved equipment to specified relative compaction of 90% minimum for top 6" of subgrade in accordance with ASTM D1557. Bring resulting high areas and depressions to required grades by scarifying, filling or cutting and recompacting.

2. Tolerance of completed grades of base or subgrade shall not vary more than .03 of 1 foot from grades indicated. Variation with tolerances shall be compensating so that average grade indicated is met.

3.5 EXCESS MATERIAL DISPOSAL

A. Unless otherwise specified or indicated on Drawings, remove from site all earth which is not required for work of this Section.

3.6 FILL MATERIAL

A. Provide all fill material required to complete grading as indicated in Contract Documents.

END OF SECTION

SECTION 02740

ASPHALT CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Asphaltic concrete paving

B. Surface sealer.

1.2 RELATED SECTIONS

A. Section 02315 - Grading: Preparation of site for paving and base.

B. Section 02310– Excavation and Fill: Compacted sub-base for paving.

1.3 REFERENCES

A. Green Book - Standard Specifications for Public Works Construction, current edition.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with applicable provisions of the "Green Book".

B. Obtain materials from same source throughout.

C. Water test in presence of District Inspector and Construction Manager after asphalt work is complete and after all patching and filling is complete (more than one may be required). Provide Survey and Certificate of final asphalt installation after all work, patching, etc. is done.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Temperature at time of placing shall not exceed 320 degrees F in cold weather, nor fall below 260 degrees F in warm weather.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Pavement: Where indicated, asphalt pavement shall consist of two thickness layers: a leveling course and a wearing (surface) course. The leveling course shall conform to B-AR-8000 of Section 203-6 of the Green Book. The wearing (surface) course shall conform to C2-AR-8000 of Section 203-6 of the Green Book.

B. Primer: Grade SC70 liquid asphalt conforming to Section 203-2 of the Green Book.

C. Seal Coat: Mixture of emulsified asphalt mineral aggregate and water conforming to Section 203-5 of the Green Book.

2.2 HEADERS AND STAKES

A. Headers: Redwood, Construction Heart Grade, surfaced four sides, 2 x 6 inches nominal

size, unless otherwise indicated on drawings.

B. Stakes: Redwood, Construction Grade, 2 x 4 inches nominal size, unless otherwise indicated on drawings.

C. Nails: Common, Galvanized, 12d minimum.

2.3 SOURCE QUALITY CONTROL

A. Submit proposed mix design of each class of mix for review prior to beginning of work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify base conditions under provisions of Section 01039.

B. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

3.2 INSTALLATION – GENERAL

A. Thoroughly clean all surfaces to be contacted by asphalt surfacing, and allow to dry.

B. Thicken all edges of asphalt paving that do not abut walls, concrete paving or curbs, or masonry, as well as edges that do contact existing asphalt pavement. Additional thickness shall be 2 inches for a minimum of 6 inches from edge.

C. Where pavement abuts stairways, join surfacing to first riser at an elevation below lowest tread equal to the average riser height of the entire stairway.

D. Protect adjacent walls, concrete pavement, landscaping, and other finished improvements from discoloration or marking during installation of asphalt pavement.

3.3 INSTALLATION – HEADERS

A. Install headers along all edges of asphalt surfacing where concrete or other firm, rigid termination does not exist.

B. Place headers so that bottom has continuous bearing on solid earth. Where excavation for headers is undercut, tamp earth under the header thoroughly. Compact backfill each side of the header to match density of undisturbed earth.

C. Align and hold headers in place with stakes of length necessary to penetrate into earth a minimum of 12 inches below asphalt pavement. Drive pointed end into earth vertically, and anchor to headers with not less than 2 nails. Space stakes not more than 32 inches on center. Set stake heads 1 inch below finished surface of pavement. Set header flush with finished surface.

D. Remove existing headers where new pavement abuts existing pavement.

E. Install temporary headers at transverse joints of paving where paving operations are not continuous.

F. Place additional header stakes and anchorage as needed to maintain proper alignment, true line and grade.

3.4 PREPARATION - BASE COURSE

A. Construct base course in accordance with Section 301-2 of the Green Book.

B. Place base course as indicated in Section 02335.

3.5 APPLICATION - PRIMER

A. Apply primer on aggregate base or sub-base at uniform rate of 1/4 gal/ sq yd.

B. Apply primer to contact surfaces of curbs and gutters in accordance with Section 302-5 of the Green Book.

C. Use clean sand to blot excess primer.

D. Coat surfaces of manholes and catch basin frames with oil to prevent bond with asphalt pavement. Do not prime these surfaces.

3.6 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with Section 302-5 of the Green Book.

B. Place asphalt within 24 hours of applying primer.

C. Place wearing (surface) course to thickness identified on plans.

3.7 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt leveling course within 24 hours of applying primer.

B. Place leveling course to thickness identified in the Schedule contained herein. Compact leveling course by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

C. Place wearing (surface) course within two hours of placing and compacting leveling course.

D. Place wearing (surface) course to thickness identified in the Schedule contained herein.

3.8 PLACING AND FINISHING ASPHALT PAVEMENT - GENERAL

A. Install manhole frames in correct position and elevation.

B. Spread asphalt paving material in a manner to cause least possible handling of mixture. Wherever practical, spread using a self-propelled mechanical spreader. Method of spreading mixture will be subject to approval of Inspector.

C. Joints: Make joints between successive runs vertical. Exercise care to ensure surface of pavement at joints is true to grade and cross section. Do not create lapped joints.

D. Rolling: Finish roll each course of pavement with a tandem roller weighing not less than 8 tons. Break down roll with a roller weighing 1-1/2 to 8 tons. Roll in a manner that preserves flow lines and the established finish grades.

E. Break down roll as soon as is practicable after spreading, but in a manner to prevent cracking or lateral displacement of mixture under roller. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks. Continue finish rolling until surface is unyielding, true to grade, and smooth to specified

tolerances.

F. Areas inaccessible to finish roller may be compacted with break down roller or tamped with hot
tamping irons and smoothed with hot smoothing irons to achieve intended finish.

3.9 PATCHING

A. Patching is defined as new plant-mixed asphalt pavement in areas where trenches have been cut or other areas where existing pavement has been removed.

B. Prior to patching, saw cut edges, compact sub-grade with vibratory equipment to a firm and unyielding sub-grade conforming to the requirements of Section 02335.

C. Where existing pavement has a crushed rock base, the existing material may be reused provided its integrity is maintained.

1. Prepare sub-grade as above specified and lower the base to allow asphalt pavement thickness of one inch thicker than the existing pavement section.

D. Apply primer to all edges.

E. Pave the patched areas with new plant mixed asphalt with a thickness one-inch greater than the existing pavement section. Roll and finish as described above.

3.10 CRACK REPAIR

A. Cracks to be Surfaced: Remove all weeds and dirt with a pick and blower. Apply weed killer into cleaned cracks and fill with an emulsion slurry or, if wide enough, with hot liquid asphalt.

B. Local areas, where pavement has cracked due to unsatisfactory sub-grade shall be treated as specified for patching areas. Remove pavement to at least 12 inches beyond the broken areas and recompact to a firm and unyielding sub-grade.

3.11 DEPRESSIONS

A. In locally settled areas (that have not cracked), prime and resurface such areas with a fine graded asphalt concrete material to match the grade of existing pavement.

3.12 SEAL COAT

A. Apply one seal coat to surface course and asphalt curbs in accordance with Section 302-4 of the Green Book.

B. Test sealed asphalt by flooding with water. Repair areas of standing water or puddles and flood test locally to ensure correction. Insure that complete drainage is achieved. Re-apply surface seal and retest as necessary.

C. After flood test is passed, clear surface and allow to dry. Apply a finish coat of surface sealer.

D. Where indicated in Drawings, apply 2 coats of surface sealer to existing asphalt pavement.

E. Apply 2 coats of surface sealer over all asphalt pavement areas patched or repaired.

F. Where new pavement abuts existing asphalt pavement, overlap surface seal a minimum of 12 inches onto existing surfacing.

3.13 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/4 inch.

D. Smoothness: No rock pockets or voids.

3.14 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 1 day or until surface temperature is less than 140 degrees F.

3.15 SCHEDULES

A. Minimum Sections:

1. See plans and soils report for minimum pavement sections.

END OF SECTION

SECTION 02750

PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete sidewalks, drives, ramps, stair steps, integral curbs, gutters, mow strips, catch basins, flagpole and post footings, equipment pads, pipe bedding and encasements and thrust blocks.

B. Concrete repair overlayment over existing concrete pavement or concrete substrate floors.

1.2 RELATED SECTIONS

A. Section 02315 - Grading: Preparation of site for paving.

B. Section 02310– Excavation and Fill: Compacted sub-base for paving.

C. Section 03200 – Concrete Reinforcement.

D. Section 05500 – Metal Fabrications: Handrail sleeves.

1.3 REFERENCES

A. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

B. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

C. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

D. ASTM C33 - Concrete Aggregates.

E. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

F. City of Santa Ana – Standard Specifications for Public Works.

G. Green Book - Standard Specifications for Public Works Construction, current edition.

H. T24, CCR - Title 24, California Code of Regulations.

1.4 SUBMITTALS FOR REVIEW

A. Conform to requirements of Section 01300– Submittals.

B. Shop Drawings: Indicate layout of expansion, control, and tool joints when such information is not specifically shown on Drawings, or if modifications are required from positions indicated on Drawings.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 304 and Sections 201 and 303 of the Green Book.

B. Obtain cementitious materials from same source throughout.

1.6 REGULATORY REQUIREMENTS

A. Conform to City of Santa Ana standards for paving work on public property.

B. Obtain and pay for all permits and inspections required by governing agencies.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet or frozen.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Form and Stake Materials: Conform to Section 303-1.3 of the Green Book. Douglas Fir, construction grade or better, or metal.

B. Joint Filler: Conform to Section 201-3 of the Green Book.

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; 60 ksi yield grade; deformed billet steel bars; unfinished.

B. Welded Steel Wire Fabric: ASTM A185 welded wire mesh; in flat sheets; unfinished.

C. Dowels: ASTM A615; 60 ksi yield grade, plain steel, unfinished.

2.3 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 201 of the Green Book, and meeting performance requirements listed herein.

B. Fine and Coarse Mix Aggregates: ASTM C33.

C. Water: Potable, not detrimental to concrete.

2.4 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1, Class A, clear with fugitive dye.

B. Pipe Sleeves: Schedule 40, PVC, 4 inches in diameter or 1 inch larger in diameter than penetrating pipe, whichever is larger.

C. Joint Sealers: Specified in Section 201-3 of the Green Book.

D. Herbicide: Spike 80w by Elanco, or approved equal.

2.5 CONCRETE MIX - BY PERFORMANCE CRITERIA

A. Mix and deliver concrete in accordance with Section 303

B. Provide concrete to the following criteria:

1. Compressive Strength: 3,500 psi @ 28 days.

C. Use accelerating admixtures in cold weather only when approved by Architect. Use of admixtures will not relax cold weather placement requirements.

D. Use calcium chloride only when approved by Architect.

E. Use set retarding admixtures during hot weather only when approved by Architect / Engineer.

2.6 REPAIR OVERLAYMENT

A. Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from ½ inch and that can be feathered at edges to join (match) existing adjacent concrete pavement elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of topping manufacturer recommended for sustrate, conditions, and applications.

3. Aggregate: Well graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer for the conditions and thickness in each case.

4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C 109 / C 109M.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Sections 01400- Quality Control and 01410 –Testing and Inspection.

B. Test samples in accordance with ACI 304.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify base conditions under provisions of Section 01039.

B. Verify compacted sub-grade is acceptable and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

3.2 SUBBASE

A. Prepare sub-base in accordance with applicable referenced Sections in this Division.

3.3 PREPARATION

A. Apply herbicide in accordance with manufacturer's instructions to all areas to be paved.

B. Moisten base to minimize absorption of water from fresh concrete.

C. Notify Architect minimum 24 hours prior to commencement of concrete placing operations.

D. Install handrail sleeves, pipe sleeves, and any other inserts.

E. Set pipe sleeves below slab at locations indicated on drawings, extended one foot beyond both edges of slab.

F. Place top of handrail sleeves flush with finished surface of concrete.

G. Overlay Repairs

1. Examine existing paving or substrate concrete under finish flooring materials where indicated and provide overlayment on existing concrete paving or substrate paving after preparing as indicated below.

2. At existing finish flooring conditions over concrete substrate, remove all materials above substrate completely and clean free of all debris, dust and foreign materals.

3. At existing concrete paving conditions, roughen the concrete with bush hammer or similar methods required for adhesion per manufacturer's recommendations.

4. Install overlayment per manufacturer's requirements in thickness and configurations indicated by new finish grades, or required to achieve slopes required by CBC Chapter 11B.

5. Where new concrete pavement joins existing, remaining concrete pavement, provide a triangular shaped configuration of overlayment over the existing concrete pavement to achieve a warped surface transition with slopes not exceeding 2% cross slope relative to the direction of travel and 5% slope in the direction of travel. The overlayment work may extend up to a maximum of 8 feet in any direction to achieve these maximum slopes. In the event this distance does not yield the maximum slopes allowed, notify the Construction Manager for instructions before proceeding.

3.4 GENERAL REQUIREMENTS

A. Coordinate all site concrete for walkways, driveways, and slabs on grade with plans for color, texture, finish and final dimensions.

B. Finish surfaces to produce a uniform appearance throughout area involved and throughout adjacent areas with the same treatment.

C. Where concrete finishing occurs adjacent to finished metal or other surface particularly where serrated or indented surfaces occur, remove all trace of cement film before allowing to harden.

D. Use no troweling machines within 12 inches of electrical junction and outlet boxes which are set to finish with concrete slabs. Float and trowel such areas by hand with wood floats and steel trowels, taking care to see that concrete is finished flush with box cover and matches adjacent surfaces.

E. Control the use of water so that no damage to previously installed work or finish is permitted to occur.

F. Do not place concrete during rainy or freezing weather unless measures are taken to prevent damage concrete. Cure concrete placed during periods of dry winds, low humidity, high temperature and other conditions causing rapid drying, initially with a fine fog spray of water applied immediately after finishing, and maintained until final curing operations are begun.

3.5 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

D. Conform to Sections 302 and 303 of the Green Book.

3.6 REINFORCEMENT

A. Place reinforcement as indicated, in accordance with requirements of Section 03200.

B. Interrupt reinforcement at expansion joints and at other joints as indicated.

C. Place dowels to achieve pavement and curb alignment as detailed.

3.7 PLACING CONCRETE

A. Place concrete in accordance with Section 303 of the Green Book.

B. Ensure reinforcement, formed joints are not disturbed during concrete placement.

C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

D. Place concrete to joint pattern indicated.

3.8 JOINTS

A. Place expansion joints at maximum 20 foot intervals and as indicated. Align curb, gutter, and sidewalk joints.

B. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant placement.

C. Provide keyed joints as indicated.

D. Conform to Section 303 of the Green Book.

E. Coordinate all plans for final markings.

F. At expansion joints and elsewhere as indicated, provide markings with a rounded edging or marking tool to a one-eighth inch radius. In textured work, edge and mark with a combination edging and smoothing tool approximately 2 inches wide.

G. Where indicated, form control and tool joints in concrete finish while still plastic. Maximum spacing between control joints shall be 10 feet. Maximum spacing between tool joints shall be 5 feet. Spacing between joints shall be equal unless otherwise indicated.

3.9 FINISHING

A. Coordinate with all plans for final finish and texture.

B. Integral wood float finish shall be applied to the pavement, sidewalk and curbs.

1. After screeding and compacting, finish with a wood float using a rotary or darbied

circular motion to produce a uniform texture and finish throughout.

2. For vehicular traffic areas, the finish shall be coarse enough to provide a non-slip surface with a minimum friction coefficient of 0.4.

3. For pedestrian traffic areas, finish shall be a non-slip surface equal to:

a. Heavy broom finish for slopes equal to or over 1:20.

b. Medium broom finish for slopes under 1:20.

C. Finishing formed surfaces:

1. Curb forms shall leave a smooth face.

2. Remove all fins.

D. Curbs, Flow Lines and Gutters: Wood float vertical faces, steel trowel horizontal surfaces.

E. Direction of Texturing: Transverse to pavement direction.

F. Inclined Vehicular Ramps: Broomed perpendicular to slope.

G. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

H. Mark pipe sleeve location with a 3 inch "V" mark at each end of sleeve.

I. Curing shall conform to Section 303 of the Green Book.

3.10 JOINT SEALING

A. Separate pavement from vertical surfaces with joint filler, 1/2 inch thick unless otherwise indicated.

B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

C. Extend joint filler from bottom of pavement to within 1/2 inch of finished surface. Conform to the Green Book for joint sealer requirements.

3.11 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/8 inch in 10 ft, non-cumulative

B. Maximum Variation From True Position: 1/8 inch.

C. Not withstanding the foregoing tolerances, installed slopes of concrete pavement shall not exceed those required by CBC Chapter 11B for accessibility by disabled persons. The contractor shall be responsible for installing concrete pavement that does not exceed the maximum slopes allowed and shall remove non-compliant work and provide compliant work.

3.12 FIELD QUALITY CONTROL

A. Section 01410 --Testing and Inspection: Field inspection and testing.

B. Three concrete test cylinders will be taken for every 75 or less cu yds of each class of

concrete placed each day.

C. Concrete which is not true to line and plane, or which is not thoroughly troweled and properly surfaced as required, or which varies in excess of tolerances, or which is scuffed or has a rough top surface not indicated, or which does not connect properly to adjoining work, or does not slope to drains or is not properly cured, will be deemed defective. Remove and replace with proper work conforming to Contract Documents at no additional cost to the Owner.

3.13 PROTECTION

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

B. Do not permit pedestrian or vehicular traffic over pavement until 75 percent design strength of concrete has been achieved.

END OF SECTION

SECTION 02760

PAVEMENT MARKING

PART 1 - GENERAL

1.01 REFERENCE:

Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.

1.02 DESCRIPTION:

A. Principal Work Items Are:

1. Painted lines, lettering, and symbols at parking areas.

2. Painted stripes at exterior stairs, to conform to Disabled Requirements.

B. Related Work Specified Elsewhere:

1. Painting: Section 09900.

1.03 SUBSTITUTIONS:

Only written approval of Architect will permit substitutions for materials specified; refer to Section 00800, Supplementary Conditions for procedure.

1.05 JOB CONDITIONS:

A. Environmental Requirements: Paint only in dry weather, on dry clean surfaces, when temperature is above 50°F.

B. Sequencing, Scheduling: Coordinate with paving work. Verify that paint type is compatible with asphalt paving surfaces seal coats.

C. Protection: Do not apply pavement markings for seven days after application of asphalt surface seal coat. After application, protect from traffic until thoroughly dry.

D. If Pavement must go into service prior to the required 30-day cure time, temporary striping for all areas affected shall be provided at no additional cost. Temporary striping shall be in accordance with this section except that only one coat of paint is required.

1.06 SUBMITTALS

A. Striping Plan: Plan shall indicate all lines, letters, diagrams, and colors for the required striping.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Traffic Paint:

1. Type: Water base, roadway traffic lane marking type; colors as selected.

2. Acceptable Manufacturers:

a. Dunn-Edwards, Vin-L-Stripe No. W-801, vinyl-epoxy as a standard of quality.

b. J. E. Bauer latex base Formula No. 1030A9 White, No. 1056A9 Yellow, No. 1118A9 Green, and No. 1854A9 Red. Blue shall be equal to color No. 15090 per Federal Standard 595B.

c. Sinclair No. 160 Vinyl Traffic Line Paint, water base.

d. Pervo Paint Company.

PART 3 - EXECUTION

3.01 INSPECTION:

Inspection: Surfaces to be striped shall be clean and dry, and surface sealer thoroughly dry.

3.02 PREPARATION:

Layout: Accurately measure and layout work. Use stencils for all work; snap lines for straight work.

3.03 APPLICATION:

A. General: Apply two coats, at the rate of 400 SF maximum per gallon per coat.

B. Painted Lines, Lettering, and Symbols At Parking Areas:

1. Pavement Marking Lines: 3" wide, minimum.

2. Disabled stalls, striping and letters according to CBC Section 1129B.3 and 1129B.4.

3. Color: White, for all work except blue at Disabled parking stalls and red to indicate No Parking.

4. Traffic Directional Arrows: Paint directional traffic flow arrows in all aisles, and at parking lot entrances and exits.

5. Tactile warning devices shall be in conformance with CBC Section 1133B.8.5.

E. Stripes At Exterior Stairs:

1. Conform to State Access Requirements.

2. Stripes: 2" wide, located 1" maximum from, and parallel to, nosing, per CBC 1133B.4.4.

3. Required Locations: All treads, all top landings, all intermediate landings.

F. Detectable / Tactile Warning Surfaces:

1. Special warnings for disabled persons shall comply with CBC Section 1133B.8.5 ADA Standards.
2. Provide minimum 5 year warranty per DSA Bulletin 101/102, revised 9/27/04.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Formwork, shoring, bracing, and anchorage.

1.1.2. Concrete reinforcement and accessories.

1.1.3. Cast-in-place concrete footings, slabs and elements.

1.1.4 Concrete Repair Overlayment. See Section 02750 Concrete Pavement for specification.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

2.1.1 Conform to ACI 301.

2.1.2 Softwood Plywood - Vertical and horizontal surfaces.

Grade Certification: APA Grade stamped, complying with PS-1.

2.1.2.1 Type: APA Plyform, Exterior Type.

2.1.2.2 Class/Face Veneer: Class I or II, B-B Veneer.

2.1.2.3 Panel Finish: Where concrete will be exposed to view in final project, with painted and non-painted finish, provide HDO resin fiber overlay.

2.1.3 Lumber Forms: Any grade or species, S4S.

2.1.4 Form Ties:

2.1.4.1 Concealed Condition: Snap-off type, fixed length, cone type, 1 inch back break dimension, free of defects that could leave holes larger than one inch in concrete surface; provide flush plugs for cone holes or grout fill as specified.

2.1.4.2 Exposed Condition: Snap-off type, fixed length, cone type, 1 inch back break dimension, free of defects that could leave holes larger than one inch in concrete surface; provide semi-recessed plugs for cone holes.

2.1.5 Form Release Agent: Cresset, Meadows or equal, colorless, water based material which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

2.1.5.1 Select type suitable and appropriate for achieving Cresset CCS 2 surface at exposed concrete applications.

2.1.6 Corners: Chamfered, rigid plastic or wood strip type; 3/4 x 3/4 inch size; maximum possible lengths.

2.1.7 Form Stakes: Steel bar stock, pre-drilled for nails.

2.1.8 Formwork Panel Edge: Provide foam edge stripping at exposed formwork panel edges to minimize mortar leakage.

2.2 REINFORCING STEEL

2.2.1 Reinforcing Steel: ASTM A615, 60 ksi yield grade billet steel deformed bars, uncoated.

2.2.1.1 Provide reinforcing steel complying with ASTM A 706, Grade 60, deformed, uncoated steel at jamb bars.

2.2.2 Welded Steel Wire Fabric: ASTM A185,Plain Type; flat sheets; plain finish.

2.2.3 Dowels: Same as 2.2.1.

2.2.4 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder/barrier puncture.

2.2.5 Fabricate concrete reinforcing in accordance with CRSI Manual of Practice, ACI SP-66, and ACI 318.

2.2.6 Do NOT bend or straighten bars in manner that will weaken or injure bar. Do not re-bend bars.

2.2.7 Do NOT use heat to bend bars.

2.2.8 Remove and replace reinforcement with fabrication defects.

2.2.9 Locate reinforcing splices as shown on Drawings. Obtain approval of Structural Engineer for splices not shown on drawings.

2.3 CONCRETE MATERIALS

2.3.1 Cement: Conform to Section 1903A Title 24 CCR and ASTM C150; normal - Type II, low alkali, gray color.

2.3.2 Fine and Coarse Aggregates: Conform to Section 1903A Part 2, Title 24 CCR, ASTM C33 and the following:

2.3.2.1 Coarse Aggregate: Clean, hard, fine-grained, sound, crushed rock or washed gravel;

2.3.2.1.1 Slabs, Columns, Walls: Class Designation 5S per ASTM C 33, Table 3, with 1 inch grading.

2.3.2.1.2 Foundations: Class Designation 3S per ASTM C 33, Table 3, with 1-1/2 inch grading.

2.3.2.2 Fine Aggregate: Washed natural or manufactured sand, hard, strong, durable particles: not more than 1 percent deleterious materials.

2.3.2.3 Aggregate shall be non-reactive per ASTM C 289.

2.3.3 Water: Clean, potable, and not detrimental to concrete.

2.3.4 Concrete slab-on-grade cushion: Clean washed concrete sand complying with ASTM C 33.

2.4 ACCESSORIES

2.4.1 Membrane Curing Blankets

2.4.1.1 Provide Whitecap or equal 483-Curelap light colored plastic faced 10 oz. burlap curing blankets complying with ASTM C 171.

2.4.2 Vapor Retarder

2.4.2.1 Manufacturer: Stego Wrap or equal, 15 mil polyolefin film.

2.4.2.2 Perm Rating: Maximum 0.01 grains/square foot/hour per ASTM E-96.

2.4.2.3 Water vapor Transmission Rate: Maximum 0.006 grains/square foot/hour per ASTM E-96.

2.4.2.4 Puncture resistance: Minimum puncture resistance of 200 pounds/square foot per GRI/GSI – 86.

2.4.2.5 Tensile Strength: Minimum tensile strength of 54 pounds MD/55 pounds CMD per ASTM D 1004. Values shall be based on ASTM E 154 Resistance to Decay test portion.

2.4.2.6 Low Temperature Brittleness: Pass per ASTM D 1790.

2.5 CONCRETE MIX

2.5.1 Prepare concrete mix design in accordance with Section 01450 and Section 1905A.2 - 1905A.6, Chapter 19A, Part 2, Title 24, CCR.

2.5.1.1 Provide concrete mixes in accordance with ACI 318, Section 5.8.

2.5.1.2 Slab on Grade Concrete strength: 4000 psi at 28 days.

2.5.1.3 Concrete slump: Maximum slump shall not exceed 4 inches, +/-1 inch.

2.5.1.4 Slab-on-grade applications: Provide mix with maximum water-cement ratio of 0.45.

2.6 OTHER MATERIALS

2.6.1 Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1 Vapor retarder installation

3.1.1.1 Proof roll subgrade.

3.1.1.2 Place 2 inch sand cushion over sub-grade.

3.1.1.3 Place vapor retarder over sand cushion, lapping edges 12 inches. Tape and seal edges and penetrations.

3.1.1.4 Obtain inspectors approval of vapor retarder installation before placing sand cushion.

3.1.1.5 Place 2 inches sand cushion over vapor retarder. Proof roll prior to reinforcement placement.

3.1.1.6 Exercise care in placing reinforcing steel and concrete to avoid puncturing the sheeting. Do not drive stakes through the barrier. Use flat base screed supports.

3.2.2 Slab Finish

3.2.2.1 Produce hard and impervious surfaces, free from defects and blemishes.

3.2.2.2 Provide steel troweled finish, Class 3, per ACI 302.1R. Steel troweling shall consist of three separate operations. Obtain Architect's approval of finish prior to proceeding.

3.2.2.3 At all corridors, utility areas, and similar surfaces not receiving subsequent finish, provide medium swirl texture.

3.2.2.4 Slabs receiving carpet or resilient floor finish: Provide smooth trowel finish, ACI 302.1R Class 3, free of ridges and defects.

3.2.2.5 Slabs receiving thin set ceramic tile, waterproofing membranes or traffic topping: Provide steel trowel and very light broom finish.

3.2.3 Slab on Grade Curing

3.2.3.1 Cure floor surfaces in accordance with ACI 308.

3.2.3.2 Curing Blanket Placement: Install blankets immediately after finishing and joint placement is completed. Place over all surfaces, including face of footings and depressions. Anchor as required to maintain in place for a period of 7 days.

3.2.4 All tolerances shall be as defined in ACI 117-90 and as specified.

3.2.4.1 Classification shall be per General Building: Cast-in-Place, ACI 117, Section 4.0, unless noted otherwise.

3.2.4.2 Unless noted otherwise, depressions in slab floors between high spots shall be a maximum 3/16 inch in ten feet, using a metal straight edge placed at any location on slab, and measured within 72 hours of pour.

3.2.4.3 For the following applications, depressions in slab floors between high spots shall be a maximum 1/8 inch in ten feet, using a metal straight edge placed at any location on slab, and measured within 72 hours of pour.

3.2.4.3.1 Slabs receiving thin-set ceramic tile.

3.2.4.3.2 Slabs in rooms with movable or operable partitions.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1. SECTION INCLUDE

1.1.1. Handrails and Guardrails

1.1.2. Fabricated "Ornamental" fences and gates

1.1.3 Miscellaneous light structural framing, support members, bracing, sleeves, welding and fasteners

PART 2 – PRODUCTS

2.1 MATERIALS

2.1.1 Plates and Bars: ASTM A283, Grade D or approved equal.

2.1.2 Fencing and Gate Pickets: Steel, shape as shown on drawings, solid stock, per ASTM A 322, finished in accordance with ASTM A 108 or approved equal.

2.1.3 Pipe: ASTM A53, Grade B Schedule 40, (pressure test not required), unless noted otherwise.

2.1.4 Tube: ASTM A 500, Grade B.

2.1.5 Sheet Steel: ASTM A 653, gauge and profile indicated, galvanized to G90 finish in accordance with ASTM A 653.

2.1.6 Bolts, Nuts, and Washers: ASTM A307 galvanized to ASTM A153 for galvanized components.

2.1.7 Welding Materials: AWS D1.1; type required for materials being welded.

2.1.8 Shop and Touch-Up Primer: VOC approved primer.

2.1.9 Touch-Up Primer for Galvanized Surfaces: Zinc rich Type.

2.2 STEEL RAILING SYSTEM

2.2.1 Steel Pipe: ASTM A53, Grade B.

2.2.2 Rails and Posts: Size, shape and spacing as shown on the Drawings, welded joints.

2.2.2.1 Handrail: 1 ½ inch OD, Schedule 80, welded joints.

2.2.3 Fittings: Elbows, T-shapes, wall brackets; bent or mitered tube steel.

2.2.4 Mounting: Adjustable brackets and flanges, with steel inserts for casting in concrete. Prepare backing plate for mounting in framed wall construction. Modify bracket as required to provide 1-1/2 inch clear dimension from face of wall surface to railing inside surface.

2.2.5 Splice Connectors: Steel welding inserts.

2.3 FENCES, GATES & HARDWARE

Gates in the path of travel must comply with door requirements as stated in CBC Section 1133B.1.1.1.4 and ADAAG 4.13.3. Hardware shall not require pinching, grasping, or twisting motion to operate and provide solid kick plates 10" minimum high. Clear space below gate shall be 3" maximum above paving on both sides of the gate. The maximum effort to operate the gates shall not exceed 5 lbs.

2.4 FABRICATION

2.4.1 Fit and shop assemble in each item in largest practical sections, for delivery to site.

2.4.2 Fabricate items with joints tightly fitted and secured.

2.4.3 Continuously seal joined members by continuous welds.

2.4.4 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.4.5 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

2.4.6 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4.7 Fabricate radiused components by cold-rolled process, using equipment and techniques resulting in crimp free surfaces. Verify component wall thickness is suitable for rolling without flattening or crimping.

2.4.8 In addition to above criteria, fabricate railing, trellis and fencing components for exposed architectural appearance conditions.

2.4.8.1 Remove all weld splatter, grind and sand all weld joints uniformly smooth, without visible scratches, gouges, or patch marks. Conform to Finish #2 of National Ornamental and Miscellaneous Metals Association "Joint Finish Guidelines."

2.4.8.2 All visible welds shall be continuous; bead or spot welding not acceptable.

2.4.8.3 Provide tube closures at all tube and pipe components.

2.4.8.4 Grind edges of all bent and fabricated components smooth to a 1/4 inch radius.

2.5 FINISHES

2.5.1 Galvanize all exterior components, after fabrication, in accordance with ASTM A123 or A123/A123M. Provide minimum 2.00 oz/sq ft galvanized coating. Fill vent holes after galvanizing.

2.6 OTHER MATERIALS

2.6.1 Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1 After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.1.1.1 Use cold galvanizing coating in accordance with manufacturer's instructions for exterior steel fabrications.

3.1.2 Install all railing and guardrail in accordance with applicable codes and regulations. Maintain all required clearances and dimensions, including the following:

3.1.2.1 Maintain continuous 1-1/2 inch clear dimension between handrail and adjacent wall. Wall surfaces adjacent to handrail shall be smooth CBC 1133B.4.2.6 and 1133B.5.5.1

3.1.2.2 Maintain railing, guardrail, and adjacent surface configuration so that a sphere 4 inches in diameter cannot pass through any opening or gap created.

3.1.2.3 Do not permit railing fabrication and installation to extend into required exit dimension at stairway.

3.1.3 Tolerances

3.1.3.1 Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

3.1.3.2 Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05521

PIPE AND TUBE RAILINGS

SECTION 05521 – PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.

B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

a. Uniform load of 50 lbf/ ft. applied in any direction.

b. Concentrated load of 200 lbf applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

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

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Welding certificates.

C. Qualification Data: For professional engineer.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

2. Provide allowance for trimming and fitting at site.

1.6 COORDINATION AND SCHEDULING

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

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

PART 2 - PRODUCTS

2.1 METALS, GENERAL

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

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 STEEL AND IRON

A. Handrails for stairs and ramps shall be 1¼" to 1½" diameter (1½" nominal) and mounted 1½" clear from side walls per CBC Sections 1133B.4.2.5 and 1133B.5.5.1.

B. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless

another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

E. Castings: Either gray or malleable iron, unless otherwise indicated.

1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

2. Malleable Iron: ASTM A 47/A 47M.

2.3 FASTENERS

A. General: Provide the following:

1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

3. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Anchors: Provide chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Shop Primers: Provide primers that comply with Division 9 painting Sections.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with top-

coat.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.

   b. Tnemec Company, Inc.; Tneme-Zinc 90-97.

D. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

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

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

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

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

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

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

G. Connections: Fabricate railings with welded connections, unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

   2. Obtain fusion without undercut or overlap.

   3. Remove flux immediately.

4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Form changes in direction as follows:

1. As detailed.

K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

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

M. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. All welded joints and surfaces shall be ground smooth, no sharp or abrasive corners edges or surfaces. Wall surfaces adjacent to handrail shall be smooth per CBC Section 1133B.4.2.6.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STEEL AND IRON FINISHES

A. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. For non-galvanized steel railings, provide non-galvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:

1. Exterior Railings (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

3. Interior Railings Indicated to Receive Zinc-Rich Primer (SSPC Zone 1A): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

E. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Do not apply primer to galvanized surfaces.

2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

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

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

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

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

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

2. Use type of bracket with predrilled hole for exposed bolt anchorage.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

3.7 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair gal-

vanizing to comply with ASTM A 780.

3.8 PROTECTION

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

B. Restore finishes damaged during installation and construction period so no evidence remains ofcorrection work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05521

SECTION 06112

FRAMING AND SHEATHING

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Structural wall and roof framing.

1.1.2. Wall, floor and roof sheathing.

1.1.3. Wood treatment.

PART 2 - PRODUCTS

2.1 LUMBER MATERIALS

2.1.1 Lumber Grading Rules: APA, NFoPA, RIS (Redwood Inspection Service), WCLIB, and WWPA.

2.1.1.1 Lumber Materials: Comply with CBC Section 2303 and all other requirements of Section 2303.1.4.

2.1.1.2 Wood Structural Panel Materials: Comply with CBC Section 2303 and all other requirements of Section 2303.1.4.

2.1.2 Beams and Stringers, 5 inches and thicker, with width more than 1 inch greater than thickness size classification:

2.1.2.1 Species: Douglas Fir-Larch.

2.1.2.2 Grade: Unless specified otherwise, No. 1.

1.1.3.1.1. Provide Select Structural grade at all exposed exterior applications, selected for appearance and straightness.

2.1.2.3 Surfacing: S4S.

2.1.2.4 Moisture Content: 19 percent maximum moisture content at time of installation.

2.1.2.5 Where size permits, provide Free of Heart Center lumber at all exterior applications.

2.1.3 Roof, ceiling and floor joist, 2 to 4 inch thick, 6 inches and wider size classifications:

2.1.3.1 Species: Douglas Fir-Larch.

2.1.3.2 Grade: Unless specified otherwise, No. 1 and better.

1.1.3.1.2. Provide Select Structural grade at all exposed exterior applications, selected for appearance and straightness.

2.1.3.3 Surfacing: S4S.

2.1.3.4 Moisture Content: 19 percent maximum, at time of installation.

1.1.3.1.3. Provide 15 percent maximum moisture content at vaulted and sloped roof framing members and at all floor framing members.

2.1.4 Studs and blocking, 2 to 4 inches thick, 4 and 6 inches and wider respectively, all plate stock not in contact with concrete, and all structural light framing size classifications:

2.1.4.1 Species: Douglas Fir-Larch.

2.1.4.2 Grade: Unless specified otherwise, No. 1 and better.

2.1.4.2.1 Limit warp to 1/2 of medium.

2.1.4.2.2 Provide Select Structural grade at all exposed exterior applications, selected for appearance and straightness.

2.1.4.3 Surfacing: S4S.

2.1.4.4 Moisture Content: 19 percent maximum moisture content, at time of installation.

2.1.5 Posts and Timber 5 x 5 inches and larger, width not more than 2 inch greater than thickness and 4 x 4 posts size classifications:

2.1.5.1 Species: Douglas Fir-Larch.

2.1.5.2 Grade: No. 1.

2.1.5.2.1 Provide Select Structural grade at all exposed exterior applications, selected for appearance and straightness.

2.1.5.3 Surfacing: S4S.

2.1.5.4 Moisture Content: 19 percent maximum, at time of installation.

2.1.5.5 Where size permits, provide Free of Heart Center lumber at all exterior applications.

2.1.6 Sills and Plates in Contact with Concrete and concrete topping: Douglas Fir-Larch species, #2 or better grade, S4S, pressure treated in accordance with Article 2.4.

2.1.7 Miscellaneous non-load carrying members: Douglas Fir-Larch species, #1 or better grade, S4S, 19 percent moisture content, at time of installation.

2.1.8 Roof blocking: Provide treated Douglas Fir No.2 grade for use as blocking, nailers, and similar applications in contact with roofing materials or flashings.

2.1.9 Use pressure treated wood as specified in Article 2.4 below for locations in contact with concrete, concrete topping, masonry and for foundation conditions.

2.1.10 Use fire retardant treated wood and plywood as specified in this Section for interior corridor applications.

2.2 PLYWOOD MATERIALS

2.2.1 Sheathing:

2.2.1.1 APA rated in accordance with PS 1 - 95.

2.2.1.2 Roof Sheathing: Unless noted otherwise, Structural I Rated Sheathing, minimum Span Rating 32/16, 5 ply, face veneer C-D, Exposure 1, Conventional Type.

2.2.1.3 Wall Shear Panels: Structural I Rated Sheathing, minimum Span Rating 32/16, face C-C, Exposure 1, Group 1 species.

2.2.1.4 Floor Sheathing: Structural I, APA Rated Sheathing, Exposure 1, square edge, Group 1 species, C-D veneers, thickness as shown on drawings.

2.2.1.4.1 Provide APA Sturd-i-flor, T and G edge, touch sanded B face veneer at resilient and seamless flooring applications.

2.2.1.4.2 Provide Exterior exposure durability classification at floor sheathing receiving seamless flooring and at all exterior landings and ramps.

2.2.1.4.3 Provide preservative treatment at plywood conditions where required by jurisdictional authority.

2.3 ACCESSORIES

2.3.1 Nail Fasteners:

2.3.1.1 Common nails complying with CBC Chapter 2303, Section 2303.6, and ASTM F 1667, diameter and length per TABLE 2304.9.1.

2.3.1.2 Provide hot dip galvanized fasteners per Section 2304.9.1.1 and Section 2304.9.5 at the following applications:

2.3.1.2.1 Exterior framing exposed to weather.

2.3.1.2.2 Framing of preservative treated lumber.

2.3.1.2.3 Interior framing in high humidity areas, such as commercial kitchens and locker rooms.

2.3.1.3 Box nails or "sinkers" are not permitted.

2.3.1.4 Where specified, provide ring shank or screw nails complying with minimum common nail requirements of Section 2303.6 and Table 2304.9.1, at roof and floor plywood sheathing.

2.3.2 Framing Connectors:

2.3.2.1 Connector references, unless noted otherwise, are based on products as defined in the latest edition of the Simpson Strong-Tie catalog.

2.3.2.1.1 Silver Teco and KC Metals, with equal configuration, structural values and jurisdictional authority approval are approved equals.

2.3.2.2 Alternate connectors submitted to the Architect for consideration as approved equal shall have equivalent ICC ES Report Number ratings.

2.3.2.3 Use only fasteners as approved for listed connector. Where more than one type of fastener in the referenced series is scheduled, provide fastener with greatest capacity.

2.4 WOOD TREATMENT

2.4.1 Wood Preservative (Site Application): Water based material system as recommended by AWPA Standard M4 for repair of treated surfaces.

2.4.2 Wood Preservative (Pressure Treatment):

2.4.2.1 Wood shall bear WWPA or WCLIB grading stamp and the AWPA Quality mark. AWPA mark shall designate treatment method, retention value and KDAT (kiln dried after treatment).

2.4.2.2 Comply with Section 2303.1.8, Item 3, Chapter 23, Part 2, Title 24, CCR, except that CCA treatments are not acceptable for conditions exposed to view in the completed project from any point.

2.4.2.3 Above Ground Application: AWPA Treatment U-1 using water borne preservative.

2.4.2.4 Ground Contact Application: AWPA Treatment U-1 using water borne preservative.

2.4.2.5 Moisture Content: Kiln Dry all materials after treatment to 19 percent maximum moisture content.

2.5 OTHER MATERIALS

2.5.1 Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1 Site applied wood treatment

3.1.1.1 Brush apply two coats of specified preservative treatment to cut ends, holes, daps, notches, and similar field cuts of pressure treated wood in accordance with AWPA M4.

3.1.1.1 Treat the ends of floor joists, girders, blocking and miscellaneous framing as specified.

3.1.1.1.1 Apply specified preservative to floor members and blocking with bottom edge located 2 feet or less above finished outside grade and in contact with treated sills or concrete/masonry foundation. Apply preservative treatment for 15 minutes to a distance of 6 inches from the end of the member.

3.1.1.1.2 Treatment is not required for studs in contact with treated sill plates.

3.1.1.2 Allow preservative to cure prior to erecting members.

3.1.2 Sheathing

3.1.2.1 Attachment of sheathing may be accomplished by machine nailing subject to approval of the Architect and DSA inspector. Over penetration of the face ply or improper maintenance of edge distances will be cause for rejection or termination of use.

3.1.2.2 Provide minimum 1/8 inch spacing between panel edges.

3.1.2.3 Secure roof sheathing with face grain perpendicular to framing members with ends staggered. Secure sheet edges over firm bearing. Provide solid blocking at all sheathing edges. Use of ply-clips is not acceptable.

3.1.2.4 Secure floor sheathing with face grain perpendicular to framing members with ends staggered. Secure sheet edges over firm bearing. Use solid blocking at all sheathing edges.

3.1.2.4.1 Install using approved threaded or ring shank fasteners, flush but not below face veneer. At all resilient flooring conditions, fasten at maximum 6 inches on center spacing. Do not fill fasteners.

3.1.2.4.2 Provide approved adhesive at all panel edges and at all supporting framing. Glue in accordance with APA AFG 01 System criteria.

3.1.2.5 Secure wall sheathing with face grain perpendicular or parallel to wall studs, with ends staggered, over firm bearing.

3.1.2.6 Place two layers of Grade D building paper, per CBC Section 2510.6, over wall sheathing; weatherlap joints.

3.1.2.7 Place temporary protection over floor and roof sheathing as required to protect sheathing from delamination and splitting.

END OF SECTION

SECTION 06410

CUSTOM CASEWORK

PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Custom fabricated cabinet units as specified here-in, except as follows:

1.1.2 Provide custom fabricated cabinets to match the existing, adjacent cabinets where the work is limited to replacing a base cabinet and countertop with new, accessible cabinets and/or sinks that are an integral part of an existing cabinet that is to remain.

PART 2 – PRODUCTS

2.1 PLASTIC COVERED CASEWORK

2.1.1 Type: Flush Overlay, Style A Frameless

2.1.2 Construction Type: Type I

2.1.3 Construction:

2.1.3.1 Casework Cores: Medium Density Fiberboard, per ANSI A 208.2, latest edition and NEMA LD3-85.

2.1.3.1.1 Comply with formaldehyde emission limit of 0.3 ppm at 0.13 SF/CF loading ratio per NPA 9-87.

2.1.3.2 Cabinet Door Cores: Medium Density Fiberboard, per ANSI A 208.2, latest edition.

2.1.3.2.1 Comply with formaldehyde emission limit of 0.3 ppm at 0.13 SF/CF loading ratio per NPA 9-87.

2.1.3.3 Drawer bottoms, sides, backs, and sub - fronts: MDF per this Section.

2.1.3.4 Casework Core Visible Edges: Unless noted otherwise, high pressure laminate, minimum 0.028 inches thickness, color to match laminated plastic.

2.1.3.5 Shelving: Provide MDF core per 2.1.3.2, 3/4 inch thick minimum, thickness as required for 50 pound per square foot loading per WIC section 15, Table 15-1.

2.1.3.5.1 Provide 1 inch thick shelving at all spans in excess of 36 inches.

2.1.3.6 Hardboard: ANSI/AHA A135.4-82, oil tempered both sides.

2.1.3.7 Countertop Cores: Particleboard, Grade 1-M-2 per ANSI A 208.1, formed as shown on drawings for specific edge.

2.1.3.7.1 Comply with formaldehyde emission limit of 0.3 ppm at 0.13 SF/CF loading ratio.

2.1.4 Surface Finish Criteria:

2.1.4.1 Exposed portions: Finish exposed portions with high pressure laminate as specified in Article 2.2. For purposes of this specification, definition of exposed portions requiring high pressure laminate includes:

2.1.4.1.1 Interior surfaces of knee space or recesses provided for movable equipment.

2.1.4.1.2 Tops of cabinets with more than 18 inches clear between ceiling and cabinet.

2.1.4.1.3 Bottoms of all wall hung cabinets

2.1.4.1.4 All cabinet door surfaces.

2.1.4.1.5 Exposed exterior surface of all cabinet backs.

2.1.4.1.6 All fixed and adjustable shelving surfaces.

2.1.4.2 All door and drawer edges, and all fixed and adjustable shelving edges: Provide 3 mm PVC edging, hot adhesive bonded, color as selected by Architect at all door and drawer edges. Provide 1 mm PVC edging at shelving, including all 4 edges of adjustable shelving.

2.1.4.3 Semi-exposed Portions - As specified in Article 2.2.

2.1.4.4 Concealed Portions: As defined in WIC Section 15, as modified in this section.

2.1.4.5 Filler panels: Provide filler panels as required to accommodate door and drawer function and allow for scribing cabinet to adjoining surfaces. Unless noted otherwise, provide 2 inch dimension at wall conditions, and 4 inch dimension at inside, cabinet to cabinet corner conditions.

2.1.4.6 Glass Panels and Doors: Clear tempered glass per Section 08800, with eased edges at sliding panels.

2.2 PLASTIC LAMINATE AND FINISH MATERIALS

2.2.1 High Pressure Laminated Plastic:

2.2.1.1 Approved manufacturers: Wilson Art, Nevamar or equal.

2.2.1.2 High Pressure Laminated Plastic Series/Type: Unless noted otherwise, provide Wilson Art Type 107, 0.050 inches thick.

2.2.1.2.1 Provide Type VST 335, 0.030 inches, at vertical surfaces designated to receive high-pressure laminated plastic.

2.2.1.3 High Pressure Laminated Plastic Countertop:

2.2.1.3.1 Abrasion Resistant Countertop: Provide Tuf-Surf II Type 107HW at all laminated plastic countertop and splash assemblies, unless otherwise specified. Provide Type 350HW at postformed designs.

2.2.2 Low Pressure Finishes for semi-exposed surfaces:

2.2.2.1 Unless specified otherwise, provide Kortron II, phone (503)-382-7296, or equal.

2.2.3 Backing Sheet: WIC Listed material.

2.2.4 Color/Finish:

2.2.4.1 As selected by Architect from full color and finish line for specified product applications.

2.2.4.2 A maximum of two separate colors and finishes will be selected by Architect for each material for casework, doors, shelves and drawers.

2.2.4.3 A maximum of one color will be selected by Architect from full color and finish line for casework countertops and splashes.

2.2.4.4 A maximum of one color will be selected by Architect from full color and finish line for semi-exposed surfaces with low pressure finish.

2.3 ACCESSORIES

2.3.1 Adhesive: Water based type recommended by laminate manufacturer to suit application. Solvent based contact and urea resin adhesives are not permitted.

2.4 HARDWARE

2.4.1 Provide 'U' shaped wire pulls or equally accessible pull hardware at all accessible casework per CBC Section 1125B.4. Also, see the Resource Guide Appendix to WIC Manual of Millwork except as noted below.

2.4.2 Shelf Support System: Provide AM No. 11, available through US Tek, phone (626)-859-9225, adjustable shelf clip, with integral restraints providing both vertical and horizontal lateral resistance, in color as selected by Architect.

2.4.3 Drawer and Door Pulls: Trimco or equal, No. 562-4 inches x US 26D.

2.4.4 Hinges: Unless noted otherwise, provide RPC or equal, 850 or 370 series, Heavy duty wrap around, Hospital Tips, 2-3/4 inch height minimum, width configuration as required for application, color as selected by Architect from complete line, including powder coating.

2.4.5 Drawer Guides: Unless noted otherwise, provide Accuride Full Extension Model 4034 at drawers less than 24 inches wide, Model 4032 at drawers 24 inches and wider.

2.4.5.1 Bottom Drawers: Provide Accuride Full Extension Model 3640 at all bottom drawers.

2.4.5.2 File Drawers: Provide Pendaflex G-6110-04(WH) file railing system at all drawers marked "file".

2.4.6 Locks:

2.4.6.1 Manufacturer: National.

2.4.6.2 Finish: US 26D.

2.4.6.3 Keying: Key to Owners standard keyway . Key alike all locks within each room, and key each room differently.

2.4.6.4 Accessory: Provide Ives IV2A or equal elbow catch at inactive cabinet door leaf.

2.4.7 Magnetic catches: Provide magnetic catches at all cabinet doors, with maximum 5 pounds holding power.

2.4.8 TV Swivel/Pull-Out Tray: Accuride CB3620-258TV, Fulterer HA421.61.704, 180 pound capacity, color white, size as shown on drawings where monitor is shown at teaching wall casework with fabricated platform complying with Article 2.1.

2.5 FABRICATION

2.5.1 Construct casework conforming to WIC Premium grade, modified as specified in this Section, and in accordance with DSA approved fabrication methods.

2.5.1.1 Provide white bumpers.

2.5.1.2 Provide white anchor screw covers/caps.

2.5.1.3 Provide corbels matching countertop material as necessary to support counter screens.

2.5.1.4 Fabricate all drawers full depth of cabinet. Provide minimum 30 inch deep drawers at flat file drawers.

2.5.1.5 Fabricate all TV Monitor shelving with 1 inch thick MDF core, with 3 /4 x 1-1/2 inch maple/oak front edge.

2.5.2 Construct countertops conforming to WIC Premium grade.

2.5.2.1 Provide wood edge trim unless specified otherwise.

2.5.2.1.1 Species: Maple//White Oak.

2.5.2.1.2 Grade/cut: Premium, per WIC, Section 3, Table 3.2, quarter sawn.

2.5.2.1.3 Moisture Content: Maximum 12%, minimum 6%.

2.5.2.1.4 Finish: Factory prefinished transparent, WIC System 2, over sanding filler and gel stain as selected by Architect.

2.5.2.1.5 Pattern: As shown on drawings

2.5.2.2 At wet area conditions, such as toilet room countertops, provide waterfall splash top edge, coved back splash and rolled front edge. Where end splash are required, butt waterfall splash portion into end splash.

2.5.2.3 Provide WIC listed backer sheet.

2.5.3 Shop assemble casework for delivery to site. Do not glue any materials on site without prior approval.

2.5.4 Fit shelves, doors, drawer fronts, and other exposed edges with matching materials. Use full length pieces only. Provide edging at all edges of adjustable shelves.

2.5.4.1 Where laminated plastic is used with a pattern or design, such as wood grains, vertically match and align pattern across face of door and drawer fronts.

2.5.4.2 Fabricate shelf depth to accommodate specified shelf clip. Notch to provide maximum1/16 inch clearance at clip.

2.5.4.3 Notch hinge into door to maintain 1/8 inch reveal.

2.5.5 Plough drawer bottoms into sides, fronts, or sub fronts, and backs. Surface attachment of bottoms is not acceptable.

2.5.6 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on - site dimensions. Prime paint or seal contact surfaces of cut edges.

2.6 OTHER MATERIALS

2.6.1 Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1 Installation considerations:

3.1.1.1 Scribe cabinets in accordance with WIC standards, Premium Grade, except that use of cellulose sponge is not acceptable.

END OF SECTION

SECTION 07212

THERMAL AND ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1. SECTION INCLUDES

1.1.1. Batt acoustical insulation for interior wall and ceiling construction.

1.1.2. Batt thermal insulation for exterior wall, floor and ceiling construction.

PART 2 - PRODUCTS

2.1 ACOUSTICAL INSULATION: BATT

2.1.1 Manufacturer: Manville, Owens Corning or equal.

2.1.2 Type: Glass fiber batt, friction fit, unfaced.

2.1.3 Construction:

2.1.3.1 Blanket: Glass Fiber, Type 1 per ASTM C 665

2.1.3.2 Facing: None.

2.1.3.3 Thickness: 4 inch.

2.1.4 Fire/Habitability Criteria

2.1.4.1 Flame Spread Classification: Maximum 25 per ASTM E 84

2.1.4.2 Smoke Developed Classification: Maximum of 50 per ASTM E 84

2.1.4.3 Thermal Resistance: R-11 per ASTM C 177 or C 518.

2.2 THERMAL INSULATION: EXTERIOR WALL

2.2.1 Manufacturer: Manville, Owens Corning or equal.

2.2.2 Type: Glass fiber batt, staple flange, faced.

2.2.3 Construction:

2.2.3.1 Blanket: Glass Fiber per ASTM C 665.

2.2.3.2 Exposed Facer: Provide reinforced foil facing, with stapling flange, with maximum 25 flame spread classification and maximum 450 smoke contributed classification where facer is not in substantial contact with the unexposed surface of the ceiling finish.

2.2.3.3 Concealed Facer: Provide kraft paper faced insulation without fire and smoke rating where facer is in substantial direct contact with unexposed surface of wall finish.

2.2.4 Fire/Habitability Criteria

2.2.4.1 Flame Spread Classification: Maximum 25 per ASTM E 84

2.2.4.2 Smoke Developed Classification: Maximum of 50 per ASTM E 84

2.2.4.3 Thermal Resistance: R-XX value, per ASTM C 177 or C 518.

2.2.4.4 Perm Rating (Foil facer): Maximum 0.02 grains/hr/sf/in Hg per ASTM C 665.

2.2.4.5 Perm Rating (Kraft facer): Maximum 1.0 grains/hr/sf/in Hg per ASTM C 665.

2.2.5 Accessory Products

2.2.5.1 Insulation Tape: As recommended by manufacturer, maximum flame spread value of 25.

2.3 THERMAL INSULATION: FLOOR AND ROOF ASSEMBLY

2.3.1 Manufacturer: Manville, Owens Corning or equal.

2.3.2 Type: Glass fiber batt, faced.

2.3.3 Construction:

2.3.3.1 Blanket: Glass Fiber per ASTM C 665.

2.3.3.2 Exposed Facer: Provide reinforced foil facing, with stapling flange, with maximum 25 flame spread classification and maximum 450 smoke contributed classification where facer is not in substantial contact with the unexposed surface of the ceiling finish.

2.3.3.3 Concealed Facer: Provide kraft paper faced insulation without fire and smoke rating where facer is in substantial direct contact with unexposed surface of ceiling or floor finish.

2.3.4 Fire/Habitability Criteria

2.3.4.1 Flame Spread Classification (Batt): Maximum 25 per ASTM E 84

2.3.4.2 Smoke Developed Classification (Batt): Maximum of 50 per ASTM E 84

2.3.4.3 Thermal Resistance:

2.3.4.3.1 Thermal Resistance - Floor: R-XX value per ASTM C 177 or C 518.

2.3.4.3.2 Thermal Resistance – Roof/Ceiling: R-XX value per ASTM C 177 or C 518.

2.3.4.4 Perm Rating (Foil facer): Maximum 0.02 grains/hr/sf/in Hg per ASTM C 665.

2.3.4.5 Perm Rating (Kraft facer): Maximum 1.0 grains/hr/sf/in Hg per ASTM C 665.

2.3.5 Accessory Products

2.3.5.1 Wire Lacing: 18 gauge pre-stretched steel wire, with approved anchor system.

2.3.5.2 Insulation Tape: As recommended by manufacturer, maximum flame spread value of 25.

2.4 OTHER MATERIALS

2.4.1 Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1 Insulation Installation:

3.1.1.1 Do not install insulation over recessed light fixtures.

3.1.1.2 Trim insulation neatly to fit spaces. Fit insulation into crevices, spaces at outlet boxes and similar penetrations.

3.1.1.3 Maintain continuous vapor barrier. Provide fire resistive tape at all edges or penetrations of foil-faced insulation, including batt ends.

3.1.1.4 Where wall insulation cavity exceeds 8 feet high, provide blocking or other approved support at 8 feet on center.

3.1.2 Wire lacing support method:

3.1.2.1 Provide wire-lacing method at floor and roof insulation where spacing of framing members exceeds batt width.

3.1.2.2 Provide wire lacing diagonally at bottom of joist cavity, fastened 16 inches on center, staggered, and fastened to each joist in an approved manner.

3.1.2.3 Adjust lacing as necessary to provide taut and consistent support for insulation batts.

3.1.2.4 Install insulation on lacing supports. Provide additional wire lacing at unsupported ends of batts.

3.1.2.5 Tape all batt ends and penetrations.

3.1.3 Staple flange application:

3.1.3.1 Staple batt through flange at wood framing.

3.1.3.2 Keep facer taut and without buckles.

3.1.3.3 Tape all batt ends and penetrations.

END OF SECTION

SECTION 07511

BUILT-UP ASPHALT ROOFING

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Roofing System Design: Uplift pressures calculated according to ASCE/SEI 7.

B. FM Approvals Listing: Class 1A-90.

C. Cool Roof Performance: CEC-Title 24.

1.2 QUALITY ASSURANCE

A. Exterior Fire-Test Exposure: Class A.

B. Pre-installation roofing conference.

1.3 WARRANTY

A. Manufacturer's Materials and Workmanship Warranty: 10 years.

B. Installer's Warranty: Two years.

PART 2 - PRODUCTS

1.4 MATERIALS

A. Sheathing paper.

B. Base Sheet: SBS-modified, asphalt-coated sheet, with glass-fiber-reinforcing mat.

C. Roofing Membrane Plies: Asphalt-impregnated, glass-fiber felt and asphalt-coated, glass-fiber cap sheet with granule surfacing.

D. Base Flashing Sheet:

1. Backer Sheet: Asphalt-impregnated, glass-fiber felt.
2. SBS-Modified Asphalt Flashing Sheet: Reinforced with polyester fabric surfaced.

E. Vapor Retarder: Polyethylene film.

F. Tapered edge strips.

G. Roof Coating: Asphalt emulsion.

H. Walkways:

1. Pads: Contractor to verify if existing roof system has walkway pads. If not, then provide and install reinforced asphaltic composition pads with mineral-granule surface.

PART 3 - EXECUTION

1.5 INSTALLATION

A. Roofing Membrane System:

1. Deck Type: N (nailable).
2. Base Sheet: 1.
3. Number of Ply Sheets: 2.
4. Surfacing Type: M (mineral-granule-surfaced cap sheet).

1.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner engaged.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Coping, parapet, and cap flashings.

1.1.2. Reglets and counterflashings over bituminous base flashings.

1.1.3. Counterflashings.

1.2. GUARANTEE

1.2.1. Contractor's Guarantee

1.2.1.1. Provide Owner with written Guarantee per Section 00630 on Contractor's letterhead, and signed by General Contractor and flashing system subcontractor.

1.2.1.2. Provide guarantee against the following defects for a time period of three years, commencing from the date of final acceptance of the project.

1.2.1.2.1. Flashing blow-off or permanent deformation from wind.

1.2.1.2.2. Water intrusion through flashing joints into building interior.

1.2.1.3. Make inspections and emergency repairs to defects or leaks in the roof system within twenty-four (24) hours of receipt of notice from the Owner.

1.2.1.4. Restore the affected areas to the standard of the original specifications as soon as weather permits.

2. PART 2 - PRODUCTS

2.1. SHEET MATERIALS

2.1.1. Galvanized Steel:

2.1.1.1. Classification: Per ASTM A 653 and A 924.

2.1.1.2. Finish: Hot Dip galvanized, G90 coating. Provide Paint-Grip finish over galvanizing at all painted flashings.

2.1.1.3. Gauge: As specified.

2.1.2. Prefinished Flashing: Provide factory prefinished flashing at all locations visible from any location in the completed project.

2.1.2.1. Base Metal: Prepainted Galvalume Sheet, 50 ksi per ASTM A 792.

2.1.2.2. Finish: PVF_2 paint system, with Kynar 500 (70%) resin base.

2.1.2.3. Color: XXXXXXXXXXXXXXXX. Provide barrier and/or clear coats as required.

2.1.3. Downspouts: Steel pipe, ASTM A 53, Grade B, Schedule 40, galvanized, unless otherwise shown or specified.

2.2. ACCESSORIES

2.2.1. Fasteners: Galvanized steel with soft neoprene washers at exposed fasteners. Finish exposed fasteners same as flashing metal.

2.2.2. Sealant: Type specified in Section 07900.

2.2.3. Solder: ANSI/ASTM B 32; type with less than 0.2% lead.

2.2.4. Flux: FS O-F-506.

2.3. PREFABRICATED COMPONENTS

2.3.1. Prefabricated Reglet Assembly:

2.3.1.1. Manufacturer and Series: Western, Fry or equal, Type as required for condition shown on drawings.

2.3.1.2. Counterflashing: Galvanized Steel, with windlocks at 32 inches on center and at each corner. Provide prefinished counterflashing where visible.

2.3.1.3. Corners: Provide factory prefabricated corner assemblies.

2.4. FABRICATION

2.4.1. Provide sheet metal work as shown on Drawings and not specified under other Sections. Fabricate as indicated. Where specific details are not shown, fabricate according to applicable SMACNA "Architectural Sheet Metal Manual" criteria.

2.4.2. Form sections true to shape, accurate in size, square, and free from distortion or defects. Match profiles at connections. Provide ribs, cleats, and reinforcement necessary to make sections rigid and substantial. Allow for expansion and contraction.

2.4.3. Unless noted otherwise, fabricate cleats and starter strips of same material as sheet, minimum 2 inches wide, interlocked with fabrication.

2.4.4. Form pieces in longest practical lengths. Locate joints of fascias, roof edges, and other sheet metal work exposed to view with respect to panel joints or other architectural features as indicated on Drawings, or as directed by Architect.

2.4.5. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip and cleat interlock.

2.4.6. Generally, provide shop joints single locked and soldered, or lapped, riveted and soldered. Provide field joints designed to permit expansion, with joint covers or lapped joints with "S" clips. Do not solder.

2.4.6.1. Provide lapped, riveted and soldered joints at gutter conditions.

2.4.6.2. Provide all concealed stiffeners and bracing at roof edge trim, fascia and gutter cover as required by Architect.

2.4.6.3. Provide 10 gauge x 1-1/2 inch wide gutter bracket support, wrapping completely around gutter, located at 32 inches on center and fastened to solid blocking with 2 No. 12 wood screws. Provide 16 gauge x 1-1/2 inch gutter strap at 32 inches on center, extending minimum 6 inches under roofing system.

2.4.6.4. Provide gutter flashing in compliance with SMACNA Chapter 1, including "rectangular Gutter Design criteria" page 1.8, 5th edition. Provide fully welded two, three and four way gutter intersections, with expansion joints fabricated and located per Figure 1-5 and 1-6.

2.4.7. Form material with flat lock seams unless noted otherwise. Overlap seams in direction of flow with finished width of lock seams and soldered lap seams not less than 1 inches, and finished width of unsoldered lap seams not less than 3 inches.

2.4.8. Where specified, solder and seal metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Provide smooth even surface on exposed soldering on finished surfaces.

2.4.9. Provide shop formed transition and corner pieces with locked and soldered corners. Locate field joints not less than one foot nor more than three feet from actual corner. Shortest length dimension of any corner piece leg shall not be less than one foot.

2.4.10. Locate parapet coping expansion joints 20 feet on center maximum, and as otherwise required to permit expansion and contraction.

2.4.11. Fabricate flashing assemblies as specified in this Section and as shown on Drawings.

2.4.12. Coping Fabrication:

2.4.12.1. Material and Gauge: Galvanized steel

2.4.12.1.1. Flashing with an exposed vertical face of 8" or less: 24 gauge.

2.4.12.1.2. Flashing with an exposed vertical face of 8" to 10": 22 gauge.

2.4.12.1.3. Flashing with an exposed vertical face of 10" to 15": 20 gauge.

2.4.12.2. Finish: As specified in this Section.

2.4.12.3. SMACNA Reference: Table 3-1, with J9 drive cleat, flat lock seam joint design, C1 corner, and E1 edge.

2.4.13. Prefabricated and Fabricated Reglet Counterflashing:

2.4.13.1. Material and Gauge: Galvanized steel, 22 gauge.

2.4.13.2. Finish: As specified in this Section.

2.4.14. Miscellaneous flashing, roof flashing, metal flashing assemblies and counterflashing:

2.4.14.1. Material and Gauge: Galvanized steel

2.4.14.1.1. Flashing with an exposed vertical face of 8" or less: 24 gauge.

2.4.14.1.2. Flashing with an exposed vertical face of 8" to 10": 22 gauge.

2.4.14.1.3. Flashing with an exposed vertical face of 10" to 15": 20 gauge.

2.4.14.2. Finish: As specified in this Section.

2.4.15. Gutters:

2.4.15.1. Material and Gauge: Galvanized steel, 22 gauge.

2.4.15.2. Finish: As specified in this Section.

2.4.15.3. SMACNA Reference: Figure 1-15C, with minimum 4 inch flashing flange beneath roof flashing system.

2.4.15.4. Provide downspout connection per SMACNA Figure 1-33, with basket strainer.

2.4.16. Through-parapet Overflow scuppers:

2.4.16.1. Material and Gauge: Galvanized steel, 22 gauge.

2.4.16.2. Finish: As specified in this Section.

2.4.16.3. SMACNA Reference: Figure 1-30, with minimum 4 inch flashing flange beneath parapet wall finish.

2.4.17. Fabricated Sheet Metal Downspouts - Round:

2.4.17.1. Material and Gauge: Galvanized steel, 22 gauge.

2.4.17.2. Finish: As specified in this Section.

2.4.17.3. SMACNA Reference: Figure 1-32A smooth, round, with hangers per Figure 1-35D.

2.4.18. Fabricated Sheet Metal Downspouts - Rectangular:

2.4.18.1. Material and Gauge: Galvanized steel, 22 gauge.

2.4.18.2. Finish: As specified in this Section.

2.4.18.3. SMACNA Reference: Figure 1-32B smooth, rectangular, with hangers per Figure 1-35B.

2.4.19. Conductor Heads:

2.4.19.1. Material and Gauge: Galvanized steel, 22 gauge.

2.4.19.2. Finish: As specified in this Section.

2.4.19.3. SMACNA Reference: Figure 1-25C .

2.4.20. Transition at plaster finished wall intersecting adjacent plaster wall: Provide 22 gauge fully soldered fabricated transition. Fabricate transition to extend beneath plaster finish at all surfaces 4 inches. Coordinate transition with coping and underlayment as directed by Architect.

2.5. OTHER MATERIALS

2.5.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Except where prefinished flashing material is specified, pre-paint all flashing visible in the completed project. Pre-paint in protected shop location, complying with paint system specified in Section 09900. Touch up after installation.

END OF SECTION

SECTION 07900

JOINT SEALERS

1. PART 1 - GENERAL

1.1. SECTION INCLUDES

1.1.1. Sealants and joint treatment necessary to provide a positive barrier against passage of moisture and air.

1.1.2. Sealants at material joints necessary to provide closure for ease of cleaning and maintenance.

1.1.3. Sealants at all penetrations of sound rated walls and floors.

1.2. GUARANTEE

1.2.1. Contractor's Guarantee

1.2.1.1. Provide Owner with written Guarantee per Section 00630 on Contractor's letterhead, and signed by General Contractor and sealant system subcontractor.

1.2.1.2. Provide guarantee for a time period of five years, commencing from the date of final acceptance of the project, against the following defects:

1.2.1.2.1. Adhesive or cohesive sealant joint failure.

1.2.1.2.2. Pin holes or blistering of sealant joint.

1.2.1.2.3. Staining of adjacent substrate or surrounding material.

1.2.1.2.4. Chalking or color change exceeding manufacturers published data.

1.2.1.3. Make inspections and emergency repairs to defects or leaks in the sealant system within twenty-four (24) hours of receipt of notice from the Owner.

1.2.1.4. Restore the affected areas to the standard of the original specifications as soon as weather permits.

2. PART 2 - PRODUCTS

2.1. SEALANTS

2.1.1. General

2.1.1.1. All sealants for any one Type shall be the product of a single manufacturer, suitable for the intended use, and per the following product characteristics.

2.1.1.2. Unless noted otherwise, use sealants in application as defined below.

2.1.2. Product Characteristics

2.1.2.1. Type 1: Unless noted otherwise, at exterior openings, joints, material transitions, bedding, and other conditions where anticipated joint movement will be plus/minus 25% or less.

2.1.2.1.1. Approved Product: Dow Corning 795.

2.1.2.2. Type 2: At all exposed metal to metal wall and roof flashing conditions, all exposed prefinished metal roofing and flashing conditions; storefront perimeter conditions, and all other conditions where anticipated joint movement will be plus/minus 25 - 50%.

2.1.2.2.1. Approved Product: Dow Corning 795.

2.1.2.3. Type 3: At horizontal concrete paving joints exposed to pedestrian and vehicular traffic, and all joints subject to immersion:

2.1.2.3.1. Pecora DynaTred.

2.1.2.4. Type 4: Exterior application in conjunction with wood products:

2.1.2.4.1. Tremco Dymonic.

2.1.2.5. Type 5: Pipes and conduits penetrating underground walls:

2.1.2.5.1. Sealant compatible with waterproofing system.

2.1.2.6. Type 6: Interior applications in conjunction with sanitary conditions:

2.1.2.6.1. Non-Food Use: General Electric Silicone Sanitary Sealant 1702.

2.1.2.7. Type 7: Interior sound control applications.

2.1.2.7.1. Approved Products: USG Sheetrock Acoustical Sealant.

2.1.2.8. Type 8: Unless noted otherwise, at interior openings, joints, material transitions and bedding, at locations shown on drawings, and other conditions where anticipated joint movement will be 25% or less.

2.1.2.8.1. Approved Products: Pecora AC-20 + Silicone.

2.1.2.9. Type 9: At all concealed prefinished metal roofing and flashing conditions, provide butyl sealant as recommended by metal roofing manufacturer.

2.1.2.10. Type 10: At all metal flashing and gutter joints subject to periodic or continuous water immersion:

2.1.2.10.1. Approved Product: Dow Corning 799.

2.1.2.11. Type 11: For joints at acoustical laminated glass:

2.1.2.11.1. Approved Product: Pecora 985 Silicone.

2.1.2.12. For other applications provide products especially formulated for the proposed use and approved in advance by the Architect.

2.1.3. Colors:

2.1.3.1. Color:

2.1.3.1.1. Polyurethane sealant applications will be selected by the Architect from standard colors normally available from the Vulkem color line.

2.1.3.1.2. Silicone sealant applications will be selected by the Architect from all colors available from the Dow Corning standard and special color line.

2.1.3.2. Should such standard color not be available from the approved manufacturer except at additional charge, provide such colors at no additional cost to the Owner.

2.1.3.3. In concealed installations, and in partially or fully exposed installations where approved by the Architect, use standard gray or black sealant.

2.2. OTHER MATERIALS

2.2.1. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. When using backup of tube or rod stock, avoid lengthwise stretching of material. Do not twist or braid hose or rod backup stock.

3.1.2. Prime joints in accordance with manufacturers recommendations.

3.1.3. Provide an approved bond-breaker where recommended by sealant manufacturer.

3.1.4. Equipment:

3.1.4.1. Apply sealant under pressure with power-actuated hand gun or manually-operated hand gun, or by other appropriate means.

3.1.4.2. Use guns with nozzle of proper size, and providing sufficient pressure to completely fill the joints as designed.

3.1.4.3. Do not use pourable sealant installation method at hardscape paving joints.

3.1.5. Thoroughly and completely mask joints where the appearance of primer or sealant on adjacent surfaces would be objectionable.

3.1.6. Install the sealant in strict accordance with the manufacturer's recommendations, thoroughly filling joints to the recommended depth.

3.1.6.1. Use of sealant dams contained within the hardscape joint is not permitted. Install sealant without interruption from end to end of joint.

3.1.7. Tool joints to the profile shown on the Drawings, or as otherwise required if such profiles are not shown on the Drawings.

3.1.7.1. Tool joints to a smooth and consistent transition. Do not leave ripples, strings, or surface tooling marks in sealant.

3.1.8. Unless otherwise specified, at all sound rated wall and floor assemblies, seal penetrations and recessed items through the floors and walls with Type 7 sealant. Seal all penetrations such as electrical device cover plates, pipes, fire extinguisher cabinets and similar penetrations in room surfaces.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Hollow metal rolled steel doors, non-rated and rated for fire resistance.

1.1.2. Hollow metal rolled steel door frames, non-rated and rated for fire resistance.

1.1.3. Hollow metal rolled steel borrowed lite and window frames, non-rated and rated for fire resistance.

2. PART 2 - PRODUCTS

2.1. STEEL DOORS

2.1.1. Manufacturer: Characteristics of specific products manufactured by Curries Company are indicated to establish required level of quality, appearance, and performance. The Architect will consider comparable products by alternate manufacturers listed in this Section, and requests for substitutions, under the provisions of Section 01610.

2.1.1.1. Acceptable Alternate Manufacturers: Amweld, Ceco, Steelcraft, or equal.

2.1.2. Type/Series:

2.1.2.1. Type: Flush, Hollow metal, with core material as specified.

2.1.2.2. Series: Series 707/707L.

2.1.2.2.1. Style: As shown on drawings.

2.1.3. Construction:

2.1.3.1. Grade:

2.1.3.1.1. Exterior Doors: Grade III per SDI 100.

2.1.3.1.2. Interior Doors: Grade II per SDI 100.

2.1.3.2. Material: Cold Rolled Steel per ASTM A 366.

2.1.3.3. Thickness: 1-3/4 inch.

2.1.3.4. Face Sheet Gauge

2.1.3.4.1. Exterior Doors: 14 gauge.

2.1.3.4.2. Interior Doors: 16 gauge.

2.1.3.5. Edge Seams: Continuously welded and ground smooth. Filler not acceptable.

2.1.3.6. Core:

2.1.3.6.1. Exterior Doors: Provide foamed in place polyurethane core, minimum 1.0 pcf density, R value of 12.5.

2.1.3.6.2. Interior Doors: Provide foamed in place polyurethane core, minimum 1.0 pcf density, R value of 12.5.

2.1.3.6.3. Fire Rated Doors: Provide mineral core where required to comply with rating shown on drawings.

2.1.3.6.4. Stair Enclosure Doors: Provide composite core at temperature rise rated doors.

2.1.3.7. Vision Glass Frame: Air Louvers VLF series, Anemostat Series FGS-75 or equal, factory primed and finish painted per Section 09900. Refer to Section 08800 for glazing.

2.1.3.8. Louvers: As specified in this Section.

2.1.3.9. Transom (where shown): Same construction and finish as door.

2.1.4. Finish:

2.1.4.1. At exterior doors, provide Hot Dip Galvanized finish per ASTM A 653, A 60 classification.

2.1.4.2. Provide spray applied primer at all interior doors per ANSI A250.10.

2.1.5. Fire Criteria:

2.1.5.1. Provide rated doors per referenced standards and as scheduled on drawings.

2.1.5.2. At stair enclosure conditions, provide rated doors with maximum 250 degree F temperature rise end point, measured in accordance with UBC Standard 7-2.

2.2. STEEL DOOR FRAMES

2.2.1. Manufacturer: Characteristics of specific products manufactured by Curries Company are indicated to establish required level of quality, appearance, and performance. The Architect will consider comparable products by alternate manufacturers listed in this Section, and requests for substitutions, under the provisions of Section 01610.

2.2.1.1. Acceptable Alternate Manufacturers: Amweld, Ceco, Steelcraft, or equal.

2.2.2. Type/Series:

2.2.2.1. Type: Unless noted otherwise, wrap around, double rabbet, flush frames.

2.2.2.2. Series:

2.2.2.2.1. Door Frames: M Series Frame.

2.2.2.2.2. Use of knocked down (KD) frames prohibited without Architects prior approval.

2.2.3. Construction:

2.2.3.1. Material: Cold Rolled Steel per ASTM A 366.

2.2.3.2. Face Dimension: 2 inches, unless otherwise shown on drawings.

2.2.3.3. Gauge

2.2.3.3.1. Exterior: 14 gauge.

2.2.3.3.2. Interior: 18 gauge.

2.2.3.4. Gasketing/Weatherseal: As specified in this Section.

2.2.3.5. Glazing: Per Section 08800.

2.2.4. Finish:

2.2.4.1. At exterior frames, provide Hot Dip Galvanized finish per ASTM A 653, A 60 classification.

2.2.4.2. Provide spray applied primer at all interior frames per ANSI A250.10.

2.2.4.3. Provide bituminous paint coating at interior surface of grout filled frames.

2.2.5. Anchors:

2.2.5.1. Provide minimum 18 gauge head and jamb anchors suitable for wall condition and in configuration for welded in place installation.

2.2.5.2. Provide masonry T-Anchors at masonry walls. Wire anchors not acceptable.

2.2.6. Glass Stops:

2.2.6.1. Manufacturer's standard glass stop, minimum 5/8 inch high for glass area under 500 square inches and minimum 3/4 inch high for glass area over 500 square inches.

2.2.6.2. Glass stop shall be attached with countersunk Phillips head screws. .

2.2.7. Fire Criteria:

2.2.7.1. Provide rated frames per referenced standards and as scheduled on drawings.

2.3. FABRICATION

2.3.1. General

2.3.1.1. Fabricate all doors and frames in accordance with S.D.I.-100 except where more stringent requirements are specified.

2.3.1.2. Supply only doors and frames manufactured by a single manufacturer.

2.3.2. Door Construction

2.3.2.1. Unless otherwise required by hardware specified in other sections, bevel vertical lock edges 1/8 inch in 2 inches.

2.3.2.2. Door lock edge reinforcing: one-piece, full height 14 gauge channel.

2.3.2.3. Closer reinforcing: one-piece, minimum 12 gauge plate.

2.3.2.4. Door hinge edge reinforcing: one-piece, full height 14 gauge channel, formed and tapped for hinges.

2.3.2.5. Weld both hinge and lock channels to each door face sheet.

2.3.2.6. Provide minimum 16 gauge top and bottom channels, flush or inverted, and welded to face sheets.

2.3.2.6.1. Close tops of outswinging exterior doors flush by the addition of steel top channel filler.

2.3.3. Frame Construction

2.3.3.1. Weld all frames and grind smooth. Provide continuous flush welds. Repair specified finish.

2.3.3.1.1. Provide continuous weld at sill condition of all openings as required to prevent water penetration to interior of frame.

2.3.3.2. Provide temporary shipping bars for protection from damage during transit and handling.

2.3.3.3. Remove temporary spreaders before setting frames.

2.3.3.4. Use of KD frames prohibited without prior Architect approval.

2.3.3.5. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.

2.3.3.6. Prepare door frame for silencers. Provide three single rubber silencers for single doors on strike side, and two single silencers on frame head at double doors without mullions.

2.3.3.7. Where required by listing, attach fire rated label to each frame unit requiring such rating.

2.3.3.8. Supply welded in mortar guards at all hardware cutouts in frames built into masonry or grouted.

2.3.3.9. Fabricate window frames for glass thickness as shown on drawings or specified. Provide roll formed integral stop portion on interior side of frame.

2.3.3.10. Provide loose glass stops, located on exterior of exterior window frame. Fasten using phillips/spanner head screws, located as necessary to assure compression of glass against weatherseal.

2.3.4. Frame Anchors

2.3.4.1. Wall anchors for masonry construction:

2.3.4.1.1. Provide galvanized anchors at exterior or masonry conditions.

2.3.4.1.2. Provide masonry anchors, adjustable, flat, corrugated or perforated 'T' shaped anchors with leg not less than 2 inches wide by 10 inches long. Use of wire type not acceptable.

2.3.4.2. Wall anchors for drywall/frame partitions:

2.3.4.2.1. Provide steel or wood stud anchors sized to accommodate frame jamb depth and face dimension on all welded frames.

2.3.4.2.2. Provide manufacturers adjustable type compression anchors where use of knocked down (KD) frame is approved.

2.3.4.3. Provide frame jamb anchors at 30 inches on center (or fractional portion) on each jamb.

2.3.4.4. Floor anchors:

2.3.4.4.1. Where access to back of frame is possible, provide angle clip type, 16 gauge minimum, welded to the bottom of each jamb.

2.3.4.4.2. Where stud framed wall occurs at concrete curb, provide additional jamb anchor at each jamb, installed at approximately 7 inches above finish floor.

2.3.4.5. Frame attachment at in-place masonry or concrete:

2.3.4.5.1. Anchor with 3/8 inch countersunk flat head stove bolt and expansion shields.

2.3.4.5.2. Space 6 inches from top and bottom of frame and at 24 inches on center maximum between.

2.3.4.5.3. Weld pipe spacers or other type of spacers per manufacturers standard design in back of frame soffit to protect frame profile during tightening of bolts and anchors.

2.3.4.5.4. Provide welded filler at anchor slot and edge, Grind smooth and prime. Use of epoxy or synthetic filler not acceptable.

2.3.5. Hardware Preparation

2.3.5.1. Reinforcement: reinforce components for hardware installation in accord with ANSI A250.6.

2.3.5.1.1. Provide 'box' type lock reinforcing, minimum 16 gauge.

2.3.5.1.2. Provide minimum 7 gauge hinge reinforcing, welded to frame.

2.3.5.1.3. Provide minimum 12 gauge closer reinforcement.

2.3.5.1.4. Provide minimum 14 gauge reinforcement at other hardware locations.

2.3.5.2. Locate factory prepared hardware locations in compliance with "Recommended locations for builders' hardware for standard steel doors and frames", as adopted by The Steel Door Institute.

2.4. DOOR LOUVERS

2.4.1. Manufacturer: Air Lover, Anemostat or equal.

2.4.1.1. For purpose of establishing required level of quality, characteristics of products manufactured by Anemostat are specified.

2.4.2. Type/Series:

2.4.2.1. Type: Split Ventilation Louver, Non-Vision, Non Rated

2.4.2.2. Series: Series FDLS

2.4.3. Construction:

2.4.3.1. Material: Cold Rolled Steel per ASTM A 366.

2.4.3.2. Face Dimension: 1-1/8 inches.

2.4.3.3. Gauge: 18 gauge frame, 20 gauge blades.

2.4.3.4. Fasteners: Spanner Head.

2.4.3.5. Screen: 18-14 mesh insert, galvanized, attached to interior surface of split louver.

2.4.3.6. Free Air Criteria: Provide minimum 50% free air flow.

2.4.4. Finish:

2.4.4.1. Provide Hot Dip Galvanized finish per ASTM A 653, G 90 classification.

2.5. DOOR LOUVERS - EXTERIOR AND LOCKER ROOM APPLICATION

2.5.1. Manufacturer: Air Lover, Anemostat or equal.

2.5.1.1. For purpose of establishing required level of quality, characteristics of products manufactured by Anemostat are specified.

2.5.2. Type/Series:

2.5.2.1. Type: Ventilation Louver, Non-Vision, Non-Rated

2.5.2.2. Series - Exterior Doors: Series PLSL

2.5.2.3. Series - Interior Doors: Series AFDL

2.5.3. Construction:

2.5.3.1. Material: Cold Rolled Steel per ASTM A 366.

2.5.3.2. Face Dimension: 1-1/8 inches.

2.5.3.3. Gauge - AFDL Series: 18 gauge frame, 20 gauge blades.

2.5.3.4. Gauge - PLSL: 18 gauge frame, 18 gauge blades, with 12 gauge security face plate.

2.5.3.5. Fasteners: Spanner Head.

2.5.3.6. Screen: 18-14 mesh insert, galvanized, attached to interior surface of split louver.

2.5.3.7. Free Air Criteria: Provide minimum 50% free air flow.

2.5.4. Finish:

2.5.4.1. Provide Hot Dip Galvanized finish per ASTM A 525, G 90 classification.

2.6. GASKET AND WEATHERSEAL

2.6.1. Manufacturer: Type 1 sealant per Section 07900.

2.6.2. Type:

2.6.2.1. Type 1: Provide wet seal at exterior window assemblies, using silicone sealant at exterior, and approved glazing tape at interior, color as selected by Architect.

2.6.2.2. Type 2: Provide dry seal installation at Interior window assemblies, using glazing tape, thickness as necessary for installation.

2.6.3. Accessories: Provide neoprene setting blocks, edge blocks and other accessories as necessary for complete installation in accordance with referenced standards.

2.7. OTHER MATERIALS

2.7.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Set welded frames in position prior to beginning partition work. Brace frames until permanent anchors are set.

3.1.2. Set anchors for frames as work progresses. Install anchors at hinge and strike levels.

3.1.2.1. Where frame is accessible from back, install sill/floor anchors to slab or floor assembly.

3.1.2.2. Where wall framing is installed on concrete curb, install jamb anchor at approximately 7 inches above floor level.

3.1.2.3. Install two head anchors per frame with width exceeding 3 feet and less than 6 feet wide. Install three anchors, equally spaced, at wider frames.

3.1.3. Install all fire rated frames in accord with NFPA-80 requirements, UL listing and manufacturers installation requirements.

3.1.4. Install stops at glass with wet seal method at exterior:

3.1.4.1. Provide heel sealant bead at joint between glass and integral frame stop.

3.1.4.2. Provide sealant cap bead at joint between glass and loose stop, tooled neatly per Section 07900.

3.1.4.3. Provide preformed gasket or tapes at interior.

END OF SECTION

SECTION 08212

WOOD DOORS

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Wood doors, rated and non-rated as specified here-in, except as follows:

1.1.2 Provide wood stile and rail doors to match existing, adjacent doors where indicated. Doors shall be equal to WIC Custom Grade Stile and Rail per Section 13 of the WIC Manual of Millwork. Wood species, detailing, finish, stain and general appearance shall match existing.

1.2. WARRANTY

1.2.1. Provide Life of Installation manufacturer's warranty under provisions of Section 01700.

1.2.2. Submit written warranty on manufacturer's standard form signed by an official of the door manufacturer agreeing to repair or replace defective doors which exhibit the following defects:

1.2.2.1. Delamination in any degree.

1.2.2.2. Warp or twist of 1/4 inch or more in any 3'-6" x 7'-0" plane of door face.

1.2.2.3. Telegraphing of stile, rail or core through face to cause surface variation in excess of 1/100 inch in any 3 inch span.

1.2.3. Warranty shall include refinishing and reinstallation as required due to repair or replacement of defective doors.

1.2.4. Warranty Period - Interior Doors: Life of the original installation.

1.2.5. Warranty Period - Exterior Doors: Five (5) years.

1.2.6. Warranty shall not apply to any field finished doors improperly sealed on all edges and faces.

2. PART 2 - PRODUCTS

2.1. NON RATED WOOD DOORS

2.1.1. Manufacturer: Weyerhauser Company, Graham or equal.

2.1.2. Types: Nonrated, flush face, solid core door with vision glass, louvers or transom panel.

2.1.3. Door Series/Style: Marshfield Series, DPC-1.

2.1.4. Construction: WIC Type A - 5 Ply Construction.

2.1.4.1. NWWDA I. S. 1-A Series and Premium Grade per WIC Section 20.

2.1.4.2. Adhesive: WIC Type I, waterproof.

2.1.4.3. Core: Mat formed particle board conforming to ANSI A208.1-1L1.

2.1.4.4. Visible Edge Bands: Hardwood matching veneer species, without finger joints, minimum 3/4 inch thick over hardwood stiles.

2.1.4.5. Veneer:

2.1.4.5.1. Grade/Species: White Birch, NWWDA Grade 1 (Premium) Grade, Transparent Finish, per WIC section 20. Select color range for *consistent light/dark/match existing.*

2.1.4.5.2. Veneer Thickness: 1/50 inch minimum.

2.1.4.5.3. Veneer Cut: Plain Sliced per NWWDA IS 1-A.

2.1.4.5.4. Veneer Grain Match: Balance match.

2.1.4.5.5. Use of rain forest products in veneer, crossbands or backs is not acceptable.

2.1.4.6. Transom: Same construction and finish as door.

2.1.4.7. Vision Glass Frame: Anemostat or equal, Series FGS-75, factory primed and finish painted per Section 09900. Refer to Section 08800 for glazing.

2.1.4.8. Louvers: Anemostat or equal, Series AFDL, factory primed and finish painted per Section 09900.

2.1.5. Finish:

2.1.5.1. Finish: Factory prefinish all doors at factory.

2.1.5.2. System: Prefinish in compliance with NWWDA System 5, filled where required by wood species.

2.1.5.3. Color: As selected by Architect from manufacturers standard color line.

OR

2.1.6. Finish:

2.1.6.1. Finish: Coordinate finishing of doors with system specified in Section 09900.

2.2. FIRE RATED WOOD DOORS

2.2.1. Manufacturer: Weyerhauser Company, Graham or equal.

2.2.2. Types: Fire-Rated, flush face, mineral core door with vision glass, louvers or transom panel.

2.2.3. Door Series/Style: Marshfield Series, DFM - rated time period as shown on drawings.

2.2.3.1. At contractors option, Marshfield Series DFP core permitted for 20 minute rated doors only.

2.2.4. Construction: WIC Type A - 5 Ply Construction.

2.2.4.1. Standards: UL 10B, NFPA 252, ASTM E 152, NWWDA I. S. 1-A Series and Premium Grade per WIC Section 20.

2.2.4.2. Adhesive: WIC Type I, waterproof.

2.2.4.3. Core: Mineral Core. Provide solid fire retardant wood blocking, free of asbestos, for hardware.

2.2.4.3.1. At contractors option, Marshfield Series DFP core permitted for 20 minute rated doors only.

2.2.4.4. Visible Edge Bands: Hardwood matching veneer species, without finger joints.

2.2.4.5. Veneer:

2.2.4.5.1. Grade/Species: White Birch, NWWDA Grade 1 (Premium) Grade, Transparent Finish, per WIC section 20. Select color range for *consistent light/dark/match existing*.

2.2.4.5.2. Veneer Thickness: 1/50 inch minimum.

2.2.4.5.3. Veneer Cut: Plain Sliced per NWWDA IS 1-A.

2.2.4.5.4. Veneer Grain Match: Balance match.

2.2.4.5.5. Use of rain forest products in veneer, crossbands or backs is not acceptable.

2.2.4.6. Transom: Same construction and finish as door.

2.2.4.7. Vision Glass Frame: Anemostat or equal, Series FGS-75 (fire rated metal vision frame), factory primed and finish painted per Section 09900. Refer to Section 08800 for glazing.

2.2.4.8. Louvers: Anemostat or equal, Series FLDL-UL (fusible link louver/fire rated), factory primed and finish painted per Section 09900.

2.2.5. Fire/Habitability Criteria:

2.2.5.1. Refer to door schedule for required ratings.

2.2.5.2. Doors shall be labeled, per WIC 429.

2.2.6. Finish: Comply with Article 2.1 of this Section.

2.3. OTHER MATERIALS

2.3.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Install doors in accordance with WIC Manual of Millwork.

3.1.1.1. Do not field trim doors without prior approval.

3.1.1.2. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

3.1.1.3. Machine cut for field applied hardware in compliance with listing.

3.1.1.4. Sand all edges of doors, including top edge, after fabrication and field adjustment to a smooth and uniform surface.

3.1.1.5. Coordinate installation of doors with installation of frames specified in Section 08110 and hardware specified in Section 08710.

3.1.1.6. Coordinate installation of glazing, including all trims, sealants and labeling requirements.

3.1.1.7. Coordinate sealer installation at cut-outs and hardware preparation.

3.1.2. Before field finishing, remove handling marks and exposure markings from all surfaces and edges with a complete block sanding using at least 150 grit sandpaper. Ease all edges. Steam out all scratches before sanding. Comply with WIC, including use of sanding sealers and fillers.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door Hardware.

B. Related Sections:

1. Section 06 20 00 - Finish Carpentry: Finish Hardware Installation
2. Section 07 92 00 - Joint Sealers – exterior thresholds
3. Section 08 11 00 - Metal Doors and Frames
4. Section 08 40 00 - Entrances and Storefronts
5. Section 08 44 13 - Glazed Curtain Walls
6. Section 10 22 26 - Operable Partitions

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

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Conduit, junction boxes & wiring.
8. Marble thresholds.

1.2 REFERENCES:

Use date of standard in effect as of Bid date.

A. American National Standards Institute – ANSI 156.18 – Materials and Finishes.

B. ICC/ANSI A117.1 - 1998 – Specifications for making buildings and facilities usable by physically handicapped people.

C. ADA – Americans with Disabilities Act of 1990

D. BHMA – Builders Hardware Manufacturers Association

E. DHI – Door and Hardware Institute

F. NFPA – National Fire Protection Association

1. NFPA 80 – Fire Doors and Windows
2. NFPA 105 – Smoke and Draft Control Door Assemblies
3. NFPA 252 – Fire Tests of Door Assemblies

G. UL – Underwriters Laboratories

1. UL10C – Positive Pressure Fire Tests of Door Assemblies.
2. UL 305 – Panic Hardware

H. WHI – Warnock Hersey Incorporated State of California Building Code

I. Local applicable codes

J. SDI – Steel Door Institute

K. WI – Woodwork Institute

L. AWI – Architectural Woodwork Institute

M. NAAMM – National Association of Architectural Metal Manufacturers

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Section 01330. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

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

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

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

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, not the discrepancy in the submittal and request direction from Architect for resolution.

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

F. Items listed with no substitute manufacturers **and/or where the words "District Standard" are shown indicates that they are the only acceptable products or manufacturer for use on the project**. ~~have been requested by Owner to meet existing standard.~~ 12-16-11 1A ADDENDUM 1A

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

1.4 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

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

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

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C / UBC Standard 7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Note: scheduled resilient seals may exceed selected door manufacturer's requirements.

F. See 2.6.E for added information regarding resilient and intumescent seals.

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

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

1.5 DELIVERY, STORAGE AND HANDLING:

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

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

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

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

1.6 PROJECT CONDITIONS AND COORDINATION:

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

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

1. Location of embedded and attached items to concrete.
2. Location of wall-mounted hardware, including wall stops.
3. Location of finish floor materials and floor-mounted hardware.
4. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
5. Manufacturer templates to door and frame fabricators.

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

D. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.

1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.7 WARRANTY:

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

1.	Locksets:	Five years
2.	Exit Devices:	Three years mechanical One year electrical
3.	Closers:	Ten years mechanical Two years electrical
4.	Hinges:	One year
5.	Other Hardware	Two years

1.8 COMMISSIONING:

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

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

2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.

3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

1.9 REGULATORY REQUIREMENTS:

A. Locate latching hardware between 30" to 44" above the finished floor, per California Building Code, Section 1133B.2.5.2.

B. Adjust doors to open with not more than 5.0 lbs pressure to open at exterior doors and 5.0 lbs at interior doors. As allowed per California Building Code, Section 1133B.2.5, only the appropriate administrative authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15 lbs.

C. Adjust door closer sweep periods so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door, per California Building Code Section 1133B.2.5.1

D. All hardware to meet California Building Code Sections 1133B.2.1, 1133B.2.5.1 and 1008.1.8.

E. Provide exit door locks and panic devices complying with Section 1003.3.1, 1008.1.9. and 1133B.2, and 1133B.2.5, Part 2, Title 24, CCR.

F. Thresholds: Comply with California Building Code Section 1133B.2.4.1. and 1008.1.6

G. Floor stops: Do not locate in path of travel. Locate no more than 4" from walls, per DSA Policy #99-08 (Access).

H. PART 2PRODUCTS.1 MANUFACTURERS:

A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE SUB:
Hinges	(IVE) Ives	Stanley, McKinney
Key System	(SCH) Schlage	District Standard
Locks	(SCH) Schlage	District Standard
Exit Devices	(VON) Von Duprin	District Standard
Closers	(LCN) LCN	District Standard
Kickplates	(IVE) Ives	Trimco
Stops	(IVE) Ives	Trimco
Seals & Thresholds	(NGP) NGP	Zero

2.2 HINGING METHODS:

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

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

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

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

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

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Mortise Locksets and Latchsets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.

2. Latchbolts: 3/4 inch throw stainless steel anti-friction type.

3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.

a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.

4. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.

5. Thumbturns: accessible design not requiring pinching or twisting motions to operate.

6. Deadbolts: stainless steel 1-inch throw.

7. Electric operation: Manufacturer-installed continuous duty solenoid.

8. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.

9. Scheduled Lock Series and Design: Schlage L series, 06N design.

10. Certifications:

a) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.

b) ANSI/ASTM F476-84 Grade 31 UL Listed.

2.4 EXIT DEVICES / PANIC HARDWARE

A. Panic hardware shall comply with CBC section 1008.1.9, (consider that if the device is mounted lower than 36" AFF, the clear opening may be restricted to less than 32" required clear opening). Panic bar shall be mounted above 36" to 44" above finished floor surface.

The unlatching force shall not exceed 15 lbs. (66.72N), applied in the direction of travel.

Panic hardware shall not be provided with "Night Latch" (NL) function except as allowed by DSA interpretation 10-08 DSA/AC (External) revised 4/28/09.

B. GENERAL FEATURES

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. 0.75-inch throw deadlocking latchbolts.
4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Releasable in normal operation with 15-lb. maximum operating force per UBC Standard 10-4, and with 32 lb. maximum pressure under 250-lb. load to the door.
8. Exterior doors scheduled with XP-series devices: Static load force resistance of at least 2000 pounds.
9. Flush end cap design as opposed to typical "bottle-cap" design end cap.
10. Comply with CBC Section 1003.3.1.9.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min .130" thickness, compression spring drive, match lockset lever design.
3. Rod and latch guards with sloped full-width kickplates for doors fitted with surface vertical rod devices with bottom latches.
4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
5. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.

2.5 CLOSERS

A. Surface Closers:

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.
4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.

6. Adjustable to open with not more than 5.0lbs pressure to open at exterior doors and 5.0lbs at interior doors. As allowed per California Building Code, Section 1133B.2.5, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15lbs.

7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.

8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.

9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.

10. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.

11. Non-flaming fluid, will not fuel door or floor covering fires.

12. Pressure Relief Valves (PRV) not permitted.

2.6 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design.

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

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

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

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

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

E. Seals: Finished to match adjacent frame color. Resilient seal material: polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Do not furnish vinyl seal material. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability.

1. Proposed substitutions: submit for approval.

2. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.

3. Non-corroding fasteners at in-swinging exterior doors.

4. Sound control openings: Use components tested as a system using nationally accepted standards by independent laboratories. Ensure that the door leafs have the necessary sealed-in-place STC ratings. Fasten applied seals over bead of sealant.

5. Fire-rated Doors, Resilient Seals: UL10C / UBC Standard 7-2 compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive-mounted resilient seal, furnish rigid housed seal at minimum, or both the rigid housed seal plus the adhesive applied seal. Adhesive applied seals alone are deemed insufficient for this project where rigid housed seals are scheduled.

6. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C / UBC Standard 7-2. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required

F. Automatic door bottoms: low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.

G. Thresholds: As scheduled and per details. Comply with CBC Section 1133B.2.4.1. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.

1. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).

2. Fire-rated openings, 90min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.

3. Fire-rated openings, 3hour duration: Thresholds, where scheduled, to extend full jamb depth.

4. Acoustic openings: Set units in full bed of Division-7-compliant, leave no air space between threshold and substrate.

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

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

H. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

I. Key Control Software: Same manufacturer as key cylinders, supply to Owner.

2.7 FINISH:

A. Generally BHMA 626 Dull Chrome.

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

C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

2.8 KEYING REQUIREMENTS:

A. Key System: Schlage Everest D utility-patented keyway, interchangeable core large format. Utility patent protection to extend at least until 2014. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and I-R Security & Safety Consultants representatives to determine system keyway(s), keybow styles, structure and degree of geographic exclusivity. Furnish Owner's written approval of the system. Owner will install permanent cylinders/cores. Confirm final key section with district locksmith.

B. Keys

1. Existing factory registered master key system.

2. Construction keying: furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.

3. Furnish 20 construction keys.

4. Furnish 2 construction control keys.

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

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

E. Permanent keys: use secured shipment direct from point of origination to Owner.

F. For estimate: 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.

1. Bitting List: use secured shipment direct from point of origination to Owner upon completion.

2. Deliver all permanent keyed cylinders,keys and factory Bitting List (Transcript) to Santa Ana USD Lock Shop.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

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

3.2 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation.

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

1. Notify Architect of code conflicts before ordering material.

2. Locate levers, key cylinders, t-turn pieces, touchbars and other operable portions of latching hardware between 30 inches to 44 inches above the finished floor, per CBC Section 1133B.2.5.1.

3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

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

D. Existing frames and doors to be retrofitted with new hardware:

1. Field-verify conditions and dimensions prior to ordering hardware. Fill existing hardware cut outs not being reused by the new hardware. Remove existing hardware not being reused, return to Owner unless directed otherwise.

2. Remove existing floor closers not scheduled for reuse, fill cavities with concrete and finish smooth

3. Cut and weld existing steel frames currently prepared with 2-¾" height strikes. Cut an approx. 8" section from the strike jamb and weld in a reinforced section to accommodate specified hardware's strike.

4. Patch and weld flush filler pieces into existing door hardware preparations in steel doors and frames, leave surfaces smooth.

5. Glue in solid wood block fillers to fill cut outs in existing wood doors, sand surfaces smooth. Alternatively, use an approved epoxy-based wood filler product, submit product data for approval.

3.3 INSTALLATION

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

1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.

3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.

4. Replace fasteners damaged by power-driven tools.

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

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

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

E. Drill pilot holes for fasteners in wood doors and/or frames.

F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

G. Field verify existing conditions and measurements prior to ordering hardware. Fill existing hardware cut outs not being used by the new hardware. Remove existing hardware not being reused.

H. Disable or remove existing floor closers where they exist. If disabled cut or remove spindle.

I. Where existing wall conditions will not allow door to swing using the scheduled hinges, provide wide-throw hinges and if needed extended arms on closers.

J. Provide proper brackets to accommodate the mounting of closers on doors with flush transoms.

3.4. ADJUSTING

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

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

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

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

4. Adjust door closers per 1.9 this section.

B. Inspection: Use hardware supplier's consultant or consultant's agent. Include supplier's report with closeout documents.

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

1. Re-adjust hardware.

2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.

3. Identify items that have deteriorated or failed.

4. Submit written report identifying problems

3.5 DEMONSTRATION:

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

3.6 PROTECTION/CLEANING:

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

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

3.7 SCHEDULE OF FINISH HARDWARE

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

SPECWORKS # 93953-B7BY00FCK

HW SET: 01

	EA	THRESHOLD	321 MS/LA	AL	NGP
			BALANCE OF HARDWARE IS EXISTING		

HW SET: 02

1	EA	PANIC HARDWARE	99L-NL 996L	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 DEL EDA	689	LCN
1	SET	SEALS	155S	AL	NGP
			BALANCE OF HARDWARE IS EXISTING		
			REPLACE HARDWARE NOT MEETING ADA		
			REQUIREMENTW		
			REWORK/REFINISH EXISTING DOOR/FRAME FOR		
			NEW HW		

HW SET: 03

3	EA	HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	MORTISE DEADBOLT	L9463T	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	PUSH PLATE	8200 4" X 16" CUT/HW	630	IVE
1	EA	PULL PLATE	8305-8 4" X 16" CUT/HW	630	IVE
1	EA	SURFACE CLOSER	4041 DEL SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	155S	AL	NGP
			SIGNS AND GRAPHICS BY OTHERS		
		THRESHOLD	THRESHOLD BY OTHERS		

HW SET: 04

			BALANCE OF HARDWARE IS EXISTING		
1		THRESHOLD	THRESHOLD BY OTHERS		

HW SET: 05

1	EA	PANIC HARDWARE	CD99L 996L	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 DEL SCUSH	689	LCN
1	SET	SEALS	155S	AL	NGP
1	EA	THRESHOLD	321 MS/LA	AL	NGP
			BALANCE OF HARDWARE IS EXISTING		
			REPLACE HARDWARE NOT MEETING ADA		
			REQUIREMENTW		
			REWORK/REFINISH EXISTING DOOR/FRAME FOR		
			NEW HW		

HW SET: 06

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	CLASSROOM LOCK	L9071T 06N	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 DEL HW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	SET	SEALS	155S	AL	NGP

HW SET: 07

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PRIVACY SET	L9040 06N L583-363	626	SCH
1	EA	SURFACE CLOSER	4041 DEL	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS402CVX	626	IVE
1	SET	SEALS	155S	AL	NGP
			SIGNS AND GRAPHICS BY OTHERS		
		THRESHOLD	THRESHOLD BY OTHERS		

HW SET: 08

1	EA	CLASSROOM LOCK	L9071T 06N	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 DEL SCUSH	689	LCN
1	SET	SEALS	155S	AL	NGP
1	EA	THRESHOLD	321 MS/LA	AL	NGP
			BALANCE OF HARDWARE IS EXISTING		
			REPLACE HARDWARE NOT MEETING ADA		
			REQUIREMENTW		
			REWORK/REFINISH EXISTING DOOR/FRAME FOR		
			NEW HW		

HW SET: 09

1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 DEL	689	LCN
1	EA	THRESHOLD	321 MS/LA	AL	NGP
			BALANCE OF HARDWARE IS EXISTING		
			REPLACE HARDWARE NOT MEETING ADA		

			REQUIREMENTW REWORK/REFINISH EXISTING DOOR/FRAME FOR NEW HW		

HW SET: 10

1	EA	CLASSROOM LOCK	L9071T 06N	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
2	EA	SURFACE CLOSER	4041 DEL SCUSH	689	LCN
1	EA	THRESHOLD	321 MS/LA	AL	NGP
			BALANCE OF HARDWARE IS EXISTING REPLACE HARDWARE NOT MEETING ADA REQUIREMENTW REWORK/REFINISH EXISTING DOOR/FRAME FOR NEW HW		

HW SET: 11

1	EA	SURFACE CLOSER	4041 DEL	689	LCN
1	EA	SURFACE CLOSER	4041 DEL EDA	689	LCN
			BALANCE OF HARDWARE IS EXISTING REPLACE HARDWARE NOT MEETING ADA REQUIREMENTW REWORK/REFINISH EXISTING DOOR/FRAME FOR NEW HW		

INSTALL EDA CLOSER ON OUTSWINGING DOOR

HW SET: 12

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	MORTISE DEADBOLT	L9463T	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	PUSH PLATE	8200 4" X 16" CUT/HW	630	IVE
1	EA	PULL PLATE	8305-8 4" X 16" CUT/HW	630	IVE
1	EA	SURFACE CLOSER	4041 DEL SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	155S	AL	NGP
			SIGNS AND GRAPHICS BY OTHERS		
		THRESHOLD	THRESHOLD BY OTHERS		

END OF SECTION

SECTION 09111

NON-LOAD-BEARING STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. Sound Transmission Characteristics: For STC-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

C. Flat Hangers: Steel sheet, 1 by 3/16 inch (25.4 by 4.76 mm) by length indicated.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2-inch- (12.7-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm).

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges, 3/4 inch (19.1 mm) deep.

2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).
b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.

a. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).

4. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

F. Grid Suspension System for Ceilings: ASTM C 635, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Furring System.
c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).

B. Slip-Type Head Joints: Where indicated, provide the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   a. Products: Subject to compliance with requirements, provide one of the following:

      1) Steel Network Inc. Series.
      2) Superior Metal Trim; Superior Flex Track System (SFT).

C. Firestop Track: As specified in Division 7 Section "Fire-Resistive Joint Systems."

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

   1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).

E. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.

   1. Depth: 1-1/2 inches (38.1 mm).
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

   1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
   2. Depth: 7/8 inch (22.2 mm).

G. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.

   1. Configuration: Asymmetrical or hat shaped.

H. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.

   1. Depth: 3/4 inch (19.1 mm).
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch (0.79 mm).
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare-metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

   1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

3.2 INSTALLING SUSPENSION SYSTEMS

A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

B. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Do not attach hangers to steel roof deck.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

C. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

   a. Install two studs at each jamb, unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches (150 mm) o.c.

C. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

D. Z-Furring Members:

1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.

3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 09220

PORTLAND CEMENT PLASTER

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Metal lath.

1.1.2. Portland cement plaster system, exterior.

1.1.3. Portland cement plaster system, interior

1.1.4. Plaster accessories.

2. PART 2 - PRODUCTS

2.1. PLASTER MATERIALS

2.1.1. Cement: ASTM C150, Type II Portland Cement, low alkali. Use of plastic cement is not permitted. See Table 2507.2 for ASTM Requirements.

2.1.2. Finish Coat: Expo Shower Finish, or approved equal, complying with ASTM C 150, Type I Portland Cement, white color, low alkali, with hydrated lime admixture.

2.1.3. Lime: ANSI/ASTM C206, Type S.

2.1.4. Aggregate: Clean sharp plastering sand, complying with ASTM C 35 and ASTM C 897.

2.1.5. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

2.1.6. Finish Coat:

2.1.6.1. Interior Finish Coat: Expo Shower Finish, or approved equal, complying with ASTM C 150, Type I Portland Cement, white color, low alkali, with hydrated lime admixture.

2.1.6.2. Exterior Finishing Coat: La Habra or equal, 30-60 mesh silica sand, premixed integral color finish coat, color as selected by Architect.

2.1.7. Glass Fiber Reinforcing: Provide Fibermesh Harbourite AR type glass fiber, length, proportion and density per manufacturers recommendations.

2.1.8. Admixture: Thoroseal Acryl 60 exterior bonding agent at masonry/concrete applications.

2.1.9. Plaster Bonding Agent: Thoro Thorobond or equal.

2.2. LATHING

2.2.1. Woven Wire Lath: 1-1/2 inch x 17 gauge lath, non-furring style, galvanized finish. Per ASTM C1032

2.2.1.1. Use of lath with integral paper backing is acceptable, providing compliance with all lapping criteria is achieved.

2.2.2. Lath at plaster soffit: Amico "Cal lath", 3.4 psy expanded metal lath, non-furring style, galvanized finish, with Grade D paper backing.

2.2.3. Use of self-furring lath is not acceptable.

2.2.3 Use of rib lath not permitted.

2.2.4. Provide DSA approved fasteners, including use of paper "wads" to fur out lath.

2.3. ACCESSORIES

2.3.1. Underlayment: FS-UU-B-790, type I, grade D.

2.3.2. Water-Resistant Underlayment: FS-UU-B-790, Type I, grade B.

2.3.3. Expansion and edge accessories:

2.3.3.1. Manufacturer: Provide manufacturer as indicated or approved equal.

2.3.3.1.1. Aluminum Accessories: Provide products manufactured by Fry Reglet Corporation, Phone (818)-289-4744, Gordon or equal.

2.3.3.1.2. Brake Metal Accessories: Unless noted otherwise, Provide products manufactured by Superior Metal Trim, phone (800)-8932-8673, Amico or equal.

2.3.3.2. Outside Corner Bead: K-Lath Kwik-Corner series, with EPKote finish.

2.3.3.3. Interior corners (where shown): Superior SIC series, galvanized, ground as required for plaster thickness.

2.3.3.4. Casing Bead/Edge Termination:

2.3.3.4.1. Amico X-66, galvanized, at lath application, 7/8 inch ground.

2.3.3.4.2. Amico N-66, galvanized, at masonry/concrete surfaces, 5/8 inch ground.

2.3.3.5. Casing Bead/Edge Termination:

2.3.3.5.1. Fry JPM-75, prime paint/clear anodized/prefinished white, with protective insert.

2.3.3.6. Control Joint: Superior SSV, galvanized, ground as required for plaster thickness.

2.3.3.7. Soffit/Fascia Transition and Soffit Vent Screed: Superior SST Series, 3-1/2 inch reveal, Vented, galvanized, ground as required for plaster thickness.

2.3.3.8. Soffit Vent Screed: Superior SRS Series, 3 inch, Vented, galvanized, ground as required for plaster thickness.

2.3.3.9. Soffit Vent Screed - Type #: Fry, PCS-75-V-300, prime paint/clear anodized/prefinished white, with protective insert.

2.3.3.10. Weep Screeds: per ASTM C926

2.3.3.10.1. Type #: Amico AMFWS-425-780, unpunched PVC, with 3-1/2 inch leg.

2.3.3.10.2. Type #: Superior SJB series, with weep holes, galvanized, with 3-1/2 inch leg, at all pavement applications, 7/8 inch ground.

2.3.3.11. Parapet wall plaster reveal screed - Type #: Superior SFS Series, 3/4 inch exposed reveal, galvanized, ground as required for plaster thickness.

2.3.3.12. Soffit/Fascia Transition- Type #: Superior SST Series, 3/4 inch exposed leg, galvanized, ground as required for plaster thickness.

2.3.3.13. Expansion Joint- Type #: Superior SSJ Series, two piece slip joint, 1 inch working dimension, galvanized, ground as required for plaster thickness.

2.3.3.14. Control Joint/Reveal - Type #: Fry PCS-75-75, prime paint/clear anodized/prefinished white, with protective insert. Provide connector clip, end cap and compatible sealant bedding.

2.3.3.15. Wall/Fascia Transition - Type #: Fry F Series, 3/4 inch exposed reveal, prime paint/clear anodized/prefinished white, with protective insert.

2.3.3.16. Radiused edge trim - Type #: Fry, profile as necessary for condition, aluminum, factory stretch formed, prime paint/clear anodized/prefinished white, with protective insert

2.3.3.17. Outside Corner - Type #: Fry PCM-75-75, prime paint finish.

2.3.4. Wire Ties: Soft annealed steel, galvanized; 18 gauge.

2.3.5. Corner Reinforcing Lath: 2.7 psy expanded metal lath, galvanized, or approved equivalent at all openings.

2.4. CEMENT PLASTER MIXES

2.4.1. Mix and proportion cement plaster in accordance with Part 2, Title 24 for regular Portland cement plaster. Do not add plasticizers of any kind without prior approval. Incorporate specified fiber reinforcing in mix design.

2.4.1.1. Use of Gibco PRF admixture is an approved admixture for use in mix design. Prepare mix design in accordance with admixture manufacturers directions. If selected, do not use lime in mix design.

2.5. ELASTOMERIC FLASHING

2.5.1. Manufacturer: MFM Building Products, phone (714)-474-9098, Polyken or equal.

2.5.2. Type: Rubberized Asphalt, with aluminum film facer.

2.5.3. Series: MFM "Peel and Seal".

2.5.4. Characteristics:

2.5.4.1. Thickness: 0.040 inches (40 mils) nominal.

2.5.4.2. Width: 18 inch.

2.5.4.3. Facing Color: White

2.6. OTHER MATERIALS

2.6.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Underlayment at framed wall applications:

3.1.1.1. Install two layers of waterproof underlayment over top of framed walls. Do not fasten through top of wall. Shingle lap over underlayment.

3.1.1.2. Install specified waterproof underlayment as head and jamb flashing at openings in compliance with "Recommended Construction Technique - Penetration Flashing Recommendations, Plaster and Drywall Systems Manual.

3.1.1.3. Install elastomeric flashing at all window opening sills and as underlayment at sloped plaster surfaces. Extend up vertical surfaces of opening and beneath window sill a minimum of 3 inches. Coordinate with underlayment and waterproof underlayment specified in this Section.

3.1.1.4. Install underlayment under elastomeric flashing at openings. Install over jamb and head flashing at openings.

3.1.2. Attach metal lath to supports in conformance with Section 2507, Chapter 25, Part 2, Title 24 CCR.

3.1.2.1. Install approved sealant over tears, holes and all fasteners not located at framing members.

3.1.2.2. Install lath using approved drilled in mechanical fasteners where lath is shown extending over masonry or concrete, including wall curbs.

3.1.3. Place 4 x 12 inch strip of corner reinforcing lath diagonally at corners of openings. Secure rigidly in place.

3.1.4. Apply paper backed metal lath taut, with long dimension perpendicular to supports in accordance with Section 2507, Chapter 25, Part 2, T-24 CCR.

3.1.4.1. Ensure paper selvage edges are properly lapped. Do not permit lath to be sandwiched or covered by underlayment.

3.1.5. Lap ends and sides of metal lath minimum 1-1/2 inches. Secure laps with tie wire where they occur between supports.

3.1.6. In addition to fastening methods required by Table 2507.2 and Section 2507.3, provide 9 gauge ring shank hook staple over 10d nail, at 27 inches on-center along joist support, and located not more than 3 inches from edge of lath.

3.1.7. Place 4 x 12 inch strip of corner reinforcement lath diagonally at corners of openings and recessed light fixture frames. Secure rigidly in place.

3.1.8. Place specified plaster accessories at terminations of plaster finish.

3.1.8.1. Secure in place by wire tying to lath. Do not anchor to plywood sheathing or supports without Architects prior approval.

3.1.8.2. Provide manufacturers recommended connector clip and sealant bedding at all accessory intersections and joints.

3.1.8.3. Provide manufacturers end cap at locations where accessories terminate against door frames, wall surfaces and similar conditions.

3.1.9. Install specified weep screed at bottom edge of plaster. Fasten to backing or sill with fully seated screws at 16 inches on center.

3.1.10. Establish control and expansion joints with specified joint devices. Do NOT allow lath to continue behind or through joint.

3.1.11. Coordinate joint placement with naturally occurring joints of other related work. Do not extend lath across expansion or control joints in substrate.

3.1.12. Provide joints as shown on drawings. Where joints not shown, provide as directed by Architect in compliance with the following criteria:

3.1.12.1. Provide wall control joint at edge of door and window frames, extended from drip screed to continuous horizontal control joint.

3.1.12.2. Provide vertical wall control joints as necessary to limit plaster area to approximately 150 square feet, with maximum 2:1 aspect ratio. Coordinate area limit with horizontal joint location. Final location as directed by Architect.

3.1.12.3. Provide horizontal wall control joint in coordination with vertical joint spacing as necessary to limit plaster area to approximately 150 square feet. Final location as directed by Architect.

3.1.12.4. In plastered ceilings and soffits, provide control joints as necessary to limit plaster area to approximately 75 square feet. Final location as directed by Architect.

3.1.13. Finish Coat Textures:

3.1.13.1. Exterior Surfaces: Apply finish coat in medium dash finish as illustrated in "Plaster Textures" published by Plaster Information Bureau and matching approved sample, except as follows:

1.13.1.1. Exterior Surfaces that are adjacent to, an extension of, or patch and repair of existing plaster walls and soffits: Apply finish coat to match existing, adjacent finish. Feather out joint/match line and extend new finish over existing as required to achieve indistinguishable work.

3.1.13.2. Interior Surfaces: Apply finish coat in two coat process. Use wood float to a smooth and consistent fine sand float finish, as illustrated in "Plaster Textures" published by Plaster Information Bureau and matching approved sample, except as follows:

1.13.2.1. Interior Surfaces that are adjacent to, an extension of, or patch and repair of existing plaster walls, ceilings and soffits: Apply finish coat to match existing, adjacent finish. Feather out joint/match line and extend new finish over existing as required to achieve indistinguishable work.

3.1.14. Tolerances - Exposed finish plaster: Maximum variation from true plane limited to 1/4 inch plus or minus, in 10 feet, non-cumulative.

3.1.15. Tolerances - Interior Plaster/Thin brick tile substrate: Maximum variation from true plane limited to 1/8 inch plus or minus, in 10 feet, non-cumulative.

3.1.16. Protect all aluminum frames, accessories, glass and thresholds from plaster application with complete waterproof protective sheeting or tape.

3.1.16.1. Verify tape compatibility with all prefinished coatings.

3.1.16.2. Do not allow tape or protection sheeting to contact glass.

3.1.16.3. Remove all covering and tape within two weeks of plaster completion in any one area.

3.1.17. During plaster operations, provide plywood or other approved protection at all roofing, walkways, and concrete paving.

3.1.17.1. Lap and tape edges as necessary to prevent water infiltration to unprotected plywood sheathing below.

3.1.18. Remove all traces of spilled or splashed plaster from surfaces and landscaping. Do not discharge plaster washoff into planter areas.

END OF SECTION

SECTION 09260

GYPSUM BOARD SYSTEMS

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Gypsum board.

1.1.2. Joint treatment and surface finishes.

1.1.3. Metal support and furring systems.

1.1.4. Cementitious backer board for ceramic tile.

1.1.5. Exterior gypsum sheathing.

1.1.6. Rated shaftwall assemblies.

1.1.7. Metal suspension system for drywall ceiling assemblies.

2. PART 2 - PRODUCTS

2.1. GYPSUM BOARD – SEE TABLE 2506.2 FOR ASTM REQUIREMENTS.

2.1.1. Manufacturer: USG, Goldbond or equal.

2.1.1.1. Provide the same manufacturer for all like products.

2.1.2. Board Type:

2.1.2.1. Non-Rated: USG Regular per ASTM C36.

2.1.2.1.1. Edge: SW Tapered.

2.1.2.1.2. Thickness: 5/8 inch.

2.1.2.2. Fire Rated: USG FireCode Core (Type X) per ASTM C36.

2.1.2.2.1. Edge: SW Tapered.

2.1.2.2.2. Thickness: 5/8 inch.

2.1.2.3. Water Resistant: USG Water Resistant FireCode Core, Type X, per ASTM C 630.

2.1.2.3.1. Edge: Tapered.

2.1.2.3.2. Thickness: 5/8 inch.

2.1.2.4. Exterior Sheathing: USG Gypsum Sheathing FireCode Core, Type X, per ASTM C 79.

2.1.2.4.1. Edge: Square.

2.1.2.4.2. Thickness: 5/8 inch.

2.1.2.5. Shaftwall Board: USG Gypsum Liner Panel, per ASTM C 442.

2.1.2.5.1. Edge: Beveled.

2.1.2.5.2. Thickness: 1 inch.

2.1.2.6. Shaftwall Face Board: USG Gypsum UltraCode Core Panel, per ASTM C 36.

2.1.2.6.1. Edge: Tapered.

2.1.2.6.2. Thickness: 3/4 inch.

2.2. ACCESSORIES

2.2.1. Acoustical Sealant: USG, Non-hardening, non-skinning, conforming to ASTM C 557 and C 919, for use in conjunction with non-rated gypsum board assemblies.

2.2.2. Drywall Joint and Edge Accessories:

2.2.2.1. Corner Bead: USG Durabead or approved alternate, metal.

2.2.2.2. Edge Trim: USG Series 200 or approved alternate, metal.

2.2.2.3. Expansion Joint: USG 093 or approved alternate, metal.

2.2.2.4. Drywall Reveal: Fry, DRM Series, reveal dimension as shown on drawings.

2.2.3. Joint and Finishing Systems:

2.2.3.1. Provide systems produced by same manufacturer as boards.

2.2.3.2. Joint Systems: USG Ready Mixed Compounds, complying with ASTM C 475, vinyl based, certified asbestos free.

2.2.3.3. Finishing System Materials: USG Multi-Purpose or approved alternate, complying with ASTM C 475, non-aggregate, vinyl based, certified asbestos free.

2.2.3.4. Primer: Manufacturers approved primer, compatible with finishes specified in other Sections.

2.2.3.5 Joint reinforcement tape and compound per ASTM C474, C475

2.2.4. Fasteners:

2.2.4.1. Gypsum board screws: type and length as required by installation and UL Listing criteria. Per ASTM C954, C1002

2.2.4.2. Gypsum board nails: type and length as required by installation and UL Listing criteria. Nails not permitted at interior gypsum board applications. Per ASTM C514, F542, F1667

2.2.4.3. Cementitious Backer Unit screws: corrosion resistant, type and length as required by manufacturer, installation and UL Listing criteria. Nails not permitted.

2.2.5. Adhesive:

2.2.5.1. Manufacturers approved adhesive for attachment to concrete surfaces. Per ASTM C557

2.2.6. Underlayment Membrane: Fortifiber Moistop or approved equal.

2.3. FRAMING COMPONENTS

2.3.1. Metal Furring Components:

2.3.1.1. Resilient Channels: USG, Series RC-1, 1/2 inch depth.

2.3.1.2. Wall Furring Channels: Provide USG Unimast Metal Furring Channel, 20 gauge, corrosion resistant steel.

2.3.2. Shaftwall Stud Systems: per ASTM C645

2.3.2.1. Series: C-H.

2.3.2.2. Size: As shown on drawings.

2.3.2.3. Gauge: 20 gauge.

2.3.2.4. Finish: Galvanized per ASTM A 653.

2.3.2.5. Accessories: Provide clips, runner and track as required for installation and assembly rating.

2.4. CEMENTITIOUS BACKER UNIT (CBU)

2.4.1. Manufacturer: United States Gypsum (USG) or equal.

2.4.2. Series: USG Durock Exterior.

2.4.3. Characteristics:

2.4.3.1. Edge: Square.

2.4.3.2. Thickness: 1/2 inch.

2.4.3.3. Indentation Resistance: 2300 psi, 1 inch disc at 0.02 inch indentation per ASTM D 2394.

2.4.3.4. Water Absorption: 10 percent maximum at 24 hours per ASTM C 473.

2.4.3.5. Flexural Strength: 1000 psi per ASTM C 947.

2.4.4. Fire and Life Safety Criteria:

2.4.4.1. Surface Burning/Smoke contributed: Maximum values of 5/0 per ASTM E 84.

2.4.4.2. Listing: UL Listed as a component in rated wall and floor assemblies per ASTM E 119.

2.5. GYPSUM BOARD BACKING

2.5.1. Non-Combustible Construction Assemblies:

2.5.1.1. USG Durock Exterior complying with this Section.

2.5.1.2. James Hardy or equal Hardi Panel mineral fiber panel, 5/8 inch thickness.

2.5.2. Combustible Construction Assemblies:

2.5.2.1. Particleboard, 5/8 inch thick, complying with Section 06410.

2.5.2.2. Plywood sheathing, 1/2 inch thick, complying with Section 06112.

2.5.2.3. USG Durock Exterior complying with this Section.

2.5.2.4. James Hardy or equal Hardi Panel mineral fiber panel, 5/8 inch thickness.

2.6. EXTERIOR GYPSUM SHEATHING SUBSTRATE

2.6.1. Manufacturer: Georgia Pacific.

2.6.2. Type: Glass fiber faced gypsum sheathing complying with ASTM C 1177.

2.6.3. Series: Dens-Glas Gold Firestop.

2.6.4. Characteristics:

2.6.4.1. Thickness: 5/8 inch.

2.6.4.2. Edge: Square.

2.6.4.3. Fire Resistivity Rating: Type X, non-combustible per ASTM E 136..

2.6.4.4. Approval: ICC Evaluation Report No. ESR-1338.

2.7. OTHER MATERIALS

2.7.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Install gypsum board in accordance with manufacturer's instructions and designated system number for fire rated assemblies.

3.1.1.1. Unless noted otherwise, utilize water resistant type for wall surfaces within four feet of the outermost edge of any plumbing fixture or moisture generating equipment. Extend water resistant gypsum board full height.

3.1.1.2. Do not use water resistant gypsum board on ceiling applications.

3.1.2. Where gypsum board extends across concrete curbs, install with specified adhesive, consisting of vertical beads placed at 4 inches on center full height. Bond to curb with rollers exerting sufficient pressure to assure full contact and surface alignment with board at framing above.

3.1.3. Cementitious backer unit installation:

3.1.3.1. Install backer board in accordance with manufacturers recommendations, including USG Systems Folder SA-700.

3.1.3.2. Apply specified underlayment membrane to framing with approved adhesive or tape. Lap membrane 4 inches in shingle fashion at all joints.

3.1.3.3. Install backer board with joints over supports. Space ends and edges 1/8 inch apart.

3.1.3.4. Install backer board using screws at maximum 8 inches on center at each support.

3.1.3.5. Prefill all joints with approved mortar. Tape all joints and level.

3.1.4. Gypsum Board Finish: Comply with descriptions and Finish Levels as specified and in accordance with referenced standard.

3.1.4.1. LEVEL 2 Finish: Gypsum board located above ceiling areas, plenums, and similar surfaces not visible in completed construction:

3.1.4.1.1. Embed tape at all joints and interior angles in joint compound.

3.1.4.1.2. Apply one separate coat of joint compound over all joints, angles, fastener heads, and accessories.

3.1.4.1.3. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

3.1.4.2. LEVEL 4 Finish: Gypsum board designated to receive vinyl wallcovering.

3.1.4.2.1. Embed tape at all joints and interior angles in joint compound.

3.1.4.2.2. Apply three separate coats of joint compound over all joints, angles, fastener heads, and accessories.

3.1.4.2.3. Surface shall be smooth and free of tool marks and ridges.

3.1.4.3. LEVEL 5 Finish - Smooth: Gypsum board surfaces receiving eggshell, semi-gloss or gloss paint finish.

3.1.4.3.1. Embed tape at all joints and interior angles in joint compound.

3.1.4.3.2. Apply three separate coats of joint compound over all joints, angles, fastener heads, and accessories.

3.1.4.3.3. Apply thin skim coat of joint compound over entire surface. Sand as necessary. Surface shall be smooth and free of tool marks and ridges.

3.1.5. Comply with the following tolerances for level, plumb and flat. Where substrate framing will not comply with specified tolerances, correct deficiencies as required.

3.1.5.1. Level and Plumb: Plus or minus 1/4 inch in 10 feet, non-cumulative.

3.1.5.2. Flatness: No gaps exceeding 1/8 inch at any point under a 10 foot straight edge placed on surface in any orientation.

END OF SECTION

SECTION 09310

CERAMIC TILE

1. PART 1 - GENERAL

1.1. SECTION INCLUDES

1.1.1. Ceramic tile.

1.1.2. Quarry tile.

1.1.3. Grout, mortar bed and setting materials.

1.1.4. Waterproof underlayment and cleavage membranes.

1.1.5. Sealers.

2. PART 2 - PRODUCTS

2.1. CERAMIC TILE

2.1.1. Basis of Design: Characteristics of specific products, where named in this Section, are indicated to establish required level of quality, appearance, and performance. The Architect will consider comparable products by alternate manufacturers where listed, and requests for substitutions, under the provisions of Section 01610.

2.1.1.1. Where tile is indicated or required to "match existing", the Contractor shall provide tile that matches existing as close as is available from sources that meet the criteria of the Basis of Design.

2.1.1.2. All tile for like applications shall be the product of a single manufacturer as indicated below.

2.1.2. Product Characteristics: Toilet Room Wall Tile - CT-2

2.1.2.1. Manufacturer: Dal - Tile

2.1.2.2. Series: Keystones Porcelain Mosaic Ceramics.

2.1.2.3. Color:

2.1.2.3.1. Field color "CT-2A": as selected by Architect from Group 2 colors.

2.1.2.3.2. Field Accent color "CT-2B": as selected by Architect from Group 3 colors.

2.1.2.4. Mix/Pattern Criteria:

2.1.2.4.1. Primary field tile color shall be CT-2A.

2.1.2.4.2. Provide two continuous rows of CT-2B, located vertically as directed by Architect, at all ceramic tile areas.

2.1.2.5. Finish: Unglazed.

2.1.2.6. Size: 2 x 2.

2.1.2.7. Grout Joint: Nominal 1/16", all joints equal, except at expansion joint conditions. Provide minimum 1/8 inch wide joint at all expansion joint conditions.

2.1.3. Product Characteristics: Toilet Room Floor Tile CT-1

2.1.3.1. Manufacturer: Dal - Tile

2.1.3.2. Series: Keystones Porcelain Mosaic Ceramics.

2.1.3.3. Color:

2.1.3.3.1. Field Tile "CT-1A": Unglazed mosaic, as selected by Architect from Group 2 color line.

2.1.3.3.2. Accent tile "CT-1B": Unglazed mosaic, as selected by Architect from Group 3 color line.

2.1.3.4. Mix/Pattern Criteria:

2.1.3.4.1. Primary field tile color shall be CT-1A.

2.1.3.4.2. Provide, within a one foot square grid, a four inch square accent of CT-1B, placed in a random pattern.

2.1.3.4.3. Provide C-833 sanitary cove transition in CT-1A at all wall to floor transitions.

2.1.3.4.4. Provide CT-1A at all wall base conditions, 2 x 2 MDKB-5B, with additional row to approximately 7 inches above finish floor. Provide surface bullnose termination at conditions without wall tile continuation.

2.1.3.5. Size: 2 x 2.

2.1.3.6. Grout Joint: Nominal 1/16", all joints equal, except at expansion joint conditions. Provide minimum 1/8 inch wide joint at all expansion joint conditions.

2.1.3.7. Coefficient of Friction: Minimum 0.60 per ASTM C-1028 and CBC 1124B.1/ ADA Standards 4.5.1.

2.2. PORTLAND CEMENT MORTAR

2.2.1. Mortar Bed: Portland Cement and sand mixture, complying with specified method and ANSI A108.1B.

2.2.2. Thin-set Application Mortar: Portland Cement mortar, with acrylic additive per ANSI A108.5 and A118.4.

2.3. PORTLAND CEMENT BOND COAT

2.3.1. American Olean or equal, Multipurpose Dryset Mortar per ANSI A108.5 and A118.4.

2.4. GROUT

2.4.1. All grouts shall be produced by same manufacturer.

2.4.2. Un-sanded Grouts: American Olean or equal, with acrylic grout additive per ANSI A118.6. Color as selected by Architect from complete color line, including Designer series.

2.4.3. Epoxy Grouts:

2.4.3.1. Manufacturer: American Olean or equal.

2.4.3.2. Series: AO 6000, 100 percent solids, sanded grout, complying with ANSI A118.3, formulated for required joint widths.

2.4.3.3. Service Temperature Resistance: 350 degrees F.

2.4.3.4. Color: As selected by Architect from complete standard 16 color line.

2.5. ACCESSORIES

2.5.1. Sealants:

2.5.1.1. Interior sealants: Unless noted otherwise, provide sealants as manufactured by grout manufacturer.

2.5.1.1.1. Where exposed to pedestrian traffic, provide sealants rated for pedestrian traffic, with minimum Shore A value of 35, as manufactured by grout manufacturer.

2.5.1.1.2. Match adjacent grout color.

2.5.1.2. Exterior Ceramic Tile Paving Sealants: As specified in Section 07900.

2.5.1.3. Exterior Ceramic Wall Tile Sealants: As specified in Section 07900.

2.5.2. Reinforcing Mesh: Use 2" x 2" x 16 gauge welded wire mesh.

2.5.3. Cleavage membrane: Provide CTI approved cleavage membrane.

2.5.4. Organic Adhesive: Type 1 organic adhesive, complying with ANSI A136.1 and approved by CTI for application.

2.6. WATERPROOFING AND CRACK ISOLATION MEMBRANES

2.6.1. Thin-set Waterproofing applications: NobleSeal TS, preformed sheet CPE membrane, 30 mil thickness, with facing. Provide preformed corners and all manufacturers recommended accessories.

2.6.2. Thin-set Joint Isolation Membrane: NobleSeal CIS, preformed sheet CPE membrane, 30 mil thickness, with facing. Provide all manufacturers recommended accessories.

2.6.3. Mortar bed waterproofing applications: NobleSeal Chloraloy 240, preformed sheet CPE membrane, 40 mil thickness. Provide preformed corners and all manufacturers recommended accessories.

2.7. THRESHOLDS/TRANSITIONS

2.7.1. Tile/Carpet Edge Protection: Provide Schluter, Schiene-M series, brass, height as required.

2.7.2. Tile/Carpet Edge Transition: Provide Schluter, Reno-TK series, brass, height as required.

2.7.3. Tile/resilient flooring Transition: Provide Schluter, Reno-MTK series, brass, height as required.

2.8. ACCESSORY TILE

2.8.1. General

2.8.1.1. All accessory tile shall be in matching size, color, and finish.

2.8.1.2. Stretcher tile can be the standard size of the manufacturer.

2.8.1.3. Provide surface bullnose trim at all open edges or ends. Unglazed or cut tile edges unacceptable.

2.8.1.4. Provide surface bullnose trim at all tile abutting jamb conditions and extending beyond frame.

2.8.1.5. Provide full curved stretcher tile for all outside corners.

2.9. OTHER MATERIALS

2.9.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Cleavage Membrane: Unless otherwise shown on drawings, where mortar bed is installed over concrete slab on grade at interior applications, provide specified cleavage membrane.

3.1.2. Joint isolation membrane installation:

3.1.2.1. Install at all cracks in concrete slab substrates, control and expansion joints, and at all transitions between dissimilar materials.

3.1.2.2. Extend each side of crack or joint a minimum of 4 times diagonal tile dimension.

3.1.2.3. Apply using approved latex modified mortar system.

3.1.2.4. At expansion joints, continue sheet material in looped fashion through joint to accommodate anticipated joint movement.

3.1.3. Tile and grout installation:

3.1.3.1. At student and public toilets rooms, install tile to minimum 8 feet above finish floor at all wall surfaces.

3.1.3.2. Install wall tile at cementitious backer board per TCA Method W244, and per ANSI A108.5.

3.1.3.2.1. Provide Portland cement leveling coat as required to provide surface complying with 1/8 inch in 8 feet tolerance.

3.1.3.3. Install grout at abrasive grit tile using grout bag or grouting machines. Conventional sponge spread technique not acceptable.

3.1.3.4. At all student toilet and public toilet rooms, grout all joints with specified epoxy grout per ANSI A108.10.

3.1.3.5. At all staff toilets rooms, grout all joints with specified non-sanded grout per ANSI A108.10.

3.1.4. Installation of expansion and control joint assemblies.

3.1.4.1. Provide expansion joints complying with TCA Detail EJ171 at the following specified locations and as located and shown on drawings:

3.1.4.1.1. At wall tile to paver/floor tile joints.

3.1.4.1.2. At all expansion and control joints in substrate. Where tile joint does not occur directly over substrate joint, provide sealant joint on each side of joint.

3.1.4.1.3. At tile joint at inside vertical corners.

3.1.4.1.4. At interior applications, at approximately 24 feet on center each way in floor and wall tile surfaces. Adjust to 12 feet at toilet tile conditions, and 8 feet for dark tile in sunlight areas.

3.1.4.1.5. At exterior applications, at approximately 12 feet on center each way in floor and wall tile surfaces. Adjust to 8 feet as necessary for dark tile in sunlight areas.

3.1.4.1.6. Where material transitions occur, comply with expansion/control joint criteria.

3.1.4.1.7. At conditions where tile extends through doorways, extend wall cove/floor tile sealant joint across doorway.

3.1.4.1.8. At floor drain/ tile edge, column penetrations, tile terminations against frames and other restraining elements.

3.1.4.1.9. At tile terminations against curbs, paving or other restraining elements.

3.1.5. Do not allow traffic on tile for a minimum of 72 hours after installation.

3.1.6. Provide damp cure of all installations per manufacturer's recommendations and per ANSI A108. Do not damp cure latex modified grout systems unless recommended by manufacturer.

3.1.7. Tolerances

3.1.7.1. Grout joint alignment with adjacent edge: 1/8" in 10 feet.

3.1.7.2. Row and column alignment: 1/8" in 10 feet deviation.

3.1.7.3. Alignment with adjacent tile: 1/16" +/-.

3.1.7.4. Level, plane and/or vertical: 1/8" in 10 feet deviation.

END OF SECTION

SECTION 09511

ACOUSTICAL CEILINGS

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Suspended metal grid ceiling system.

1.1.2. Acoustical panels.

1.1.3. Acoustical tiles.

1.1.4. Perimeter trim.

2. PART 2 - PRODUCTS

2.1. CEILING SUSPENSION SYSTEM

2.1.1. Manufacturer: Chicago Metallic, Donn or equal.

2.1.2. Series: 1200

2.1.2.1. Main Runner: 200-01

2.1.2.2. Cross Runners: 1214-01 at 48 inch length, and 1226-01 at 24 inch length.

2.1.2.3. Edge moldings: "L" shaped, 1420-01.

2.1.2.4. Face Dimension: 15/16 inches.

2.1.3. Duty Rating: Heavy Duty per ASTM C635.

2.1.4. Fire Resistance Rating: Non-rated assembly.

2.1.5. Color: Painted finish, as selected from standard line.

2.1.6. Support/Fastening System: Components of size and type as shown in the drawings or identified in DSA IR 25-2 (7/25/05), as required to rigidly secure acoustic ceiling system with maximum deflection of 1/360.

2.1.7. Compression Strut: Provide vertical compression strut at grid in accordance with DSA IR 25-2 (7/25/05) and as shown on drawings.

2.2. ACOUSTIC PANELS: ACP-1

2.2.1. Manufacturer: Armstrong or equal.

2.2.2. Series: Fine Fissured

2.2.2.1. Style: Fine Fissured RH90, 1729.

2.2.2.2. Edge: Square edge.

2.2.2.3. Size: 24 x 48 x 5/8 inch.

2.2.3. Fire/Habitability Criteria:

2.2.3.1. Fire Resistance Rating: Class A per ASTM E1264, maximum Flame Spread of 25, maximum smoke contributed of 450, UL Labeled

2.2.3.2. Noise Reduction: NRC range of 0.60..

2.2.3.3. Light Reflectance: LR-1 (Minimum 0.80).

2.2.3.4. Humidity Resistance: No visible sag under conditions not to exceed 90 percent humidity and 104 degrees F, with 10 year warranty coverage.

2.2.4. Finish: Factory applied paint.

2.2.5. Color: White.

2.3. ACOUSTIC PANELS: ACP-2

2.3.1. Manufacturer: Armstrong or equal.

2.3.2. Series: Fine Fissued

2.3.2.1. Style: Fine Fissured RH90, 1732.

2.3.2.2. Edge: Tegular, angled edge.

2.3.2.3. Size: 24 x 24 x 5/8 inch.

2.3.3. Fire/Habitability Criteria:

2.3.3.1. Fire Resistance Rating: Class A per ASTM E1264, maximum Flame Spread of 25, UL Labeled, with maximum smoke contributed value of 450

2.3.3.2. Noise Reduction: NRC range of 0.60..

2.3.3.3. Light Reflectance: LR-1 (Minimum 0.80).

2.3.3.4. Humidity Resistance: No visible sag under conditions not to exceed 90 percent humidity and 104 degrees F, with 10 year warranty coverage.

2.3.4. Finish: Factory applied paint.

2.3.5. Color: White.

2.4. ACOUSTIC PANELS: LAY-IN SCRUBBABLE APPLICATION ACP-3

2.4.1. Manufacturer: Armstrong or equal.

2.4.2. Series: ML Fire Guard

2.4.2.1. Style: No. 864, non-perforated, with retention clip 414.

2.4.2.2. Edge: Square.

2.4.2.3. Size: 24 x 48 x 5/8 inch.

2.4.2.4. Weight: 1.0 PSF or greater.

2.4.3. Fire/Habitability Criteria:

2.4.3.1. Fire Resistance Rating: Class A per ASTM E1264, maximum Flame Spread of 25, maximum smoke contributed of 450, UL Labeled.

2.4.3.2. Noise Reduction: NRC range of 0.10.

2.4.3.3. Light Reflectance: LR-.80 (Minimum 80%).

2.4.3.4. Labeling: All panels shall have UL Label.

2.4.3.5. Clean Room Application: Suitable for use in Class 100 Clean Rooms per FS 209D.

2.4.4. Finish: Factory applied vinyl facing.

2.4.5. Color: White.

2.5. ACOUSTIC TILE - ADHESIVE APPLIED: ACT-1

2.5.1. Manufacturer: Armstrong or equal.

2.5.2. Series: Minatone

2.5.2.1. Style: Cortega, 745.

2.5.2.2. Edge: K4C4, beveled, for butt installation.

2.5.2.3. Size: 12 x 12 x 5/8 inch.

2.5.3. Fire/Habitability Criteria:

2.5.3.1. Fire Resistance Rating: Class A per ASTM E1264, maximum Flame Spread of 25, maximum smoke contributed of 450, UL Labeled.

2.5.3.2. Noise Reduction: NRC range of 0.55.

2.5.3.3. Light Reflectance: LR-1 (Minimum 0.80).

2.5.4. Finish: Factory applied paint.

2.5.5. Color: White.

2.5.6. Accessories: Provide UL listed adhesive, with maximum flame spread value of 10 and maximum smoke contributed value of 10.

2.6. OTHER MATERIALS

2.6.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 – EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. *Install system in accordance with CBC Sections 2506.2.1 and 2506.2.1.1, including required vertical compression struts.*

3.1.2. *Where ducts or other equipment prevent the regular spacing of hangers, install independent framing below ductwork or equipment from which hangers may be attached. Hangers are prohibited from being attached to any non structural building element.*

3.1.3. *Variation from Flat and Level Surface: 1/8 inch in 10 feet.*

END OF SECTION

SECTION 09900

PAINTING

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Surface preparation.

1.1.2. Surface paint and stain finishes as scheduled.

2. PART 2 - PRODUCTS

2.1. MATERIALS AND SYSTEMS

2.1.1. INTERIOR SURFACES

2.1.1.1. Steel Doors/Door and Window Frames - Semi-Gloss, 100 percent acrylic latex over suitable primer.

2.1.1.2. Gypsum Board:

2.1.1.2.1. Exposed to contact: Semi-Gloss, 100 percent acrylic latex over suitable primer.

2.1.1.2.2. Areas not subject to contact:: Flat, 100 percent acrylic latex.

2.1.1.3. Wall preparation for vinyl wall coverings: Pigmented Primer Sealer.

2.1.1.4. Wood - Semi-Transparent Stain finish - ST-1

2.1.1.4.1. One coat waterborne stain finish.

2.1.1.4.2. one coat sanding sealer for exposed and backprime applications.

2.1.1.4.3. Two coats semi-gloss lacquer, VOC approved formulation.

2.1.1.5. Wood - Opaque: Semi-Gloss, 100 percent acrylic latex over suitable primer.

2.1.1.6. Plaster Surfaces: Semi-Gloss, 100 percent acrylic latex over suitable primer.

2.1.1.7. Ferrous metal piping, miscellaneous metal fabrications, and related components: Semi-Gloss, 100 percent acrylic latex over suitable primer.

2.1.1.8. Masonry: Semi-Gloss, 100 percent acrylic latex over suitable filler/primer.

2.1.1.9. Wood Theater Floor: Flat Finish, 100 percent acrylic latex floor paint.

2.1.1.10. Galvanized flashings, ductwork, electrical conduit, and related components: Semi-Gloss, 100 percent acrylic latex over suitable primer over acid etch cleaning.

2.1.2. EXTERIOR SURFACES

2.1.2.1. Steel Doors/Window Frames/Metal Decking - Galvanized: Semi-Gloss, 100 percent acrylic latex, over suitable primer over acid etching.

2.1.2.2. Plaster and Cast-in-place Concrete Wall Surfaces, designated as painted: Semi-Gloss, 100 percent acrylic latex over suitable primer.

2.1.2.3. Ferrous metal piping, trusses, steel canopy members, miscellaneous metal fabrications, and related components. Semi-Gloss, 100 percent acrylic latex over suitable primer following solvent cleaning.

2.1.2.4. Wood - Opaque - semi gloss finish. Semi-Gloss, 100 percent acrylic latex over suitable primer.

2.1.2.5. Wood Sawn Lumber Members - Opaque stain: Solid color Acrylic latex.

2.1.2.6. Wood Glu-Lam Lumber Members- Semi-Transparent stain: Waterborne stain system.

2.2. WATER BASED EPOXY COATINGS - DISTRICT KITCHENS

2.2.1. Manufacturer: Tnemec, as distributed by TPC Consultants, phone 310-643-5191, Ameron or equal.

2.2.2. Type: Water base acrylic epoxy system, high build film, chemically resistant.

2.2.3. Series: H.B. Tneme-Tufcoat, Series 113.

2.2.4. System Characteristics: Multiple coats of water based epoxy over primer recommended by manufacturer.

2.2.5. Epoxy Characteristics and Performance:

2.2.5.1. Adhesion: Minimum rating of 5, Method B, steel, 5 mm crosshatch per ASTM D 3359.

2.2.5.2. Scrubability: For 113 H.B., maximum 0.8 mils removed after 1,000 cycles and no more than 2 gloss units change per ASTM D 4060.

2.2.5.3. Temperature Resistance: Acceptable in-service temperature range of 170 degrees F continuous, 250 degrees F intermittent.

2.2.5.4. Abrasion Resistance: Maximum 160 mg weight loss at 1000 cycles with CS17 wheel, 1000 gram load, per ASTM D 4060.

2.2.5.5. Humidity Resistance: Series 113 HB applied to lightweight unfilled concrete block, with no cracking or loss of adhesion after 7 days exposure, 110 degrees F, 95 percent relative humidity. No gloss change in excess of 5 units and no color change exceeding 2 MacAdam units.

2.2.5.6. Chemical Resistance: After chemical spot test on cured film, provide Series 113 HB coated surface complying with the following chemical resistance:

*	Sodium Hydroxide - 5%	No effect, 4 Hour
*	Hydrochloric Acid - 5%	No effect, 4 Hour
*	Sulphuric Acid - 5%	No effect, 4 Hour
*	Sodium Phosphate - 5%	No effect, 4 Hour

* No Effect: No evidence of blistering, loss of adhesion or softening after 48 hour recovery period.

2.2.6. Fire/Life Safety/Habitability Criteria

2.2.6.1. Flammability: Minimum Class A Flame Spread value per ASTM E 84.

2.2.6.2. Smoke generated: maximum 450 per ASTM E 84.

2.2.6.3. Air Quality Compliance: All products used shall comply with local VOC criteria.

2.2.7. Accessory Products: Primers/Joint Detailing: Provide materials as recommended by manufacturer for application.

2.2.8. Finish and Color

2.2.8.1. Finish: Satin.

2.2.8.2. Color: Color selected from manufacturers complete Colorbook line for specified product.

2.3. HIGH PERFORMANCE URETHANE COATING - EXTERIOR APPLICATIONS

2.3.1. Manufacturer: Tnemec, as distributed by TPC Consultants, phone 310-643-5191.

2.3.2. Type: Aliphatic PolyUrethane system, high build film, chemically resistant.

2.3.3. Exterior Applications: Galvanized flashings, steel fabrications and structural steel elements above student contact zone.

2.3.4. Series: H.B. Endura Shield, Series 75.

2.3.5. System Characteristics: Multiple coats of aliphatic polyurethane over primer recommended by manufacturer.

2.3.6. Characteristics and Performance:

2.3.6.1. Adhesion: Minimum rating of 5, Method B, steel, 5 mm crosshatch per ASTM D 3359.

2.3.6.2. Salt Spray resistance (fog): For Series 75 topcoat, No failure per ASTM B 117, 1000 hours.

2.3.6.3. Temperature Resistance: Acceptable in-service temperature range of 250 degrees F continuous, 275 degrees F intermittent.

2.3.6.4. Abrasion Resistance: Maximum 75 mg weight loss at 1000 cycles with CS17 wheel, 1000 gram load, per ASTM D 4060.

2.3.6.5. Exposure Resistance: Series 74 applied to lightweight unfilled concrete block, with no blistering cracking or chalking, with less than 30 percent gloss change and less than 1.5 MacAdam units for Endura Shield Blue Series 74 after 1500 hours exposure, per ASTM G 53.

2.3.7. Habitability Criteria: Air Quality Compliance: All products used shall comply with local VOC criteria.

2.3.8. Accessory Products: Primers/Joint Detailing: Provide materials as recommended by manufacturer for application.

2.3.9. Finish and Color

2.3.9.1. Finish: Semi-gloss.

2.3.9.2. Color: Color selected from manufacturers complete Colorbook line for specified product.

2.4. OTHER MATERIALS

2.4.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Verify weather stripping at door assemblies is compatible with specified paint finish.

3.1.2. Steel Doors and Door/Window Frames:

3.1.2.1. Provide specified primer at all frames, including frames with fabricators primer system. Comply with criteria specified in this Section.

3.1.2.2. Prepare frame steel surfaces as required for proper adhesion and appearance of specified finish coat system.

3.1.2.3. Paint all surfaces of window frames, including surfaces not visible when operable vent portions are in closed position.

3.1.2.4. Paint all surfaces of window frames, including surfaces not visible when operable vent portions are in closed position.

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

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

3.1.5. Finish all surfaces of doors, including tops and bottoms.

3.1.5.1. Apply two coats of approved sealer to all surfaces milled for hardware preparation, including hinge mortise, latching mechanism cutout and related door penetrations.

3.1.5.2. Apply paint to non-factory prefinished doors and frames by spray method only.

3.1.5.3. Before finishing, remove handling marks and exposure markings from all surfaces and edges with a complete block sanding using at least 150 grit sandpaper. Ease all edges. Steam out all scratches before sanding. Comply with WIC including use of sanding sealers and fillers.

3.1.6. Do not paint over labels at fire rated doors, door or window frames or other fire rated assemblies.

3.1.7. Exterior metal flashings, fabrications and structural components: Unless noted otherwise, apply paints and coatings as specified below:

3.1.7.1. Do not paint exterior galvanized metal handrails and railings.

3.1.7.2. Apply exterior urethane paint to all roof penetrations visible to the eye from typically occupied locations in the finished project. "Typically occupied" includes those portions of the project visible to a standing person from elevated portions of the site.

3.1.7.3. Unless designated prefinished, apply exterior urethane paint to metal roof copings, gutters, downspouts and flashings, fabrications and steel structural components above the student contact line and visible to the eye from typically occupied locations in the finished project.

3.1.7.4. Unless designated prefinished on drawings, apply exterior acrylic paint to metal roof copings, gutters, downspouts and flashings, fabrications and steel structural components below the student contact line and visible to the eye from typically occupied locations in the finished project.

3.1.7.5. Apply exterior acrylic paint to all plaster, plaster trim, reveals and accessories.

3.1.8. Extra Stock:

3.1.8.1. Extra Stock: Provide an unopened five gallon container of each color and sheen to Owner.

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

END OF SECTION

SECTION 10100

MARKERBOARDS AND TACKBOARDS

1. PART 1 - GENERAL

1.1. WORK INCLUDED

1.1.1. Marker boards, wall and cabinet mounted

1.1.2. Vinyl covered tack boards.

1.1.3. *Chalk boards, wall and cabinet mounted*

1.1.4. Trim and accessories.

2. PART 2 – PRODUCTS

2.1. MANUFACTURERS

2.1.1. Basis of Design: Characteristics of specific products manufactured by Claridge Products and Equipment Co. (501-743-2200) are indicated to establish required level of quality, appearance, and performance. The Architect will consider comparable products by alternate manufacturers listed in this Section, and requests for substitutions, under the provisions of Section 01610.

2.1.1.1. Acceptable Alternate Manufacturers: Greensteel, Nelson Adams, or equal.

2.2. MARKERBOARDS

2.2.1. Type: Porcelain enamel marker boards.

2.2.1.1. Type A: Stationary, wall mount.

2.2.1.2. Type B: Horizontal sliding panel teaching wall assembly, cabinet mount.

2.2.2. Series/Style:

2.2.2.1. Type A: Claridge Factory Built Unit, Series 3 frame.

2.2.2.1.1. Design: Unless otherwise shown on drawings, provide Type A design with trim and map rail.

2.2.2.2. Type B: Claridge HS series, manual operation, sliding panels as shown on drawings, with track configuration as required to permit stacking all panels on one side.

2.2.2.2.1. Panel operation: Provide top suspension system, nylon ball bearing rollers at top, with nylon guide rollers at bottom.

2.2.3. Construction:

2.2.3.1. Size: Refer to Drawings.

2.2.3.2. Writing Surface: LCS 24 gauge porcelain enamel skin.

2.2.3.3. Core:

2.2.3.3.1. Wall mount core: 3/8 inch particle board.

2.2.3.3.2. Sliding marker board core: Manufacturers standard composite board.

2.2.3.4. Back: 0.015 inch aluminum sheet.

2.2.3.5. Perimeter Trim: Aluminum channel trim.

2.2.3.6. Adhesives: Type recommended by manufacturer.

2.2.3.7. Map Rail: Aluminum map rail with cork insert.

2.2.3.8. Map Supports: Formed aluminum hooks, sliding type to fit map rail, provide two for each 4 foot of board length.

2.2.3.9. Chalk/marker trough: Extruded aluminum, one piece, full length of marker board; molded end closures.

2.2.3.10. Fabricate in full lengths, no joints allowed except as shown on drawings.

2.2.3.11. Flag Holders: Cast aluminum bored to receive one inch diameter flag staff, bracketed to fit top rail of marker board, provide one per classroom.

2.2.4. Finish:

2.2.4.1. Porcelain Enamel: Glass fiber enamel, baked to vitreous surfaces; color as selected from manufacturer's standard range for standard dry marker surfaces.

2.2.4.2. Aluminum Frame and Accessories: Mill finish natural aluminum.

2.3. TACKBOARDS

2.3.1. Type: Vinyl covered tack boards

2.3.2. Series/Style: Claridge Factory built Unit, Series 3.

2.3.3. Construction:

2.3.3.1. Size: Refer to Drawings.

2.3.3.2. Tack Board Surface: Fabricork, Series 1381 FREW.

2.3.3.3. Core: 7/16 inch backer board.

2.3.3.4. Back: None.

2.3.3.5. Perimeter Trim: Aluminum channel trim.

2.3.3.6. Adhesives: Type recommended by manufacturer.

2.3.4. Finishes:

2.3.4.1. Vinyl covering: burlap finish, color as selected by Architect from standard color line.

2.3.4.2. Aluminum Frame and Accessories: Mill finish natural aluminum.

2.4. OTHER MATERIALS

2.4.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. *Clean marker board surfaces in accordance with manufacturer's instructions.*

3.1.2. *Cover marker board surfaces with protective cover, taped to frame.*

3.1.3. *Remove protective cover at Owner occupancy.*

END OF SECTION

SECTION 10172

SOLID PLASTIC TOILET COMPARTMENTS

1. PART 1 - GENERAL

1.1. SECTION INCLUDES

1.1.1. Solid plastic toilet compartments.

1.1.2. Urinal screens.

2. PART 2 - PRODUCTS

2.1. TOILET COMPARTMENTS

2.1.1. Basis of Design: Characteristics of specific products manufactured by Santana Products, Inc. are indicated to establish required level of quality, appearance, and performance. The Architect will consider comparable products by alternate manufacturers listed in this Section, and requests for substitutions, under the provisions of Section 01610.

2.1.1.1. Acceptable Alternate Manufacturers: Capitol Partitions, or equal.

2.1.2. Type: Solid polymer plastic compartment system.

2.1.3. Series:

2.1.3.1. Toilet Compartments: Floor mounted/Overhead braced system, modified as specified, with hardware as specified.

2.1.3.2. Urinal Screen - staff toilets only: Floor mounted/wall braced panel, with hardware as specified.

2.1.4. Construction:

2.1.4.1. Solid Plastic Panel: Solid polymer panel.

2.1.4.2. Pilaster Shoe: ASTM A167 type 304 stainless steel with No. 4 finish.

2.1.4.3. Attachments, Screws, and Bolts: Provide stainless steel, with tamper proof fasteners.

2.1.4.4. Hardware: Unless otherwise specified, provide aluminum or stainless steel hardware components. ZAMAC components are not acceptable.

2.1.4.4.1. Integral self-closing hinge system consisting of nylon top pin and nylon cam action bottom pin.

2.1.4.4.2. Slide bolt door latch with exterior emergency access feature at all compartment doors, mount between 30" to 44" above finish floor.

2.1.4.4.3. Door strike and keeper with rubber bumper.

2.1.4.4.4. Coat hook at each compartment.

2.1.4.4.5. Door pulls at each compartment. Provide U-shape door pulls on each side of door of accessible compartments.

2.1.4.4.6. Door Stops at top and bottom of each door panel.

2.1.4.4.7. Continuous Channel at pilaster to panel and panel to wall connection.

2.1.4.4.8. Provide continuous aluminum edge strip at all door and panel bottom edge, installed with tamper proof fasteners.

2.1.4.4.9. Headrail, continuous, at toilet compartments, with profile configuration free of locations suitable for concealing cigarettes/contraband in rail.

2.1.5. Fabrication:

2.1.5.1. Fabricate partitions by forming solid plastic panel with finished faces and edges. Finish edges convex.

2.1.5.2. Bevel corners and edges of cut - outs.

2.1.5.3. Doors and Panels:

2.1.5.3.1. Thickness: 1 inch

2.1.5.3.2. Door Width: 24 inch, unless shown otherwise.

2.1.5.3.3. Door Width at Accessible compartment: 32 inch minimum clear opening, 34 inch minimum at side entry stalls , door swing as shown on plans and per CBC Section 1115B.3.1.4.4.

2.1.5.3.4. Toilet compartment door and panel height: 55 inches.

2.1.5.4. Toilet Compartment Pilasters: 1 inch thick, 82 inches high.

2.1.5.5. Urinal Screen: Size as shown on drawings.

2.1.6. Fire/Habitability Criteria:

2.1.6.1. Self-Ignition Temperature: Minimum of 650 degrees F, tested per UBC Standard 26-6 or approved equivalent.

2.1.6.2. Smoke Density Rating: Maximum value of 75, tested per UBC Standard 26-5 or approved equivalent.

2.1.7. Finish/Color:

2.1.7.1. Colors shall be selected by Architect from complete Poly-Marble HD, Poly-Granite HD, and Poly-Mar HD line.

2.1.7.2. A maximum of two separate colors will be selected by Architect for women and girls compartments.

2.1.7.3. A maximum of two separate colors, different from colors selected in 2.1.7.2, will be selected by Architect for men and boys compartments.

2.1.7.4. Provide color for plastic brackets and channels as directed by Architect.

2.1.7.5. Stainless Steel: No. 4, Satin.

2.2. OTHER MATERIALS

2.2.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Coordinate with work specified in Section 06112 to assure proper type and location of blocking and framing required for installation into solid backing. Anchorage using molly bolts or toggle bolts prohibited.

3.1.2. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions. Install all required safety set screws to prohibit removal of integral hinge.

3.1.3. Install partition system with continuous channel. Maintain 1/4 inch space between channel and panels. Maintain maximum of 3/16 inch space between door and pilaster.

3.1.4. Attach panels and pilasters to brackets with tamper proof through bolts and nuts.

3.1.5. Anchor urinal screen panels to walls with panel channels and vertical post brace as shown on drawings.

3.1.6. Provide adjustment for floor variations with screw jack through aluminum angle. Conceal floor fastenings with pilaster shoes.

3.1.7. Equip each door with two hinges, one door latch, two doorstops, one coat hook and bumper.

3.1.7.1. Provide accessible compartment doors with U-shape pull on both sides, mounted at 34 inches above finish floor.

3.1.7.2. Provide slide latch mounted at 36 inches above finish floor.

3.1.7.3. Mount coat hook at 48 inches above finish floor in accessible compartments. Locate as directed by Architect. Do not mount on door panel.

Door hardware shall be mounted at 30" to 44" above finished floor per CBC Section 1115B.3.1.4.5.

3.1.8. Install door strike and keeper with door bumper on each pilaster in alignment with door latch.

END OF SECTION

SECTION 10440

SIGNS AND BUILDING IDENTIFICATION

1. PART 1 - GENERAL

1.1. SECTION INCLUDES

1.1.1. Permanent room or space identification signage

1.1.2. Directional and Informational Signage, site exterior and interior.

1.1.3. Safety Signage.

1.1.4. Vehicle traffic control signage.

2. PART 2 – PRODUCTS

2.1. PERMANENT TACTILE SIGNAGE

2.1.1. Manufacturer: RB Industries, (specified as basis of design) phone 619-448-3930, Apco or equal.

2.1.2. Type: Etched metal signage system.

2.1.3. Series: 300 Photomag.

2.1.4. Material Characteristics: 0.125 inch thick magnesium alloy.

2.1.5. Graphic Image Process: Acid etched process providing raised and braille relief image. Applied message is not acceptable.

2.1.6. Sign Size, Design, Style Criteria:

2.1.6.1. Character size: 5/8 inch minimum, maximum 2 inch height, raised 1/32 inch above surface.

2.1.6.2. Character proportion: Provide width to height ratio between 3:5 and 1:1.

2.1.6.3. Character stroke proportion: Provide stroke width to height ratio between 1:5 and 1:10.

2.1.6.4. Letter Style: Upper case Helvetica Regular.

2.1.6.5. Braille criteria: Provide California Contracted Grade 2 braille, with dots spaced 1/10 inch on center in each cell, and cells spaced 2/10 inch apart. Provide dots raised 1/40 inch above surface, with rounded or domed profile.

2.1.6.6. Design sign with room number on first line, room name on second, braille message on third line. Center all copy. Provide minimum 1/2 inch clear space at sides and below braille image (space between text and Braille must be minimum 3/8" and maximum 1/2").

2.1.6.7. Pictogram Criteria: Where pictograms are specified as room identification signage, provide pictogram centered in minimum 6 inch high space with no text or braille within this space. Provide tactile and braille message centered below pictogram.

2.1.6.8. Toilet Rooms: In addition to room identification signs, comply with 12 inch triangle/circle size requirements per Section 1115B.6, Part 2, Title 24, CCR. Do not provide tactile and braille message (on door).

2.1.7. Sign Message:

2.1.7.1. Toilet room door symbols: Provide door mounted signs, separate from room identification signage, complying with Section 1115B.6, Part 2, Title 24, CCR. Provide appropriate international gender symbol on each sign. Do not put tactile and braille message on sign.

2.1.7.2. Room Signs: Provide signs at locations shown on drawings. At all exterior entrance doors, provide symbol of accessibility per details.

2.1.7.3. Exit Signs: Provide signs at all door locations with exit signs providing access to stairways, exit corridors or exterior. Provide specific signage at each location per CBC Section 1011.3.

2.1.7.4. Toilet room signs: Provide signs at locations shown on drawings. At toilets, provide symbol of accessibility per details.

2.1.7.5. Enclosed Stairway Signs: Provide sign at each stair landing at stair side, identifying floor level and upper/lower level terminations, similar to "Access To Floors 1 through Roof".

2.1.7.6. Provide signs identifying "Area of Rescue Assistance" in compliance with CBC Sections 1007.6.5 and 1117B.5.1 (#2), Part 2, Title 24, CCR and ADAAG 4.3.11.5. Locate at each entrance to area of rescue assistance..

2.1.7.7. At each "Area of Rescue Assistance" provide instructional signage in compliance with CBC Sections 1007.6.5 and 1117B.5.1 (#2), Part 2, Title 24, CCR on the use of area and communication systems.

2.1.8. Finish/Contrast/Color:

2.1.8.1. Finish: Provide signs with matte, non-reflective finish, with a maximum 11-19 degree gloss on 60 degree dosimeter.

2.1.8.2. Contrast: Provide signs with minimum light to dark contrast between background and message of 70 percent.

2.1.8.3. Color: Provide signs with two colors as selected by Architect from manufacturer's standard color line.

2.1.8.3.1. Background: Color 1, selected from very dark color range.

2.1.8.3.2. Message: Color 2 selected from white or very light color range.

2.1.8.3.3. International Symbol of Accessibility: White symbol on Federal Blue background (#15090 per Federal Standard 595B).

2.1.8.3.4. Finish System: Mathews acrylic polyurethane coating system, VOC approved, complying with glare finish criteria.

2.1.9. Mounting:

2.1.9.1. Exterior: Provide stainless steel spanner head tamper resistant screw in expansion shields suitable for substrate. Countersink screw flush with surface.

2.1.9.2. Interior: Unless noted otherwise, provide double stick foam tape mounting, 1/32 inch thick.

2.1.9.3. Where signs are mounted on glass panels, install using structural silicone sealant method specified in this section.

2.1.9.4. Verify surfaces with irregular or rough finish have been properly finished to establish flush and lip free installation.

Mounting location shall be determined so that a person may approach within 3inches of signage without encountering protruding objects or standing within the swing of the door per CBC Section 1117B.5.7.

2.1.10. Fabrication Certification: Prior to installation, provide written certification stating permanent signage has been proofread by Library of Congress certified readers or approved alternate.

2.2. DIRECTIONAL AND INFORMATIONAL SIGNAGE

2.2.1. Manufacturer: RB Industries, (specified as basis of design) phone 619-448-3930, Apco or equal. Signage manufacturer under this article shall match signage provided in Article 2.2

2.2.2. Type: Etched metal signage system.

2.2.3. Series: 300 Photomag.

2.2.4. Material Characteristics: 0.125 inch thick magnesium alloy.

2.2.5. Graphic Image Process: Acid etched process providing raised and braille relief image. Applied message is not acceptable.

2.2.6. Sign Size, Design, Style Criteria:

2.2.6.1. Character size: As required to comply with viewing distance criteria. Provide minimum 3 inch height at signs located 80 inches or greater above finish floor.

2.2.6.2. Character proportion: Provide width to height ratio between 3:5 and 1:1.

2.2.6.3. Character stroke proportion: Provide stroke width to height ratio between 1:5 and 1:10.

2.2.6.4. Letter Style: Upper and lower case combined Helvetica Regular.

2.2.6.5. Center all copy in field.

2.2.7. Sign Message:

2.2.7.1. Accessible Route Direction Signs: Provide signage with symbol of accessibility with arrow pointed as directed by Architect.

2.2.7.2. Assistive Listening Device: Provide signs indicating availability of assistive listening devices in compliance with Section 1103B.1, Part 2, Title 24, CCR and ADAAG 4.30.7. In addition, provide message on sign stating "Contact School Administration to make arrangements for access to listening device for after school hours use".

2.2.7.3. Accessible Phone: Provide signage complying with Section 1105B.4, Part 2, Title 24, CCR and ADAAG 4.30.7 indicating volume control equipped phones.

2.2.7.4. Accessible bleacher seating location: Provide signs indicating location of accessible seating, with message "ACCESSIBLE SEATING - KEEP CLEAR" and symbol of accessibility.

2.2.7.5. TDD Phone: Provide signage complying with Section 1105B.4, Part 2, Title 24, CCR and ADAAG 4.30.7 indicating text display telephones.

2.2.8. Finish/Contrast/Color:

2.2.8.1. Finish: Provide signs with matte, non-reflective finish, with a maximum 11-19 degree gloss on 60 degree dosimeter.

2.2.8.2. Contrast: Provide signs with minimum light to dark contrast between background and message of 70 percent.

2.2.8.3. Color: Provide signs with two colors as selected by Architect from manufacturer's standard color line.

2.2.8.3.1. Background: Color 1, selected from very dark color range.

2.2.8.3.2. Message: Color 2 selected from white or very light color range.

2.2.8.3.3. International Symbol of Accessibility: White symbol on Federal Blue background.

2.2.8.3.4. Finish System: Mathews acrylic polyurethane coating system, VOC approved, complying with glare finish criteria.

2.2.9. Mounting:

2.2.9.1. Exterior: Provide stainless steel spanner head tamper resistant screw in expansion shields suitable for substrate. Countersink screw flush with surface.

2.2.9.2. Interior: Unless noted otherwise, provide double stick foam tape mounting, 1/32 inch thick.

2.2.9.3. Where signs are mounted on glass panels, install using structural silicone sealant method specified in this section.

2.2.9.4. Verify surfaces with irregular or rough finish have been properly finished to establish flush and lip free installation.

Mounting location shall be determined so that a person may approach within 3inches of signage without encountering protruding objects or standing within the swing of the door per CBC Section 1117B.5.7.

2.3. SITE DIRECTIONAL AND INFORMATIONAL SIGNAGE

2.3.1. Manufacturer: Vomar, phone (818) 894-7174 or equal.

2.3.2. Type: Non-illuminated flat sign panel, aluminum frame, ground set unless noted otherwise.

2.3.3. Series: E Series.

2.3.4. Size and Construction:

2.3.4.1. Sign Image Size: Minimum 9 inches high x 18 inches long. Adjust size as necessary to accommodate message and character size criteria of referenced regulations.

2.3.4.2. Mounting Height: 36 inches to top of sign, unless noted otherwise.

2.3.4.3. Sign Panel Material: 0.080 inch Aluminum panel, background painted with PPG Duranar, Kynar 500 fluoropolymer painted finish complying with AAMA 605.2-90, over black fiberglass back-up panel.

2.3.4.4. Frame: Steel tube frame per Section 05500.

2.3.5. Sign Size, Design, Style Criteria:

2.3.5.1. Character size: As required to comply with viewing distance criteria. Provide minimum 3 inch height at signs located 80 inches or greater above finish grade.

2.3.5.2. Character proportion: Provide width to height ratio between 3:5 and 1:1.

2.3.5.3. Character stroke proportion: Provide stroke width to height ratio between 1:5 and 1:10.

2.3.5.4. Letter Style: Upper and lower case combined Helvetica Regular.Center all copy in field.

2.3.6. Sign Content:

2.3.6.1. Provide free standing sign with symbol of accessibility, with directional arrow oriented as directed by Architect. Provide image on both sides.

2.3.6.2. Provide wall mounted sign indicating availability of assistive listening devices in compliance with Section 1103B.1, Part 2, Title 24, CCR and ADAAG 4.30.7. In addition, provide message on sign stating "Contact School Administration to make arrangements for access to listening device for after school hours use".

2.3.6.3. Provide fence mounted sign indicating accessible seating locations in compliance with ADAAG 4.30.7, with message "ACCESSIBLE SEATING - KEEP CLEAR" and symbol of accessibility. Locate at each bleacher at each seating area, mounted on railing.

2.3.6.4. Provide sign with "ADMINISTRATION" message, including directional arrow.

2.3.6.5. Accessible Phone: Provide signage complying with Section 1105B.4, Part 2, Title 24, CCR and ADAAG 4.30.7 indicating volume control equipped phones.

2.3.6.6. TDD Phone: Provide signage complying with Section 1105B.4, Part 2, Title 24, CCR and ADAAG 4.30.7 indicating text display telephones.

2.3.7. Graphic Process: Silkscreen, surface printing, urethane paint system suitable for exterior application, with clear urethane overcoat.

2.3.8. Finish/Contrast/Color:

2.3.8.1. Finish: Provide signs with matte, non-reflective finish, with a maximum 19 degree gloss on 60 degree dosimeter.

2.3.8.2. Contrast: Provide signs with minimum light to dark contrast between background and message of 70 percent.

2.3.8.3. Color: Provide signs with two colors as selected by Architect from manufacturer's standard color line.

2.3.8.3.1. Background: Color 1, selected from very dark color range.

2.3.8.3.2. Message: Color 2 selected from white or very light color range.

2.3.8.3.3. International Symbol of Accessibility: White symbol on Federal Blue background (#15090 per Federal Standard 595B).

2.3.8.3.4. Frame: Color as selected by Architect.

2.3.9. Mounting:

2.3.9.1. Ground Set: Concrete footing.

2.3.9.2. Exterior Wall: Provide spanner head tamper resistant screw in expansion shields suitable for substrate.

2.3.9.3. Verify surfaces with irregular or rough finish have been properly finished to establish flush and lip free installation.

Mounting location shall be determined so that a person may approach within 3inches of signage without encountering protruding objects or standing within the swing of the door per CBC Section 1117B.5.7.

2.4. SITE VEHICLE CONTROL SIGNAGE

2.4.1. Manufacturer: Western Highway Products, phone (800)-479-3783, or equal.

2.4.2. Provide painted aluminum series, design as shown on drawings and as specified, with H6-TP spanner head vandal resistant fasteners, H-5 spacer and all required mounting components.

2.4.2.1. Accessible Parking Site Entrance Sign: RFH 1824.

2.4.2.2. Accessible Parking Space Sign: RFH 1212PB.

2.4.2.3. Van Accessible Parking Space Sign: RFH 1212PB, with 2RFH-VAN - R12 at van accessible spaces.

2.4.3. Concrete: 2500 psi concrete in accordance with the provisions of Section 03310.

2.4.4. Post: Steel pipe, 3 inch diameter unless noted otherwise, galvanized per Section 05500, finish painted per Section 09900.

2.5. SAFETY SIGNAGE

2.5.1. Provide all interior and exterior safety signage, signage required by jurisdictional authorities, and related signage, including but not necessarily limited to, signs with the following message:

2.5.1.1. "Room Occupancy Limit - XXX". Provide ten (10) signs, 5 sets of 2 with different occupancy numbers.

2.5.2. Stair Signs: Provide sign at each stair complying with CBC Section 1020.1.6, Part 2, Title 24, CCR, identifying stairway number, roof access, floor level, and upper/lower level terminations.

2.5.2.1. Fabricate with message, graphic character, and color as required by jurisdictional authority, in laminated plastic sign system matching Article 2.1.

2.6. OTHER MATERIALS

2.6.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Install signs after substrate surfaces receive final finish.

3.1.2. Center room identification signage shall be mounted at 60 inches above floor, located on strike side of door (per CBC Section 1117B.5.7) or as directed by Architect.

3.1.3. Where signs are installed in sealant method on glass panels, provide back plate matching sign at opposite side of glass

3.1.4. When sign is installed on window surface or other similar recessed conditions, provide spacer as required to maintain sign face within 3 inches of outermost wall plane.

3.1.5. Where signs are mounted on gate or fence mesh, sandwich mesh between sign and backing panel of same material and size as sign. Install using sex bolt, tamper resistant fasteners, mounted through aluminum sleeve/spacer.

END OF SECTION

SECTION 10800

TOILET AND WASHROOM ACCESSORIES

1. PART 1 - GENERAL

1.1. SECTION INCLUDES

1.1.1. Toilet and washroom accessories.

1.1.2. Lavatory and sink trap and piping prefabricated wrap kit.

2. PART 2 – PRODUCTS

2.1. WASHROOM AND MISCELLANEOUS ACCESSORIES

2.1.1. Manufacturer: Bobrick (818) 982-9600 or equal.

2.1.2. Toilet Area Accessories:

2.1.2.1. Toilet Paper Dispenser:

2.1.2.1.1. TPH-0: B-3888, Classic Series, semi-recessed, with lock.

2.1.2.1.2. TPH-1: B-2888, Classic Series, surface mount with lock.

2.1.2.2. Toilet Seat Cover Dispenser TSCD: B-221, Classic Series, surface mount.

2.1.2.3. Sanitary Napkin Disposal SNWR: B-254, Classic Series, surface mount.

2.1.3. Washroom Area Accessories:

2.1.3.1. Paper Towel Dispenser PTD: B-262, Classic Series, Surface mount.

Electric Hand Dryer HD-1: B-750, Recessed.

Mirror MR-1: B-290, size as shown on drawings, 18 x 36 inch size minimum, tempered glass.

2.1.3.2. Soap Dispenser SD-1: B-2112, Classic Series, wall mounted, liquid type, with maximum 5 lbf operating force.

2.1.4. Miscellaneous Accessories

2.1.4.1. Mop Rack: B-223-36.

2.1.5. Finish: No. 4 satin luster, unless noted otherwise.

2.2. GRAB BARS

2.2.1. Manufacturer: ASI (818) 982-9600. No substitution.

2.2.2. Toilet Compartment Grab Bar GB-1: ASI 3100 Series, 36 inches long, concealed mounting, set screw flange cover, satin finish.

2.2.3. Toilet Compartment Grab Bar GB-2: ASI 3100 Series, 42 inches long, concealed mounting, set screw flange cover, satin finish.

2.3. TRAP AND PIPING WRAP

2.3.1. Provide Brocar (Phone 1-800-827-1207) prefabricated trap and piping insulation kit, C500 series, with all required accessory fittings, color white. Provide at all disabled accessible lavatories and sinks.

2.4. OTHER MATERIALS

2.4.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Where installing Owner furnished items (OFCI), schedule meeting with Owner as necessary to obtain all required installation criteria from Owner, including accessory size, fastener locations and other requirements for a complete an secure installation. Schedule meeting so as to not delay installation of required rough-in services, blocking, backing and embeds.

3.1.2. Where Owner will provide and install accessories (OFOI), schedule meeting with Owner as necessary to obtain all required installation criteria from Owner, including accessory size, fastener locations and other requirements in order to install all required backing, blocking, and support framing for a complete and secure installation. Schedule meeting so as to not delay installation of required rough-in services, blocking, backing and embeds.

3.1.3. Toilet accessories required to be accessible shall be mounted at heights according to CBC 1115B.8.

3.1.4 The grab bar cannot project more than 3" into the 48" minimum clear space in front of the water closet per CBC Section 1115B.4.1.3.

3.1.5 Toilet paper and feminine napkin dispensers located on the grab bar side of an accessible toilet room or still should not project more than the grab bar. The accessory shall not be located closer than 1 ½" clear of the tangent point of the grab bar. Accessible surface mounted above grab bar will restrict usability.

END OF SECTION

SECTION 11130

PROJECTION SCREENS

1. PART 1 - GENERAL

1.1. WORK INCLUDES

1.1.1. Projection screen, exposed wall mounting.

1.1.2. Projection screen, concealed, above ceiling mounting, electric operated.

1.1.3. Projection screen, custom made, concealed, above ceiling mounting.

2. PART 2 – PRODUCTS

2.1. PROJECTION SCREEN - MULTI-PURPOSE ROOMS

2.1.1. Manufacturer: Stewart FilmScreen, phone (800)-762-4999, or equal.

2.1.2. Series:

2.1.2.1. Type 1 - Above Ceiling Concealed: Electriscreen ABT-4.

2.1.3. Characteristics: Type 1

2.1.3.1. Screen Size: 120 inches wide x 96 inches.

2.1.3.2. Viewing Surface: Ultramatte 150, Flame and mildew resistant vinyl fabric, matte white.

2.1.3.3. Power Criteria: 120 VAC.

2.1.3.4. Motor: 120v, 60 Hz, instant reversing, gear drive with permanently lubricated ball bearings, automatic thermal overload protection, limit switches to automatically stop screen in up or down positions.

2.1.3.5. Mounting: As Shown on Drawings.

2.1.3.6. Control: Three position key activated, with up, down, off operation.

2.2. PROJECTION SCREENS

2.2.1. Manufacturer: Manufacturer: Da-Lite Screen Company(specified as basis of design), Draper, Bretford, or equal.

2.2.2. Series:

2.2.2.1. Type 1 - Wall Mount: Da-Lite Model B.

2.2.2.2. Type 2 - Above Ceiling Concealed: Boardroom Electrol.

2.2.3. Characteristics: Type 1

2.2.3.1. Screen Size: 70 inches x 70 inches.

2.2.3.2. Viewing Surface: Flame and mildew resistant vinyl fabric, matte white.

2.2.3.3. Mounting Brackets: 14 inch extension brackets.

2.2.3.4. Accessories: Magnetic tilt locks.

2.2.4. Characteristics: Type 2

2.2.4.1. Screen Size: 70 inches x 70 inches.

2.2.4.2. Viewing Surface: flame and mildew resistant vinyl fabric, glass beaded.

2.2.4.3. Power Criteria: 115 VAC, 1.13 Amps.

2.2.4.4. Motor: 115v, 60 Hz, instant reversing, gear drive with permanently lubricated ball bearings, automatic thermal overload protection, limit switches to automatically stop screen in up or down positions.

2.2.4.5. Mounting: As Shown on Drawings.

2.2.4.6. Control: Three position key activated, with up, down, off operation.

2.3. OTHER MATERIALS

2.3.1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

3. PART 3 - EXECUTION

3.1 INSTALLATION AND PLACEMENT CONSIDERATIONS

3.1.1. Install level, plumb, and secure at proper location.

3.1.2. Install flush with adjacent finish ceiling.

3.1.3. Adjust for proper operation and door fully closed in up position.

END OF SECTION

SECTION 15010

GENERAL PROVISIONS, MECHANICAL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers and applies to all work included in DIVISION 15.

B. Work Included in This DIVISION: Materials, equipment, fabrication, installation and tests for fully operational and safe systems, including all necessary materials, appurtenances and features whether specified or shown on drawings or not, all in conformity with applicable codes and authorities having jurisdiction for the following:

1. Mechanical work covered by all sections within DIVISION 15 of the specifications, including, but not limited to:

a. Heating, ventilating and air conditioning systems and equipment.

b. Plumbing systems and equipment.

c. Control systems.

d. Testing and balancing.

1.02 RELATED WORK AND REQUIREMENTS

A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all work in this division.

B. Carefully check the documents of each section with those of other sections and Divisions. Ascertain the requirements of any interfacing materials or equipment being furnished and/or installed by those sections and Divisions, and provide the proper installation and/or required interface.

1.03 REFERENCE STANDARDS

A. Published codes, specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Division where cited below:

1. AABC - Associated Air Balance Council.

2. ADC - Air Diffuser Council.

3. AMCA - Air Moving and Conditioning Association.

4. ANSI - American National Standards Institute.

5. ARI - Air-Conditioning and Refrigeration Institute.

6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers.

7. ASME - American Society of Mechanical Engineers.

8. ASTM - American Society for Testing and Materials.

9. FM - Factory Mutual.

10. Local Utility Authorities.

11. National, State and Local Codes of all authorities having jurisdiction.

12. NEMA - National Electrical Manufacturer's Association.

13. NFPA - National Fire Protection Association.

14. OSHA - Occupational Safety and Health Act.

15. CBC - California Building Code.

16. UL - Underwriters' Laboratories, Inc.

17. CMC - California Mechanical Code.

18. CPC - California Plumbing Code.

19. The State of California Codes including Title 24.

B. In addition to complying with all other legal requirements, comply with current provisions of governing codes and regulations in effect during progress of the Work, and with the following:

1. Drawings and specification requirements shall govern where they exceed Code and Regulation requirements.

2. Where requirements between governing Codes and Regulations vary, the more restrictive provisions shall apply.

3. Nothing contained in Contract Documents shall be construed as authority or permission to disregard or violate legal requirements. The Contractor shall immediately draw the attention of the Architect to any such conflicts noted in the Contract Documents.

1.04 QUALITY ASSURANCE

A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.

B. Supply all equipment and accessories new and free from defects.

C. Supply all equipment and accessories in compliance with the applicable standards listed in article 1.03 of this section and with all applicable national, state and local codes.

D. All items of a given type shall be the products of the same manufacturer.

1.05 SUBMITTALS

A. Submit shop drawings, product data, samples and certificates of compliance required by contract documents.

1. See Submittals paragraph in Division 1 and paragraph 1.19 GUARANTEE in this section.

B. Submit in accordance with Division 1:

C. Corrections or comments made on the shop drawings during review do not relieve the Contractor from compliance with requirements of the drawings and specifications. Shop drawing checking by the Engineer is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for:

1. Confirming and correlating all quantities and dimensions.

2. Selecting fabrication processes and techniques of construction.

3. Coordinating his work with that of all other trades.

4. Performing his work in a safe and satisfactory manner.

D. Quantity of Submittals Required.

1. Layout Shop Drawings:

a. Submit one reproducible transparency and one print.

b. Upon review, transparency will be annotated and returned. Print will be retained by the Engineer.

c. Copies of this transparency will serve as record copies for Architect.

d. Additional prints will not be reviewed nor returned.

2. Product Data (brochures):

a. Submit six copies of product data.

b. Five copies will be returned.

c. If comments are required, comment sheet(s) will be returned with each copy.

d. One copy will be retained by the Engineer.

E. Submittal Format:

1. Number each submittal in consecutive order.

2. In each submittal include complete index with following information:

   a. Project title and number.

   b. Submittal number.

   c. Referenced specification DIVISION, Section, Title, Paragraph and Page Number or Drawing Number as applicable.

   d. Date of submission.

   e. Referenced addendum or change order number as applicable.

   f. Names of Contractor, supplier and manufacturer.

   g. Description of item.

   h. Stamp with Contractor's initials or signed certifying:

      1) Review of submittal.

      2) Verification of products, field measurements and field construction criteria.

      3) Coordination of shop drawing and/or information in submittal with requirements of work of this Division and other Divisions of Contract Documents.

F. Resubmission Requirements:

   1. Make any corrections or change in submittals required. Resubmit for review until no exceptions are taken or a resubmission is not required.

   2. Shop Drawings and Product Data:

      a. Revise initial drawings or data, and resubmit as specified for initial submittal.

      b. Indicate any changes which have been made other than those requested.

   3. Clearly identify resubmittal by original submittal date, number and revision number and indicate all changes from previous submittal.

G. Substitutions:

   1. Submit in accordance with Section 01630.

   2. The bid shall include products per paragraph 2.01 MANUFACTURERS. Architect will consider formal requests for substitution of products in place of those specified only if these are submitted with the bid for evaluation and in accordance with all conditions specified hereafter.

3. Requests for substitutions after award of contract shall be considered only in case of product unavailability. Product unavailability shall be verified in writing by manufacturer.

4. Submit separate request for each substitution at time of bid, or at appropriate time thereafter in the event of non-availability of item included in bid. Support each request with:

   a. Complete data substantiating compliance of proposed substitution with requirements stated in Contract documents.

   b. Data relating to changes in construction schedule.

   c. Any effect of substitution on other Work in this and other Divisions, and any other related contracts, and changes required in other work or products.

5. Contractor shall be responsible at no extra cost to Owner for any changes resulting from proposed substitutions which affect work of other Sections or Divisions, or related contracts.

6. Claims for additional costs caused by substitution which may subsequently become apparent shall be met by the Contractor.

7. Substitutions will not be considered for acceptance when acceptance will require substantial revision of Contract Documents, unless Contractor bears cost of redesign.

8. Where any redesign of electrical, mechanical or other work is required due to substitution, arrangement or equipment layout other than herein specified or shown:

   a. Arrange for required redesign by Architect and Engineer.

   b. Pay all costs for such redesign.

9. Substitute products shall not be ordered or installed without prior written approval/acceptance by Architect.

10. Architect will have sole discretion to determine acceptability of proposed substitutions and reserves the right to reject any such substitution.

11. Approval of substitutions shall not relieve Contractor from full compliance with requirements of Contract documents.

H. Operating Instructions, Maintenance Manuals and Parts Lists:

1. Before requesting acceptance of work, submit one set for review by Architect.

2. After review, furnish five printed and bound sets.

3. Include:

a. Manufacturer's name, model number, service manual, spare-parts list, and descriptive literature for all components, cross referenced and numbered on Record Drawings, and in accordance with Title 24 as required.

b. Maintenance instructions.

c. Listing of possible breakdown and repairs.

d. Instruction for starting, operation and programming.

e. Detailed and simplified one line, color coded flow and wiring diagram.

f. Name, address and phone number of contractor's equipment suppliers and service agencies.

g. Assemble manufacturer's equipment manuals in chronological order, following the specification alpha-numeric system, in heavy duty 3-ring binders clearly titled on the spine and front cover with appropriate index dividers.

I. Record Drawings:

1. Comply with requirements of Division 1: PROJECT RECORD DOCUMENTS.

2. Submit to Architect for review prior to final acceptance inspection, one complete set of finished, drafted reproducible record drawings.

a. Fully illustrate all revisions made by all trades in course of work.

b. Include all field changes, adjustments, variances, substitutions and deletions, including all Change Orders.

c. Exact location, type, and function of concealed valves, dampers, controllers, piping, air vents and piping drains.

d. Exact size, invert elevations and location of underground and under floor piping and ducts.

3. These drawings shall be for record purposes for Owner's use and are not considered shop drawings.

1.06 DESCRIPTION OF BID DOCUMENTS

A. Specifications:

1. Specifications, in general, describe quality and character of materials and equipment.

2. Specifications are of simplified form and include incomplete sentences.

3. Words or phrases such as "The Contractor shall," "shall be," "furnish," provide," "a," "an," "the," and "all" etc. have been omitted for brevity.

B. Drawings:

1. Drawings in general are diagrammatic and indicate scope, sizes, routing, locations, connections to equipment and methods of installation, but not necessarily offsets, obstructions or structural conditions. Locations on drawings may be distorted for purposes of clearness and legibility.

2. Scaled and figured dimensions are approximate and are for estimating purposes only, but shall be followed with sufficient accuracy to coordinate with other work and structural limitations.

3. Before proceeding with work, check and verify all dimensions and carefully check space requirements with other Work to ensure that all equipment and materials can be installed in spaces allotted.

4. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.

5. The Contractor is responsible for installing the work in such a manner that it will conform to the structure and architectural elements, avoid obstructions, maintain headroom, leave adequate clearance for proper maintenance and repairs, and provide clearances and access required by codes.

6. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.

7. Above items to be performed at no additional cost to the Owner.

C. If any part of Specifications or Drawings appears unclear or contradictory, apply to Architect for his interpretation and decision as early as possible, including during bidding period. Do not proceed with such work without Architect's decision.

1.07 DEFINITIONS

A. "Furnish" or "Provide": to supply, install and connect up complete and ready safe and regular operation of particular work referred to unless specifically otherwise noted.

B. "Install": to erect, mount and connect complete with related accessories.

C. "Supply": to purchase, procure, acquire and deliver complete with related accessories.

D. "Work": labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.

E. "Piping": pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.

F. "Wiring": raceway, fittings, wire, boxes and related items.

G. "Concealed": embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures.

H. "Exposed": not installed underground or "concealed" as defined above.

I. "Indicated," "Shown" or "Noted": as indicated, shown or noted on drawings or specifications.

J. "Similar" or "Equal" of base bid manufacture: in the Engineer's opinion, equal in materials, weight, size, design, and efficiency of specified product, conforming with 2.01 MANUFACTURERS.

K. "Reviewed," "Satisfactory," or "Directed": as reviewed, satisfactory, or directed by or to Architect.

L. "Motor Controllers": manual or magnetic starters (with or without switches), individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.

M. "Control" or "Actuating Devices": automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.

1.08 UTILITY CONNECTIONS

A. Arrange for and pay utility costs for work of this Division.

B. Included:

1. Connection to utility company mains.

2. Connection to on-site piping mains.

3. Payment of service charges.

4. Provisions for temporary utilities.

1.09 JOB CONDITIONS

A. Examine all drawings and specifications in a manner to be fully cognizant of all work required under this Division.

B. Adjoining work of other Divisions shall be examined for interferences and conditions affecting this Division.

C. Examine site related work and surfaces before starting work of any Section.

1. Report to Architect, in writing, conditions which will prevent proper provision of this work.

2. Beginning work of any Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor.

3. Perform any required removal, repair or replacement of this work caused by unsuitable conditions at no additional cost to Owner.

D. Connections to existing work.

1. Verification of existing: Before submitting bid, become thoroughly familiar with actual existing conditions and systems at the building, and of the existing installations to which connections must be made, including any necessary alterations, and existing building engineering practices and requirements. The intent of the work is shown on the drawings and described herein, and no consideration will be granted by reason of lack of familiarity on the part of the contractor with actual physical conditions, requirements, and practices at the site.

2. Install new work and connect to existing work with minimum interference to existing facilities.

3. Temporary shutdowns of existing services:

   a. At no additional charges.

   b. At times not to interfere with normal operation of existing facilities.

   c. Only with written consent of Owner.

4. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work.

5. Restore existing disturbed work to original condition.

E. Removal and relocation of existing work.

1. Disconnect, remove or relocate material, equipment, plumbing fixtures, piping and other work noted and required by removal or changes in existing construction.

2. Where existing pipes, conduits and/or ducts which are to remain prevent installation of new work as indicated, relocate, or arrange for relocation, of existing pipes, conduits and/or ducts.

3. Provide new material and equipment required for relocated equipment.

4. Plug or cap active piping or ductwork behind or below finish.

5. Do not leave long dead-end branches. Cap or plug as close as possible to active line.

6. Remove unused piping, ductwork and material.

7. Dispose of removed fixtures and equipment as directed.

1.10 CLEARANCE FROM ELECTRICAL EQUIPMENT

A. Piping or ductwork:

1. Prohibited in:

   a. Electric rooms and closets.

b. Telephone rooms and closets.

1.11 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Check dimensions of access route through the site from delivery point to final location. Where necessary, ship in crated sections of size to permit passing through available space. Dismantle and/or reassemble, reprovision and retest equipment too large to pass through available access route to final location in one piece.

B. Ship equipment in original packages, to prevent damaging or entrance of foreign matter.

C. Handle and ship in accordance with manufacturer's recommendations.

D. Provide protective coverings during construction.

E. Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by Architect.

F. Tag all items with weatherproof tag, identifying equipment by name and purchase order number.

G. Include packing and shipping lists.

H. Special requirements as specified in individual sections.

1.12 SPECIAL TOOLS

A. Furnish to Owner at completion of work:

1. One set of any special tools required to operate, adjust, dismantle or repair equipment furnished under any section of this Division.

2. "Special tools": those not normally found in possession of mechanics or maintenance personnel.

1.13 PROTECTION OF MATERIALS

A. Protect from damage, water, dust, etc., material, equipment and apparatus provided under this Division, both in storage and installed, until Notice of Completion has been filed.

B. Provide temporary storage facilities for material and equipment.

C. Material, equipment or apparatus damaged because of improper storage or protection will be rejected.

1. Remove from site and provide new, duplicate, material equipment or apparatus in replacement of that rejected.

D. Cover motors and other moving machinery to protect from dirt and water during construction.

E. Protect premises and work of other Divisions from damage arising out of installation of work of this Division.

1. Repair or replace, as directed by Architect, materials and parts of premises which become damaged as result of installation of work of this Division.

2. Remove replaced parts from premises.

1.14 REVIEW OF CONSTRUCTION

A. Work may be reviewed at any time by representatives of Architect.

B. Advise Architect that work is ready for review at following times:

1. Prior to backfilling buried work.

2. Prior to concealment of work in walls and above ceilings.

3. When all requirements of Contract have been completed.

C. Neither backfill nor conceal work without Architect's consent.

1.15 SCHEDULE OF WORK

A. Arrange work to conform to schedule of construction established or required to comply with Contract Documents.

B. In scheduling, anticipate means of installing equipment through available openings in structure.

C. Confirm in writing to Architect, within 30 days of signing of contract, anticipated number of days required to perform test, balance, and acceptance testing of mechanical systems:

1. This phase must occur after completion of mechanical systems, including all control calibration and adjustment, and requires substantial completion of the building, including closure, ceilings, lighting, partitioning, etc.

2. Submit for approval at this time, names and qualifications of test and balancing agencies to be used.

D. Arrange with Owner schedule for work in each area.

E. Unless otherwise directed by Owner perform work during normal working hours.

F. Work delays:

1. In case noisy work interferes with Owner's operations, Owner may require work to be stopped and performed at some other time, or after normal working hours.

2. Lost time and overtime will be compensated for by Owner.

3. Submit, with bid proposal, schedule of hourly rates and overtime premiums.

1.16 NOISE REDUCTION

A. Cooperate in reducing objectionable noise or vibration caused by mechanical systems.

1. To extent of adjustments to specified and installed equipment and appurtenances.

B. Correct noise problems caused by failure to install work in accordance with Contract Documents. Include labor and materials required as result of such failure.

1.17 PERMITS, LICENSES, AND INSPECTIONS

A. Permits and Licenses: Secure required permits and licenses including payments of all charges and fees.

B. Inspections:

1. Obtain certificates of final inspection approval from authorities having jurisdiction, and submit to Architect before acceptance of the Work.

2. Obtain inspections during the Work as required to allow timely progress of these and other trades.

1.18 GUARANTEE

A. Guarantee all materials, equipment, apparatus and workmanship to be free of defective materials and faulty workmanship for period of one year from date of filing of Notice of Completion, unless extended guarantee periods are specified in individual sections.

B. Provide new materials, equipment, apparatus and labor to replace that determined by Architect to be defective or faulty.

C. This guarantee also applies to services such as Instructions, Adjusting, Testing, Noise, Balancing, etc.

D. Equipment manufacturers shall include extended warranty to give full coverage during warranty period, unless longer period is specified.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Product Options:

1. Contractor's Options:

a. For products specified only by reference standard, select product meeting that standard, by any manufacturer.

b. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with Specifications.

c. For products specified by naming one product or manufacturer, use that product or manufacturer.

d. Wherever catalog numbers and specific brands or trade names are used, they are used to establish standards of quality, utility and appearance required.

B. Submission of equipment of manufacturers' other than those specified shall detail equality and difference, item by item.

2.02 ACCESS DOORS

A. Size for proper access, adjusting and maintenance:

1. 12 in. x 12 in. minimum for valves, trap primers, shock absorbers, etc.

2. 24 in. x 24 in. for man access to concealed fans, coils, etc., unless indicated otherwise.

B. Supply as required by work in this DIVISION.

C. Turn over for setting under trade installing surface on which panels are installed. Direct location and setting, after review by Architect.

2.03 ACCESS TILE IDENTIFICATION:

A. Buttons, tabs, and markers: to identify location of concealed work.

2.04 PAINTING

A. In accordance with Section 09900.

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILL

A. Excavate, backfill and restore surfaces inside and outside building.

B. Excavation:

1. In accordance with requirements of Division 2.

C. Installation of Underground Piping:

1. On solid undisturbed ground.

a. Provide firm bed of sand for pipes with any form of protective covering.

2. Bottom of trenches:

a. Tamped hard.

b. Graded for required pitch.

c. Shaped to give uniform support to lower third of full length of pipe.

d. Recesses excavated for bells and joints.

3. Support and protect piping so it remains in place without settling or damage during and from backfilling.

a. Replace damaged pipe.

3.02 CONCRETE WORK

A. On concrete floors, install equipment on concrete housekeeping pads:

1. Pads 4 in. high.

2. Extend 6 in. minimum beyond equipment base, all sides.

3. Concrete work, including forming and reinforcing, under DIVISION 3 for this project:

a. Coordinate size and location with General Contractor.

b. Furnish and locate anchors and anchor bolts.

3.03 WATER PROOFING

A. Where any work pierces waterproofing, installation shall be subject to review.

1. Provide all necessary sleeves, caulking, flashing and flashing fittings required to make openings absolutely watertight.

B. Flashing:

1. Fittings for piping through roof:

a. Galvanized cast iron bottom recess roof type.

b. Similar to Josam No. 26440 or No. 26450.

3.04 ACCESS TO VALVES AND EQUIPMENT

A. Access shall be possible where valves, expansion joints, fire dampers, motors, filters, control devices, and any other equipment requiring access for servicing, repairs, or maintenance are located in walls, chases, and/or above ceilings.

B. Definition of Accessible:

1. Valves and dampers may be operated.

2. Control devices may be adjusted.

3. Fire dampers may be reset.

4. Equipment access panels may be opened.

5. Normal maintenance work such as replacement of filters, lubrication of bearings, etc., may be performed readily within arm's reach of access opening.

6. It shall not be necessary to crawl through furred ceiling space to perform such operations.

C. Install piping, equipment and accessories to permit easy access for maintenance.

D. Group concealed valves, expansion joints, controls, dampers and equipment requiring service access, so as to be freely accessible through access doors and to minimize the number of access doors required.

E. Relocate piping equipment and accessories as required, at no extra cost to afford proper maintenance access.

F. For access into ductwork see 15910: DUCT ACCESSORIES.

G. Coordinate location of access panels with applicable trades installing walls or ceiling.

1. Coordinate panel locations with lights and other architectural features.

2. Submit proposed panel locations to Architect for review.

H. Access doors or panels will be installed by the trade furnishing surface on which panels are installed.

3.05 CLEANING AND ADJUSTING

A. Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.

B. Painted or exposed work soiled or damaged: clean and repair to match adjoining work before final acceptance.

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

D. Flush out piping after installation.

E. Traps, wastes and supplies: unobstructed.

3.06 FIELD QUALITY CONTROL

A. Tests:

1. Perform as specified in individual sections, and as required by authorities having jurisdiction.

2. Duration as noted.

B. Provide required labor, material, equipment, and connections.

C. Furnish written report and certification that tests have been satisfactorily completed.

D. Repair or replace defective work, as directed.

E. Pay for restoring or replacing damaged work due to tests, as directed.

F. Pay for restoring or replacing damaged work of others, due to tests, as directed.

END OF SECTION

SECTION 15140

SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe and equipment hangers and supports.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03300 CONCRETE

1.03 RELATED SECTIONS

A. Section 15260 - Piping Insulation.

B. Section 15410 - Plumbing Piping.

C. Section 15535 - Refrigerant Piping and Specialties.

D. Section 15890 – Ductwork.

1.04 REFERENCES

A. ASME B31.1 - Power Piping.

B. ASME B31.2 - Fuel Gas Piping.

C. ASME B31.5 - Refrigeration Piping.

D. ASME B31.9 - Building Services Piping.

E. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

F. NFPA 14 - Installation of Standpipe and Hose Systems.

G. ANSI B31.1 - Code for Pressure Piping.

H Manufactured Standard Society Document: MSS-SP-58 and MSS-SP-69.

1.05 SUBMITTALS

A. Submit under provisions of Division 1.

B. Shop Drawings:

1. Indicate system layout with location and detail of trapeze hangers.

2. Specially fabricated supports.

3. Hanger types and locations for all piping greater the 4 in., and any suspended loads exceeding 250 lb. which are suspended from metal deck slab from floor.

C. Product Data: Provide manufacturers catalog data including load capacity.

D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers, upper attachments, anchors and guides.

E. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.06 REGULATORY REQUIREMENTS

A. Provide an adequate pipe suspension system in accordance with recognized engineers practices, using standard commercially acceptable pipe hangers and accessories.

B. Where applicable codes require supports in excess of specifics herein, the Code shall govern.

C. Where thermal movement in pipe line occurs, hanger assembly shall support pipe line in all operating conditions.

D. Equipment Anchorage:

1. All mechanical and electrical equipment shall be anchored or braced to meet the horizontal and vertical forces prescribed in the 2007 CBC, Section 1614A.1.13 and ASCE 7-05 Section 13.3, 13.4, 13.6 and Chapter 6.

2. The attachment of the following items shall be designed to resist the forces prescribed above, but need not to be detailed on the plans, and the project inspector will verify that these items (equipment) have been anchored:

a. Equipment weighing less than 400 pounds supported directly on the floor or roof.

b. Furniture required to be attached in accordance with ASCE 7-05, Section 13.5.

c. Temporary or movable equipment with flexible connection to power utilities.

d. Equipment weighing less than 20 pounds supported by vibration isolators.

e. Equipment weighting less than 20 pounds suspended from a roof or floor or hung from a wall.

3. For those elements that do not require details on the approved drawings, the installation shall be subject to the approval of the Mechanical/Electrical Engineer.

E. Piping, Ductwork, and Electrical Distribution System Bracing:

1. Piping, ductwork and electrical distribution systems shall be braced to resist the forces prescribed in ASCE 7-05 Section 13.3 as defined in ASCE 7-05 Section 13.6.9, 13.6.7, 13.6.5.5 Item 6, and 2007 CBC 1614A.1-13.

2. The bracing and attachments to the structure shall comply with one of the OSHPD Pre-Approvals with an OPA #, such as Mason Industries (OPA 349), or ISAT (OPA 485) as modified to satisfy anchorage requirements of ACI 318, Appendix D.

3. Copies of the manual shall be available on the jobsite prior to the start of hanging and bracing of the pipe, ductwork, and electrical distribution systems.

4. The Structural Engineer of Record shall verify the adequacy of the structure to support the hanger and brace loads.

F. See drawings for additional equipment anchorage requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS – MANUFACTURERS SPECIFIED ON DRAWINGS TAKE PRECEDENT OVER MANUFACTURERS LISTED IN THIS SPECIFICATION SECTION

A. Hangers, Inserts and Supports:

1. B-Line.

2. Anvil International, Inc.

3. Superstrut.

4. Tolco.

B. Pipe Protection and Thermal Hanger Shields:

1. Pipe Shields, Inc.

2. Elcen Metal Products Company.

3. Midland-Ross Corp.: Superstrut.

4. Uni-Grip.

5. Kin Line.

C. Expansion Shields:

1. ITT Phillips Drill Co.: Red Head.

2. Hilti Fastening Systems.

3. Omark Industries, Inc.

4. Ramset Fastening Systems.

D. Miscellaneous Devices:

1. Kopty.

2. Wejit.

2.02 PIPE HANGERS AND SUPPORTS

A. Model numbers are Superstrut, unless otherwise indicated.

B. Individual Pipe Hangers:

1. All hangers for pipes 2 in. and larger to be provided with means of vertical adjustment.

2. Cold pipe all sizes: Clevis hanger, No. C710.

3. Hot pipe sizes up to 4 in.: Clevis hanger, No. C710.

4. Cast iron pipe: Hanger No. C-710-R.

C. Multiple or Trapeze Hangers:

1. Factory channel:

a. 12 gauge thick steel.

b. Single or double section.

c. Electro-chromate finish.

d. Strutnuts: Series A-100 or CM-100.

e. Straps: Series 702.

f. Other accessories.

g. No. A-1200 or A-1202.

D. Wall Supports:

1. Pipe sizes up to 3 in.: Steel bracket No. C738.

E. Vertical Support:

1. Riser clamp Series C-720.

2. At each floor unless otherwise indicated.

F. Floor Support:

1. Hot pipe sizes up to 4 in.; cold pipe, all sizes:

   a. Adjustable cast iron saddle No. R786.

   b. Locknut nipple.

   c. Floor flange.

G. Thermal Hanger Shields.

1. Insulated pipe supports:

   a. Insulated pipe supports shall be supplied and installed by the contractor on all insulated pipe and tubing.

   b. All insulated pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes: ASME B 31.1.

2. Approved insulated pipe support:

   a. Pipe supported on rod hangers:

      1) Equal to pipe shield A1000, A2000, A3000, A4000, and A9000.

   b. Pipe supported on flat surfaces:

      1) Equal to pipe shield A1000, A2000, A5000, A6000, and A7000 to A7400 Series.

   c. Pipe Risers:

      1) Equal to Pipe Shield Models E1000 to E1300 Series and E2000 to E2300 Series.

3. Insert to extend one inch beyond metal shield ends on following piping:

   a. Refrigerant suction.

4. Shield lengths and gauges per manufacturer's published catalog recommendations.

5. Similar to Pipe Shields Incorporated.

H. Pipe Isolators:

1. Galvanized steel shell with felt padding.

2. Similar to:

   a. Piping: No. C715.

b. Tubing: No. C716.

I. Insulated Pipe Strap:

1. 1/2 in. to 1 in. plumbing piping in wood frame construction.

2. Felt insulated.

3. Nailable pipe straps:

a. In lieu of other hangers and dielectric isolators.

4. Similar to Kopty.

2.03 STRUCTURAL ATTACHMENTS

A. Model Numbers are Superstrut, unless otherwise indicated.

B. Anchor Bolts: Size as specified for hanger rods.

C. Concrete Inserts:

1. Malleable iron.

2. Place reinforcing steel through insert as recommended by manufacturer for recommended loads.

3. Equal to No. 452.

D. Hanger Rods:

1. ASTM A107. Hot rolled steel.

2. ANSI B1.1 threads.

3. Threaded both ends, threaded one end, or continuous threaded.

E. Hanger Rod Fixtures:

1. Turnbuckles:

a. No. F-112 or equal.

2. Linked Eye Rod:

a. Rod swivel.

b. No. E-131 or equal.

3. Clevis:

a. No. F-111 or equal.

F. Expansion Shields:

1. Carbon-steel anchors, zinc coated.

2. Stainless steel for corrosive atmospheres.

3. For normal concrete use:

   a. Self-drilling anchor.

   b. Sleeve anchor.

   c. Stud anchor.

4. For thin concrete use:

   a. Wedge anchor.

5. For brick or concrete block use:

   a. Sleeve anchor.

6. Maximum load safety factors:

   a. Static loads - 4.

   b. Vibratory loads - 8 - 10.

   c. Shock loads - 8 - 10.

7. Size to suit hanger rods.

8. ITT Phillips "Red Head" or equal.

G. Miscellaneous Metal:

1. Steel plate, shapes and bars: ASTM A36.

2. Steel pipe columns: ASTM A53, Schedule 40, black.

3. Bolts and nuts: regular hexagon-head type, ASTM A307, Grade A.

4. Lag bolts: square head type.

5. Plain washers: round, carbon steel.

2.04 DUCT HANGERS AND SUPPORTS

A. See Section 15890: DUCTWORK.

PART 3 - EXECUTION

3.01 PIPE HANGERS, SUPPORTS AND GUIDES

A. General:

1. Assure adequate support for pipe and contents.

2. Prevent vibration or swaying.

3. Provide for expansion and contraction.

4. Supports of wire, rope, wood, chain, strap perforated bar or any other makeshift device not permitted.

5. Comply with applicable requirements at ANSI B31.1.0 and B31.2 for piping.

6. Support piping independently so that equipment is not stressed by piping weight of expansion.

7. Refer to DSA approved project drawings for support details.

8. See drawings for additional information.

B. Horizontal piping, except as noted:

1. Adjustable clevis type and rod:

a. All services at or below 250°F.

2. Trapeze hangers:

a. Guide individual pipes on trapezes with 1/4 in. U-bolt or Superstrut 702 pipe clamp.

1) Install thermal hanger shield at each support point.

3. Threaded steel rods:

a. 2 in. vertical adjustment with 2 nuts each end for positioning and locking.

b. Size to 4 in. IPS:

Pipe, IPS	Rod
to 2 in.	3/8 in.
2-1/2 in. and 3 in.	1/2 in.
4 in.	5/8 in.

C. Vertical piping:

1. Base support:

a. Base elbow or welded equivalent.

b. Bearing plate on structural support.

2. Top support:

a. Special hanger or saddle in horizontal connection.

b. Provisions for expansion.

3. Intermediate supports: steel pipe clamp at floor:

a. Bolted and welded to pipe.

b. Extension ends bearing on structural steel or bearing plates.

4. For multiple pipes: coordinate guides, bearing plates and accessory steel.

D. Horizontal insulated piping:

1. Install thermal hanger shields for all types of supports.

E. Vertical insulated piping:

1. Install thermal hanger shields at guides.

F. Install Pipe isolators between hangers and:

1. Insulated copper tubing.

G. Plumbing Walls:

1. Small plumbing piping in walls may be supported from steel waste and vent piping with WEJ-IT "Adjusto-Spacer System" components in lieu of other hangers and isolators.

2. Steel support components shall be separated from copper piping with plastic tape.

3.02 PIPE SUPPORT SPACING

A. Maximum spacing for horizontal piping:

Type of Pipe	Size	Maximum Spacing
Steel	1 in. to 1-1/4 in.	7 ft.
	1-1/2 in. and smaller	6 ft.
	1-1/2 in. to 2 in.	8 ft.
	2 in. and larger	10 ft.
	2-1/2 in. to 3 in.	10 ft.
	4 in.	14 ft.
Brass or copper	3/4 in. and smaller	5 ft.
	1 - 1-1/4 in.	6 ft.
	1-1/2 - 3 in.	8 ft.
Bell and Spigot (Notes 1, 2, 3)	All	10 ft.

B. Spacing Notes:

1. Not less than one support per joint.

   Additional supports at: Changes in direction and other locations indicated on plans.

2. Changes in direction.

3. Branch piping and runouts over 5 ft.

C. Support standpipes and fire sprinkler piping in accordance with NFPA.

3.03 ATTACHMENT TO STRUCTURE

A. Wall Supports

1. Stud Walls:

   a. Toggle bolts.

   b. Studs welded to structural studs.

   c. Lag screws into wood backing.

B. Refer to DSA approved project drawings for details and information.

3.04 DUCT HANGERS AND SUPPORTS

A. See Section 15890: DUCTWORK.

END OF SECTION

SECTION 15190

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Identification of mechanical products installed under Division 15.

1.02 SUBMITTALS

A. Submit under provisions of Division 1.

B. Submit list of wording, symbols, letter size and color-coding for mechanical identification.

C. Submit valve chart and schedule, including valve tag number, location, function and valve manufacturer's name and model number.

D. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Seton Name Plate Company.

B. Brady Company

2.02 MATERIALS

A. Color: Unless specified otherwise, conform with ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

C. Metal Tags: Brass with stamped letters; tag size minimum 2-inch diameter with smooth edges and brass chain.

D. Stencils: With clean cut symbols and letters; identified as indicated below, including direction of flow:

System	Letters
Refrigerant Suction Line	R.S.L.
Refrigerant Liquid Line	R.L.L.
Pumped Condensate	P.C.
Gravity Condensate	G.C.
Domestic Cold Water	D.C.W.

E. Stencil Paint: In accordance with Painting Section, semi-gloss enamel.

F. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.

B. Metal Tags: Install with brass chain.

C. Stencil Painting: Apply in accordance with Painting Section.

D. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with metal tags.

E. Controls: Identify control panels and major control components outside panels with plastic nameplates.

F. Valves: Identify valves in main and branch piping with brass tags. Obtain existing numbering from Owner and continue existing sequence.

G. Piping: Identify piping, concealed or exposed with stenciled painting. Tags may be used on small diameter piping. Identify service, flow direction and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure and at each obstruction.

H. Ductwork: Identify ductwork with stenciled painting. Identify as to air handling unit number and area served. Locate identification at air handling unit at each side of penetration of structure or enclosure and at each obstruction.

3.03 VALVE CHART AND SCHEDULE

A. Provide valve charts and schedules in aluminum frame with clear plastic shield. Install at location as approved.

END OF SECTION

SECTION 15260

MECHANICAL PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 SUBMITTALS

A. Product Data: Catalog cuts giving product description, thickness for each service, and locations.

1.03 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84., NFPA 255. and UL 723.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Insulation - Fiber Glass:

1. Owens-Corning Fiberglass Corp.
2. Manville Corp.
3. Certain-Teed Products Corp.

B. Insulation - Elastomeric Closed Cell:

1. Armstrong World Industries, Inc.
2. Rubatex Corp.
3. Halstead Industrial Products.

C. Weatherproof Aluminum Jacket:

1. Childers Products Co.
2. Manville Corp.
3. Insul-Coustic/Birma Corp.

D. Adhesives:

1. Foster Div. Amchem Products Inc.

2. Childers Products Co.

3. Epolux Mfg. Corp.

4. Insul-Coustic/Birma Corp.

E. Mechanical Fasteners:

1. AGM Industries, Inc.

2. Miracle Adhesives Corp.

2.02 GENERAL

A. All insulation materials, including jackets, facings, adhesives, coatings, and accessories are to be fire hazard rated and listed by Underwriters' Laboratories, Inc., using Steiner Tunnel Test Method for Fire Hazard Classification of Building Materials, Standard UL 723 ASTM E-84, and NFPA-255.

1. Flamespread: maximum 25.

2. Fuel contributed and smoke developed: maximum 50.

3. Flameproofing treatments subject to deterioration from moisture or humidity, are not acceptable.

4. Underwriters' Laboratories, Inc. listed.

2.03 MATERIALS

A. Insulation:

1. Fiber glass:

a. Molded: one piece, maximum 0.26 K factor at 75°F mean temperature.

1) Manville APT 2000 Pipe Insulation or equal.

b. Blanket: minimum 1 lb density, maximum 0.28 K factor at 75°F mean temperature.

1) Manville Microlite Unfaced Duct Wrap or equal.

c. Board: Maximum 0.23 K factor at 75°F mean temperature.

1) Manville 814 or equal.

2. Flexible, closed cell elastomeric thermal insulation:

a. Molded pipe insulation:

1) Maximum 0.27 K factor at 75°F mean temperature.

2) Maximum water vapor transmission rating of .17 perm-in.

b. Sheet insulation:

1) Maximum 0.28 K factor at 75 deg F mean temperature.

2) Maximum water vapor transmission rating of .17 perm-in.

c. Armstrong "Armaflex" or equal.

B. Jackets and facings:

1. Pipe insulation jackets:

a. All-service or all-purpose:

1) Laminate of white kraft facing.

2) Glass scrim reinforcing and aluminum foil.

b. Weatherproof:

1) Corrugated aluminum jacket:

a) Moisture barrier adhered to inside face.

b) Piping up to 4 in.: 0.016 in. thick.

c) Piping larger than 4 in.: 0.020 in. thick.

d) D0Longitudinal seams on bottom.

2) Secure to insulation with aluminum or stainless steel bands.

3) For sealing joints, see PART 3 EXECUTION.

C. Performed Pipe Fitting Covers:

1. Factory fabricated formed covers of polyvinyl chloride or aluminum.

2. Polyvinylchloride covers similar to Manville "Zeston."

3. Aluminum covers similar to General Aluminum Supply Corp. "GASCO".

D. Adhesives and coatings:

1. Similar to Foster product names and figure numbers as follows:

a. Lagging adhesive: 30-04, UL Label.

b. Vapor barrier coating: Tite-fit 30-35, UL Label.

c. Vaporseal adhesive: Spark-fast 85-20 UL Label.

d. Cellular glass bedding and sealing compound adhesive: Foamseal 30-45.

e. Outdoor mastic: Monolar Mastic 60-38 UL Label.

E. Wire, banding and fastening devices:

1. Wire: minimum 16 gauge copper clad annealed steel wire.

2. Bands: 3/4 in. nominal width with wing seals, of minimum thickness as follows:

a. Aluminum: 0.007 in. except where exposed to weather, 0.020 in.

b. Galvanized steel: 0.005 in.

c. Stainless steel: 0.010 in.

3. Staples: outward clinching type of corrosion resistant steel.

F. Mechanical Fasteners:

1. Mild steel, copper plated.

2. Similar to AGM Industries "Power Base" insulation pins.

3. Insulation washers:

a. Galvanized steel.

b. 1-1/2 in. diameter.

c. Similar to AGM Industries SLW-1.

PART 3 - EXECUTION

3.01 PIPE INSULATION SCHEDULE

A. Notes for Pipe Insulation Schedule:

NOTE 8. For piping in walls and ceilings not otherwise requiring insulation.

B. Pipe Insulation Types:

1. Type P-1:

a. Molded fiberglass.

b. All-service jacket.

c. Vapor-sealed.

2. Type P-3:

a. Flexible, closed cell elastomeric insulation, tubular.

Service	Type	Size	Thickness
1. Service Hot Water Under 200°F	P-1	1/2 to 2" 2-1/2 to 4"	1 1-1/2
2. Hot Water Under 200°F	P-1	1-1/4 to 2 in. 2-1/2 to 4 in.	1-1/2 2
3. Refrigerant Suction (Cooling Only Units)	P-3	Runouts to 2 in.	1
4. Refrigerant Suction and Liquid (Heat Pump Unit)	P3	Runouts to 2 in.	1
5. Refrigeration Suction and Liquid Underground	P-3 encased PVC Conduit Pipe	Runouts to 2 in.	1
6. Condensate Drain Systems	P-1	1/2 to 2" 2-1/2 to 4"	1/2 1

3.02 NON-INSULATED PIPING AND EQUIPMENT

A. Non-insulated piping:

1. Cooling coil condensation drain except concealed horizontal portions.

3.03 PIPE INSULATION APPLICATION

A. General:

1. Before applying insulation:

a. Test piping for tightness and obtain approval.

b. Clean surfaces to be insulated of dust, grease and foreign matter.

2. Butt edges neatly.

3. Fill voids with insulating cement.

4. Longitudinal overlaps:

a. 2 in. minimum.

b. For exposed work: toward ceiling or wall.

c. For weatherproof aluminum jackets: on side to shed water.

5. Circumferential overlaps on weatherproof aluminum jackets: 2 in. minimum.

6. Continuous insulation passing through sleeves or other openings.

B. Valves, fittings, flanges and accessory insulation:

1. Unless otherwise noted, insulate:

a. Flanges.

b. Fittings.

2. Insulation for fittings and accessories requiring servicing or inspection:

a. Insulation removable and replaceable without damage.

b. Enclosed within two piece, No. 18 gauge aluminum covers fastened with cadmium plated bolts and nuts.

3. Insulation of same thickness as adjacent piping insulation.

4. For piping systems insulated with fiber glass:

a. Wire on pre-molded fiber glass fitting covers or metered segments of pipe insulation.

b. For concealed locations only, wired on compressed fiber glass blanket may be used.

c. For pipe sizes under 3 in., hydraulic setting insulating cement may be used.

d. Vapor barrier for vaporsealed insulation only:

1) Apply uniform layer of vapor barrier coating to cover entire surface of fitting insulation.

2) Embed layer of fiber glass tape into wet coating, extending 2 in. over adjoining pipe covering.

3) Apply finish layer of vapor barrier coating over entire surface.

5. Flanges: insulation sleeve of same material as pipe insulation, to cover flange and overlap insulation on adjacent piping.

a. Finish for outdoor locations only: weatherproof aluminum jacket compatible with weatherproof jacket on adjoining pipe insulation.

C. At pipe hangers:

1. Insulation protection shields specified in Section 15140: SUPPORTS, ANCHORS AND SEALS.

2. Butt insulation to shields.

3. 3 in. wide vapor barrier tape or band over butt joints.

D. Jackets and Facings:

1. Vaporsealed types: continuous; staples not permitted.

2. Adhere longitudinal laps:

   a. Adhere 3 in. wide joint strip, of same material as facing, at center of each butt joint.

3. Adhesives:

   a. Vaporsealed insulation: vaporseal adhesive.

   b. Heating service insulation: vaporseal adhesive.

   c. Weatherproof aluminum jacket: sealing compound.

E. Wiring, banding and fastening devices:

1. Secure insulation to piping and equipment in accordance with following minimum requirements:

   a. Piping insulation section 3 ft. long:

      1) Concealed vaporsealed insulation banded at ends and center.

      2) Other concealed insulation banded at ends and center or stapled on 2 in. centers.

   b. Pipe fitting insulation:

      1) Loops of wire to secure metered segments of insulation.

      2) Wire spiraled on from end to end on blanket insulation.

   c. Outdoor piping weatherproof aluminum jackets banded at circumferential joints and center of each section:

      1) Lap joint at bottom.

F. Refrigerant Piping Insulation:

1. For condensing units, install insulation on above ground refrigerant suction piping and fittings, including thermal bulb, from thermal expansion valve. For spilt system heat pump units, install insulation on above ground refrigerant liquid and suction piping and fittings. Install insulation on above ground not gas bypass lines.

2. Install insulation in snug contact with pipe and in accordance with Manufacturer's recommendations:

   a. Insulate flexible pipe connectors.

   b. Insulate thermal expansion valves with insulating tape.

c. Insulate fittings with sheet insulation and as recommended by Manufacturer.

3. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.

4. Install insulation on lines through clamp assembly of pipe support. Do not butt insulation up against sides of clamp assembly. Install sleeve around insulation at each clamping location to prevent crushing of insulation when clamp is tightened.

5. Stagger joints on layered insulation. Seal joints in insulation.

6. Install insulation exposed outside building so "slit" joint seams are placed on bottom of pipe.

7. Paint exterior exposed insulation with two coats of specified exterior finish.

3.04 FIELD QUALITY CONTROL

A. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.

END OF SECTION

SECTION 15410

PLUMBING PIPING AND VALVES

PART 1 GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Pipe and pipe fittings.

B. Valves.

C. Sanitary sewer piping system.

D. Domestic water piping system.

E. Condensate drain piping system.

F. Insulation.

1.02 REFERENCES

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.03 RELATED SECTIONS

A. Section 09900 – Painting.

B. Section 15140 – Supports & Anchors.

C. Section 15190 – Mechanical Identification.

D. Section 15260 – Mechanical Insulation.

E. Section 15430 – Plumbing Specialties.

F. Section 15440 – Plumbing Fixtures.

G. Section 15450 – Plumbing Equipment.

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sleeved Roof Flashings:

1. Smith.
2. Stoneman.

B. 'No Hub' Couplings:

1. MG coupling.
2. Clamp-All.
3. Husky.
4. Tyler.

C. Gate, Globe, and Check Valves:

1. Crane Co.
2. Nibco, Inc.
3. Hammond.

D. Ball Valves:

1. Apollo.
2. Nibco, Inc.
3. Hammond.

E. Vent and Gas Cocks:

1. Milwaukee.
2. Apollo.
3. Crane.
4. Lunkeheimer.

F. Insulation:

1. Johns-Manville.
2. Imcoa.
3. Owens Corning.
4. Armstrong.
5. Certain-Teed.

2.02 PIPE

A. Sanitary Sewer Piping Buried Beyond 5 Feet of Building:

1. Cast Iron Pipe: Hubless, ASTM A74 service weight. Fittings: Cast iron. Joints: ASTM C564 neoprene gasketing system.
2. Polyethylene Encasement: ASTM D1248 polyethylene tube or sheet form to encase cast iron pipe, with minimum 0.008-inch (0.20 mm) thickness. Install encasement as per ASTM A74 and manufacturer's recommendations. T. Christy Enterprises, Inc. or equal.

B. Sanitary Sewer and Vent Piping, Buried Within 5 Feet of Building:

1. Cast Iron Pipe: Hubless, ASTM A74 service weight. Fittings: Cast iron. Joints: CISPI HSN compression type with ASTM C564 neoprene gaskets.
2. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

3. Polyethylene Encasement: ASTM D1248 polyethylene tube or sheet form to encase cast iron pipe, with minimum 0.008-inch (0.20 mm) thickness. Install encasement as per ASTM A74 and manufacturer's recommendations.

C. Sanitary Sewer and Vent Piping, Above Grade:

1. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
2. Copper Pipe: ASTM B306, DWV. Fittings: ANSI B16.3, cast bronze, or ANSI B16.29, wrought copper. Joints: ASTM B32, solder, Grade 50B.

D. Water Piping, Buried Within 5 Feet of Building

1. Copper Tubing: ASTM B88, Type K hard drawn. Fittings: ANSI B16.18, cast copper alloy soler joint pressure fittings. Joints: ASTM B32, solder, Grade 95TA.
2. Wrapping per Section 3.01H and I.

E. Water Piping, Above Grade:

1. Copper Tubing: ASTM B88, Type L hard drawn. Fittings: ANSI B16.18, cast copper alloy solder joint pressure fittings. Joints: ASTM B32, solder, Grade 95TA.

F. Condensate Drain Piping, Above Grade:

1. DWV Copper Tubing: ASTM B88, Type L hard drawn. Fittings: ANSI B16.29, wrought copper solder joint drainage fittings. Joints: ASTM B32, solder Grade 95TA. Insulate concealed piping with one-inch thick fiberglass insulation with factory applied vapor barrier jacket.
2. Pulse furnace condensate drain.

2.03 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service; 1/16 inch thick preformed.

C. Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular deflection, contraction and expansion; "C" shaped composition sealing gasket; steel bolts, nuts and washers; galvanized couplings for galvanized pipe.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier. Underground metal piping shall be bonded for electrical continuity.

1. Include 12 inch long brass nipple.

2.04 ACCESSORIES

A. Insulating Couplings:

1. Similar to EPCO Model X or FX.

2.05 ESCUTCHEONS, FLASHINGS AND SLEEVES

A. Escutcheons: Polished chrome plated brass.

B. Flashings for pipes through roofs: Similar to Stoneman 1100 series.

C. Sleeves; of following types as required:

1. Schedule 40, galvanized steel pipe sleeves.

2.06 PACKINGS

A. Through fire rated partitions: Fire resistant sealing system acceptable to local jurisdiction.

2.07 VALVES, GENERAL

A. Provide valves of same manufacturer for all similar plumbing applications or systems. Valves, to have manufacturer's name and pressure rating clearly marked on outside of body.

B. For copper tubing provide solder-joint valves, flare fittings, or IPS-to-copper adaptor, sized for use with tubing and respective valve.

C. For flanged valves, provide streamline companion flanges, ANSI B16.5, 150 class psi.

D. Provide valves rated not less than 125 psi steam working pressure, unless indicated otherwise.

E. Provide valve materials suitable for service and temperature of respective systems, especially with respect to discs, plugs, balls, linings, gaskets, and lubricants of globe valves, plug cocks, ball valves, etc.

F. Provide all ball valves with "full port."

2.08 SAFETY AND RELIEF VALVES

A. Watts, Wilkins or Conbraco.

B. Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

2.09 VALVES - HOT AND COLD DOMESTIC WATER SERVICE

A. Bronze gate valves, 2 in. and under:

1. Class #125, 200# WOG.
2. Non-rising stem, non-asbestos packing.

B. Bronze ball valves, 2 in. and under:

1. Class 150#, 600# WOG.
2. Two piece construction, blowout proof stem.

C. Bronze check valves, 2 in. and under:

1. Class #125, 200# WOG.
2. Swing check.

D. Iron gate valves, 2-1/2 in. and larger.

1. Class #125, 200# WOG.
2. IBBM.
3. OS&Y, non-asbestos packing.

E. Iron check valves, 2-1/2 in. and larger (flanged):

1. Class #125, 200# WOG.
2. IBBM.
3. Renewable seat and disc.

F. Iron check valves, 2-1/2 in. and larger (for pump discharge):

1. Class #125.
2. Globe design silent check.

2.10 NATURAL GAS SYSTEM

A. Plug valves, 3 in. and larger:

1. CI body and plug.
2. Lubricated cast iron plug.

B. Plug valves, 2-1/2 in. and smaller:

1. Bronze body and plug.
2. Threaded ends.

2.11 INSULATION

A. General:

1. All insulation materials including jackets, facings adhesives, coatings and accessories are to be fire hazard rated and listed by Underwriters Laboratories, Inc. in conformance with UL723.
2. Insulation thickness and 'R' value ratios to be in accordance with California State energy code and Section 15260.

B. Required Locations:

1. Domestic hot water piping except where exposed at fixtures.
2. Domestic hot water storage tanks.

3. Domestic hot water heaters.

C. Installation: Insulation protection shields and spacing blocks are required at pipe hanger locations.

PART 3 EXECUTION

3.01 INSTALLATION

A. Arrangement:

1. Except for large scale details piping is diagrammatically indicated: Install generally as shown.
2. Do not scale Drawings for exact location of piping.
3. Install piping to best suit field conditions and coordinate with other trades.
4. Each piping group to be in one plane, insofar as possible.
5. Do not sleeve structural members without consent of Architect.
6. Maintain I in. clearance from adjacent work, including insulation, except as noted or approved.
7. Install piping concealed above ceilings or in walls unless otherwise indicated.

B. Expansion, Contraction and Bending:

1. Install piping with provisions for expansion and contraction: Provide expansion loops, swing joints, and/or expansion joints where indicated.
2. Do not spring or force piping during installation.

C. Sloping and Draining:

1. Slope piping as indicated on drawings, true to line and grade, and free of traps and air pockets.

D. Strainers: Install ahead of all reduced pressure backflow preventers and pressure regulators.

E. Gauges and Thermometers:

1. Locate thermometers and gauges to permit observation by personnel standing on floor.
2. Maximum height of thermometer above finished floor to be 8 feet, provide remote reading thermometers if required.
3. Provide instrument cocks at pressure gauges.

F. Copper:

1. Crimping of copper tubing prohibited.
2. Isolate copper pipe and tubing from contact with steel hangers or stud wall construction.
3. For branch drops and rises to plumbing fixtures, anchor branch to wall with drop-ear ell or tee.

G. Coatings (buried piping): Reapply coal-tar coating on buried ferrous piping, after installation, to surfaces from which coating has been removed or scraped.

H. Wrapping (buried piping): Provide a minimum of 20-mil thickness polyvinyl tape similar to Calpico V-20 for all buried copper lines.

3.02 SYSTEMS INSTALLATION

A. Domestic Water:

1. Connect copper tubing to fixtures with hard brass fittings.
2. Chrome plated where exposed at plumbing fixtures.

B. Waste, Vent and Storm Water: Provide accessible cleanouts per local codes, and where indicated on drawings.

C. Natural Gas:

1. Make equipment connections with ground joint unions and gas cocks.
2. Provide accessible shut-off valves:

a. Each entrance to each building
b. At each individual piece of equipment with gas connection.

3.03 PIPE JOINTING

A. Prohibited fittings:

1. Bushings on pressure piping
2. Clamp-on branch connections.
3. No-hub couplings on pumped sanitary or wastewater discharge piping.

B. Provide insulating couplings or dielectric unions at all connections of ferrous piping to non-ferrous piping.

C. Unions: Provide unions or flanges to render all items in systems easily removable, including:

1. Piping specialties.
2. Both sides of pumps and equipment.

D. Pipe Ends:

1. Perform pipe cutting and end preparation to result in clean ends with full inside diameter.
2. Grind and ream as necessary, burred ends of all pipe and tubing shall be reamed to the full bore of the pipe or tube and all chips shall be removed.

E. Nipples:

1. Close nipples not permitted.
2. Provide extra heavy pipe for nipples where unthreaded portion is less than 1-1/2 in. long.

F. Threaded Joints:

1. Sealed with sealant compounds or teflon tape.

2. Sealant compounds: Similar to John Crane or Rector Seal.

G. Soldered and Brazed Joints:

1. Use no-lead, solder for all copper piping.
2. Clean surfaces to be jointed of oil, grease, rust and oxides:

H. No-Hub Cast Iron Soil Pipe:

1. Neoprene gaskets and cast iron split clamps secured by stainless steel bolts and nuts, similar to MG Coupling Co. or 24 gauge Type 304 stainless steel housing and clamp; similar to Clamp-all, Tyler or Husky.
2. Where components are suspended in excess of 18 in. by means of non-rigid hangers, brace against horizontal movement (sway brace).
3. 6 in. and larger: brace to prevent horizontal movement at every branch opening and change of direction by securing to building structure.
4. Vertical piping shall be supported at each stack base and at each floor. Free-standing vertical piping should be adequately staked or braced during construction to maintain alignment.
5. Horizontal piping shall be supported within 24 in. of the Coupling joint at 10 ft. intervals for 10-foot pipe lengths and at 5 ft. intervals for 5 ft. Piping lengths. Supports or hangers should be properly placed to maintain alignment and grade with provision made to prevent shear.

3.04 ESCUTCHEONS, FLASHING AND SLEEVES

A. Escutcheons:

1. Install at exposed piping penetrations of walls, floors and ceilings. "Exposed" means all finished rooms, including storage, janitor and mechanical rooms.
2. Where piping is insulated, escutcheons shall fit insulation outside diameter.

B. Flashings:

1. Flash and counterflash watertight all pipe and duct penetrations of roofs and exterior walls.
2. Flash pipes through roofs with vandal caps for vents.
3. Provide counter-flashing sleeves.
4. Other flashings shall be galvanized sheet metal.

C. Sleeves:

1. Provide membrane clamps at penetrations of membranes.
2. Other concrete walls, floors and roofs:

   a. Adjustable telescopic metal sleeves.
   b. Tightly pack annular space between pipe and sleeve with approved compound.

3. For insulated piping, sleeve diameter shall not be less than diameter of insulation.
4. Terminate sleeves flush with walls, and ceiling.
5. For exposed vertical pipe, extend sleeves 1 in. above finished floor except where escutcheons are required.

6. Packing through fire rated partitions shall be a fire resistant material acceptable to local jurisdiction.

D. Separate piping through walls, other than concrete walls, from contact with wall construction materials. Use non-hardening caulking, fire rated where necessary.

3.05 ADJUSTMENT AND CLEANING

A. General:

1. During installation, keep openings in piping closed to prevent entrance of foreign matter.
2. Provide covers for floor drain gratings during construction to prevent use accumulation of debris.
3. Clean pipe, fittings and valves internally.

B. Water systems: Upon start-up fill with clean water.

3.06 FIELD QUALITY CONTROL - PIPING

A. Tests:

1. Refer to other sections for tests to plumbing systems and other special piping systems.
2. Notify Architect in writing one week before test.
3. Furnish written report and certification that tests have been satisfactorily completed.
4. Repair or replace leaks and defects without additional cost.

3.07 PROVIDE VALVES AT FOLLOWING LOCATIONS

A. In all branches or headers serving more than one fixture or piece of equipment.

B. For shut-off of risers and branch mains.

C. For branches from main or riser serving one fixture.

D. On each side of all apparatus such as pumps, tanks, heaters, control valves, etc.

E. For flushing, draining, and sterilizing the systems.

F. Valves should be of domestic manufacture.

3.08 INSTALLATION, GENERAL

A. Pressure rating of valves same as piping in which installed.

B. Install valves for water and gas, with stems upright or horizontal, above ground in walls behind access panels.

C. Install swing checks in horizontal position.

D. Provide silent check valves at discharge of pumps.

E. Provide drain valves at main shut-off valves, low points of piping and apparatus.

F. Locate wheel handles to clear obstructions when operated with hands.

G. Locate equipment shut-off valves to be accessible without climbing over equipment.

3.09 VALVE APPLICATIONS

A. Gate Valves:

1. Shut-off, sectionalizing and isolation.
2. Drain valves.

B. Globe and Angle Valves:

1. Balancing water.
2. Throttling: water, and air.
3. By-pass.

C. Plug cocks:

1. Balancing and throttling: water.
2. Shut-off: gas.
3. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

3.10 FIELD QUALITY CONTROL - VALVES

A. Test operate valves from closed-to-open-to-closed position while valve is under test pressure.

B. Test valve bonnets for tightness.

C. Check all valves for packing. Replace leaking packing.

D. Test temperature and pressure relief valves three times.

E. Check all valves for lubricant. Service valves which do not operate smoothly with suitable lubricant before placing in operation.

3.11 TESTS - DRAINAGE SYSTEMS

A. Drainage and vent piping inside building and underground metallic piping (including house sewers):

1. Pipe Testing Schedule (Drainage):

System Tested	Test Pressure (psig)	Test With:
Vent	Fill with water to top of highest vent, allow to stand two hours, or longer, as directed by Inspector. Minimum	Water

	head required for any joint shall be 10-feet in building.
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10-feet of water vertically

3.12 TESTS - WATER SYSTEMS

	System Tested	Test Pressure (psig)	Test With:
1.	Domestic water piping (metallic)	200	Water

3.13 INSTALLATION

A. Minimum Cover Underground Piping: Per local Codes.
B. Piping:
1. Free of traps.
2. Grade and valve for complete control and drainage of system with drain cocks at low points and base of valved risers.

3.14 DISINFECTION

A. Cleansing and Disinfecting:

1. Disinfect underground water mains after installation and test in accordance with requirements of local codes.
2. Disinfect interior potable water distribution system in accordance with requirements of local codes.

END OF SECTION

SECTION 15430

PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Floor drains.

B. Cleanouts.

C. Water hammer arrestors.

D. Trap primer.

1.02 REFERENCES

A. ANSI A112.21.1 - Floor Drains.

B. ANSI A112.26.1 - Water Hammer Arrestors.

C. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

D. PDI WH-201 Water Hammer Arrestors.

1.03 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

B. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Floor Drains, Cleanouts, Backwater Valves, Grease Traps:

1. Zurn Industries, Inc.
2. Jay R. Smith Mfg. Co.

B. Grates, Yardboxes:

1. Alhambra Foundry
2. Neenah Foundry Co.
3. Brooks.

C. Valves: See Section 15410: PLUMBING PIPING AND VALVES.

D. Shock Absorbers:

1. Jay R. Smith Mfg. Co.
2. Zurn Industries Inc.
3. Precision Plumbing Products.
4. Sioux Chief.

E. Trap Primers:

1. Sloan
2. Precision Plumbing Products
3. J.R. Smith
4. Watts.

2.02 PIPE AND PIPE FITTINGS

A. See Section 15410 - PLUMBING PIPING AND VALVES.

2.03 TRAPS

A. Fixture type: As noted under Plumbing Fixtures Section 15440.

B. Provide for floor drains, floor sinks, and connections to fixtures and equipment.

C. Provide all floor drain and floor sink traps with code approved priming devices.

2.04 VALVES

A. See Section 15410: PLUMBING PIPING AND VALVES.

2.05 CLEANOUTS

A. General:

1. Furnish and install cleanouts where indicated on plans. All cleanouts to have bronze countersunk rectangular slotted plugs lubricated with non-hardening thread lubricant. Flush with floor cleanout tops shall have non-skid covers. Flashing flange with device (suffix F-C) required on membrane floors.

B. Finished Room Floors:

1. Smith No. 4020 cast iron adjustable floor level cleanout assembly with round nickel bronze top.
2. Smith No. 4031 cast iron adjustable floor level cleanout assembly with round nickel bronze top with inverted hub and neoprene gasket.

C. Linoleum or Asphalt Tile Floors:

1. Smith No. 4140 cast iron adjustable floor level cleanout assembly with round nickel bronze top. Top depression to be covered with surrounding floor pattern bonded with waterproof adhesive.
2. Smith No. 4151 same top assembly as No. 4140 but with inverted hub and neoprene gasket.

D. Terrazzo Floors:

1. Smith No. 4180 cast iron adjustable floor level cleanout assembly with round nickel bronze top with center lifting device. Top depression to be filled with terrazzo and finished.
2. Smith No. 4191 same top assembly as No. 4180 but with inverted hub and neoprene gasket.

E. Unfinished Floors:

1. Smith No. 4220 all cast iron adjustable floor level cleanout assembly with round heavy-duty top.
2. Smith No. 4231 all cast iron adjustable floor level cleanout assembly with round heavy-duty top, inverted hub and neoprene gasket.

F. Carpeted Floors:

1. Smith No. 4023-X cast iron adjustable floor level cleanout assembly with round nickel bronze top. Top furnished with clamping frame for use on carpeted floors.
2. Smith No. 4031-X same top assembly as No. 4020-X but with an inverted hub and neoprene gasket.

G. Wall Round Cover:

1. Smith No. 4402 cast iron ferrule with lead seal plug, round stainless steel cover with center screw.
2. Smith No. 4422 for taper thread plug.

2.06 FLOOR DRAINS

A. Floor drain or similar traps directly connected to the drainage system and subject to infrequent use shall be provided with an approved means of maintaining their water seals, except where not deemed necessary for safety or sanitation by the Administrative Authority.

2.07 WATER HAMMER ARRESTORS

A. WHA:

1. Threaded stainless steel casing, partially filled with liquid and charged with gas as required for normal line pressure.
2. Stainless steel or neoprene bellows.

B. Similar to Smith 5000 series (for plumbing fixtures).

2.08 TRAP SEAL PRIMER VALVES

A. Provide for all floor drains.

B. Similar to “J.R> Smith” or “PPP”.

C. Provide access door where concealed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Slope horizontal drainage piping per local codes unless noted otherwise on plans.

B. Provide hanger support at starting end of all drainage lines which turn from vertical to horizontal.

C. For no-hub CI piping: where non-rigid hanger rods are in excess of 18 in., brace against horizontal movement (sway brace).

D. For no-hub CI piping 5 in. and larger: brace to prevent horizontal movement at every branch opening and change of direction by securing to building structure.

E. Changes in direction of drainage piping by use of:

1. 45° Wyes.
2. Long turn tee Wyes.
3. Long sweep quarter bends.
4. Sixth, eighth or sixteenth bends.
5. Short turn sanitary tees permissible on horizontal to vertical where space conditions require.

F. Slip joints: on fixture trap inlets or elbows connection to fixture tailpieces only.

G. Vent Pipe Terminations:

1. At least 10 ft away from any window, door or intake opening:
2. At least 12 in. away from parapet or bulkhead walls and roof drains to allow for flashing.

H. Vent piping: grade to drain out condensation and connect at base of stack to prevent accumulation of rust.

I. Located cleanouts as follows:

1. Where indicated on plans.
2. Per local codes.
3. Changes in direction.
4. Base of all vertical stacks.

3.02 TESTS

A. Drainage and vent piping inside building and underground metallic piping (including house sewers):

1. Refer to Section 15410.

END OF SECTION

SECTION 15440

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Drinking Fountains.

1.02 REFERENCES

A. ANSI/ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

B. ASME A11.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

C. ANSI/ASME A112.19.1 - Enameled Cast Iron Plumbing Fixtures.

D. ANSI/ASME A112.19.2 - Vitreous China Plumbing Fixtures.

E. ANSI/ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards).

F. ANSI Z358.1 - Emergency Eyewash and Shower Equipment.

1.03 SUBMITTALS

A. Product Data: Provide catalogue, data and illustrations of fixtures, sizes, materials, rough-in dimensions, utility sizes, trim and finishes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Plumbing Fixtures:

1. American Standard, Inc.
2. Kohler Co.

B. Brassware:

1. Chicago Faucet Co.
2. T and S.
3. Speakman.

C. Pressure Balanced Shower Mixing Valves:

1. Symmons.
2. Speakman.
3. Moen.

D. Flushometers:

1. Sloan Valve Co. (Royal).
2. Zurn.

E. Fixture Carriers:

1. Jay R. Smith.
2. Zurn Industries.

F. Toilet Seats:

1. Olsonite
2. Beneke
3. Church.

G. Stainless Steel Sinks:

1. Just Mfg. Co.
2. Elkay Mfg. Co.

2.02 FIXTURES AND TRIM - GENERAL

A. Fixtures:

1. Vitreous china, fixtures conforming to ANSI A112.19.2M: White vitreous, except as noted.
2. Stainless steel fixtures conforming to ANSI A112.19.3.
3. Acid resisting enameled cast iron, fixtures conforming to ANSI A112.19.1M.
4. Supports conforming to ANSI A112.6.1M: Where wall hung fixtures are supported adjacent to stud walls, provide rear anchor foot assembly with bolting to slab.
5. Handicapped requirements State of California Building Code.
6. Americans with Disabilities Act (ADA)
7. Accessible plumbing fixtures shall comply with all of the requirements of CBC Section 1115B.
8. Heights and location of all fixtures shall be according to CBC section 1115B.4 and Table 1115B-1.
9. Fixture controls shall comply with CBC Section 1115B.4.4.4 for showers, 1115B.4.3.1 for lavatories, 1115B.4.1.5 for toilets and 1115B.4.2.3 for urinals.
10. Sinks shall not exceed 6-1/2" in depth, CBC Section 1115B.4.7.1.

B. Exposed pipe, fittings, traps, escutcheons, valves, valve handles and accessories, above and below fixtures.

1. Chromium plated brass.
2. Chromium plated Type "L" tubing supply risers may be used.

3. Indirect waste piping from equipment in food service areas shall have silver spray painted finish applied after installation.

C. Fixture fittings:

1. Conforming to ANSI A112.18.1.
2. Renewable seats or replaceable internal units.
3. Composition washers.
4. All metal indexed handles.
5. Stops and supplies: similar to Brasscraft "HSR" heavy pattern.
6. Or equal by Chicago Faucet.

D. ADA Insulation Protectors:

1. Insulate all new and existing accessible sinks and lavatories drainage piping, hot and cold stops and supplies with insulation per ADA 4.19.4 and shall conform to testing standard of ASTM E84 Class A Material (25 Flame/450 Smoke) criteria and IAPMO PS 94-2001A Listed.

2. Protectors shall consist of molded closed cell PVC, with anti-fungal, antimicrobial, properties and shall be of a one-piece design with a smooth and soft texture plus an extended tailpiece for custom fit. Include PVC Velcro fasteners for full enclosure and a weep hole at bottom of J-bend for condensation drainage and air circulation. Protectors shall be secured by Heavy-Duty, interlocking Snap Fasteners for a Permanent safe fit.

3. Manufacturer: PLUMBEREX INC. Brand: TRAP GEAR or approved equal.

E. Refer to Plumbing Fixture Schedule on drawings for items not listed here within.

2.03 WATER CLOSETS

A. Water Closet (WC-1) (Student Standard & Accessible):

1. Fixture: Floor mounted flush valve, elongated bowl, vitreous china, 'barrier free' seat height, 1.5 gal.
2. Flush valve: Chromium plated, 1.5 gal. flush.
3. Seat: Elongated open front, less cover.
4. For model numbers refer to Plumbing Fixture Schedule.

2.04 URINALS

A. Urinal (UR-1) (Student Accessible):

1. Fixture: Wall hung vitreous china, water-free, barrier free design.
2. Stub water with cap 1" from face of wall complete with escutcheon for future use.

2.05 LAVATORIES

A. Lavatory (L-1) (Student Standard):

1. Fixture: Vitreous china wall hung.
2. Faucet: Refer to Plumbing Schedules for Model numbers.
3. Trim: Refer to Plumbing Schedules for Model numbers.

2.06 DRINKING FOUNTAIN

A. Drinking Fountain (DF-1):

1. Barrier free combination unit with dual bubblers fountains, enameled iron with support carrier.
2. See Plumbing Fixture Schedule for Model numbers.

2.07 STAINLESS STEEL SINKS

A. Single Compartment Sink (SK-2) (Student Accessible):

1. Fixture: 18 gauge stainless steel, type 304 self rimming. Refer to Plumbing Schedules for Model numbers.
2. Faucet: Refer to Plumbing Schedules for Model numbers.
3. Trim: Refer to Plumbing Schedules for Model numbers.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install and connect up the following items provided under General Construction Work or by Owner:

1. Stainless steel sinks.
24. Provide water supply fixtures with stop valves.

B. During course of construction:

1. Cover exposed fittings with Vaseline and burlap.
2. Cover fixtures with protection housings.
3. Uncover and thoroughly clean fixtures and fittings when directed.
4. Fixtures shall be in perfect condition at completion of job. Fixtures not in perfect condition shall be replaced by Contractor without additional cost.

C. Fixture carrier base plates or feet: lagged to slab with expansion shields and bolts in all bolt holes.

D. Where wall hung fixtures are supported adjacent to stud walls, provide rear anchor foot assembly bolted to slab.

END OF SECTION

SECTION 15535

REFRIGERANT PIPING AND SPECIALTIES

PART 1 - GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Filter-driers.

E. Expansion valves.

F. Flexible connections.

1.02 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASTM unless indicated otherwise.

C. Liquid Indicators:

1. Use line size liquid indicators in main liquid line leaving condenser.

D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

E. Permanent Filter-Driers:

F. Use in low temperature systems.

G. Use in systems utilizing hermetic compressors.

H. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.03 SUBMITTALS

A. Shop Drawings: Indicate schematic layout of system, including equipment, piping, critical dimensions, and sizes.

B. Product Data: Catalog cuts giving general assembly of specialties and data including load capacity.

C. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

1.04 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.05 QUALIFICATIONS

A. Design piping system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the state where the Project is located.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Dehydrate and charge components such as piping and receivers, seal prior to shipment, and maintain seal until connected into system.

1.07 MAINTENANCE MATERIALS

A. Provide two refrigeration oil test kits each containing everything required to conduct one test.

PART 2 - PRODUCTS

2.01 PIPING

A. Copper Tubing: ASTM, Type ACR hard drawn.

1. Fittings: ASME wrought copper.
2. Joints: Braze, AWS BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480°F.

B. Pipe Supports and Anchors:

1. Hangers for Pipe Sizes 1/2 to 1-1/2 In.: Carbon steel, adjustable swivel, split ring.
2. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
3. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.02 REFRIGERANT

A. Refrigerant: ASHRAE 34;

1. R-410a.

2.03 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator and plastic cap; for maximum working pressure of 430 psig, and maximum temperature of 200°F.

2.04 FILTER-DRIERS

A. Permanent Straight Through Type: ARI, UL listed, steel shell with molded desiccant filter core, for maximum working pressure 400 psig.

2.05 EXPANSION VALVES

A. Angle or Straight Through Type: ARI; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, non-adjustable superheat setting, replaceable inlet strainer, with capillary tube and remote sensing bulb and remote bulb well.

2.06 FLEXIBLE CONNECTORS

A. Corrugated bronze hose with single layer of [stainless steel] exterior braiding, minimum 9 in. long with copper tube ends; for maximum working pressure 400 psig.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:

1. Support horizontal piping as scheduled.
2. Install hangers to provide minimum 1/2 in. space between finished covering and adjacent work.

3. Place hangers within 12 in. of each horizontal elbow.
4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
6. Provide copper plated hangers and supports for copper piping.

G. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40% in direction of flow.

H. Provide access to concealed valves and fittings.

I. Flood piping system with nitrogen when brazing.

J. Insulate piping and equipment.

K. Follow ASHRAE procedures for charging and purging of systems and for disposal of refrigerant.

L. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

M. Fully charge completed system with refrigerant after testing.

3.03 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME.

B. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 in. vacuum and 200 psig kPa using halide torch. Test to no leakage.

3.04 SCHEDULES

A. Pipe Hanger Spacing

PIPE SIZE (Inches)	MAX. HANGER SPACING (Feet)	HANGER ROD DIAMETER (Inches)
1/2 to 1-1/4	6.5	3/8

END OF SECTION

SECTION 15783

SPLIT TYPE AIR CONDITIONING UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Split type air conditioning units.

B. Controls.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 16120 – Low Voltage Wire 600 Volt AC: Installation of thermostats and other control components.

1.03 RELATED SECTIONS

A. Section 16120 – Low Voltage Wire 600 Volt AC: Electrical supply to units.

1.04 REFERENCES

A. ARI 210 - Unitary Air-Conditioning Equipment.

B. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation System.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Indicate refrigerant, drain and electrical rough-in connections on shop drawings or product data.

C. Submit manufacturer's installation instructions under provisions of Division 1.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions and maintenance and repair data.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site.

B. Store and protect products.

C. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

1.08 WARRANTY

A. Provide one-year manufacturer's warranty.

B. Provide six years manufacturer's warranty on refrigeration compressor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Mitsubishi.

B. Carrier.

C. Trane.

2.02 MANUFACTURED UNITS

A. The air conditioning system shall be split type system. The system to consist of a slim silhouette, compact wall mounted packaged evaporator section and matching SlimLine air-cooled outdoor unit. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label. All wiring to be in accordance with the National Electric Code (NEC). The units shall be rated in accordance with ARI Standard 210 and bear the ARI label. A full charge of R-410a for 25 feet of refrigerant tubing shall be provided in the condensing unit. System SEER shall meet or exceed 2005 Federal Standards.

B. Indoor Unit: The indoor unit shall be completely factory assembled and wired. The casing shall have a baked enamel finish. The evaporator fan shall be a high performance, forward curve line flow fan direct driven by a single motor. The fan shall be statically and dynamically balanced and run on permanently lubricated bearings. An adjustable change vane shall be provided with the ability to direct the airflow from horizontal to vertical. An adjustable guide vane shall be provided to manually change the air direction from left to right. The evaporator coil shall be of nonferrous construction with smooth plate fins bonded to copper tubing. The tubing shall be brazed with phoscopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan with drain shall be provided under the coil.

C. Outdoor Unit: The outdoor unit shall be completely factory assembled, piped and wired. The casing shall be fabricated of galvanized steel, bonderized and finished with baked enamel. The unit shall be furnished with a direct drive, propeller type fan arranged for horizontal discharge. The motor shall have inherent protection, be of the permanently lubricated type and resiliently mounted for quiet operation. The fan shall be provided with a raised guard to prevent contact with moving parts. The compressor shall be of the high-performance rotary type with accumulator and internal thermal overloads. The compressor shall be mounted so as to avoid the transmission of vibration. The refrigeration system shall have the capability to operate with a maximum height difference of 25 feet and overall refrigerant tubing length of 49 feet between indoor and outdoor sections without the need for line size changes, traps, or additional oil. Refrigerant flow from the condenser to be controlled by means of a capillary tube. The condenser coil shall be of nonferrous construction with smooth plate fins bonded to copper tubing. The coil shall be protected with an intefral metal guard. The unit shall be controlled by the microprocessor located in the matching indoor unit.

2.03 CABINET

A. The control system shall consist of two (2) microprocessor sections. One microprocessor shall be factory wired and located within the indoor unit. It shall have the capability of sensing room temperature and indoor coil temperature; receive and process commands from the remote controller; and control the outdoor unit. The microprocessor within the wall mounted remote monitor and controller shall display set point; provide two (2) manually selected modes of cooling, normal and economy operation at 2 degrees above set point; night setback operation of 4 degrees above set point; and manual or automatic fan speed control. Automatic fan speed control shall be based upon the temperature difference between set point and room temperature maintaining lowest speed possible. The remote control shall be wireless, using infra-red, line of sight for control of system and shall include automatic ON/OFF timer; liquid crystal display; "I FEEL" control mode which adjusts temperature by tapping the button that describes the present condition - "Too Cool", "Too Warm", or "OK". The optimum temperature set this way is memorized for immediate recall whenever the system is used again. The system shall be capable of automatic restart when power is restored after power interruption.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturers' instructions.

B. Coordinate installation of units with architectural and electrical work.

C. Supply units fully charged with refrigerant and filled with oil.

D. Scheduled performance is based on ARI 210 test conditions. Scheduled sound rating is based on ARI 270.

END OF SECTION

SECTION 15870

POWER VENTILATORS

PART 1 - GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Roof exhausters.

B. Ceiling exhaust fans.

1.02 SUBMITTALS

A. Product Data: Catalog cuts giving construction information, and including fan curves with specified operating point clearly plotted, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.03 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.04 EXTRA MATERIALS

A. Provide two sets of belts for each fan.

PART 2 - PRODUCTS

2.01 ROOF EXHAUSTERS

A. Manufacturers:

1. Cook
2. Greenheck
3. Or Equal

B. Product Requirements:

1. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
2. Sound Ratings: AMCA 301, tested to AMCA 300 ,and bear AMCA Certified Sound Rating Seal.
3. Fabrication: Conform to AMCA 99.
4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

C. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 16 gauge aluminum birdscreen; square base to suit roof curb with continuous curb gaskets.

D. Roof Curb: 8 inch high self flashing of galvanized steel with continuously welded seams, built in cant strips one inch (25 mm) insulation and curb bottom, and factory installed nailer strip.

E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with nylon bearings.

F. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self aligning pre-lubricated ball bearings.

2.02 CEILING EXHAUST FANS

A. Manufacturers:

1. Cook

2. Greenheck

3. Or Equal

B. Centrifugal Fan Unit: Direct driven with galvanized steel housing lined with 1/2 inch (13 mm) acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

C. Grille: Molded white plastic or aluminum with baked white enamel finish.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Install flexible connections between fan inlet and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof exhausters.

G. Provide backdraft dampers on outlet from ceiling exhauster fans.

END OF SECTION

SECTION 15890

DUCTWORK

PART 1 - GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Low pressure ducts.

1.02 DEFINITIONS

A. Duct Sizes: Shown on the plans as clear inside dimensions. For lined ducts, maintain sizes inside lining.

1.03 DEFINITIONS

A. Seam: locks or weld applied longitudinally to close section of duct, e.g. longitudinal seam, spiral seam.

B. Joint: abutting connection between duct sections for continuity of air passage, e.g. crossjoint, transverse joint, coupling.

C. Reinforcement: hardware applied to strengthen duct, e.g. girth angles, tie rods, fasteners (not connectors), etc.

D. Stiffening: folding, bending, beading, crossbreaking or corrugating of sheets to achieve strength through shape, e.g. pocket lock secures joint and is transverse stiffener, with girth angle and/or fasteners applied (not connectors), joint or stiffener is reinforced.

1.04 DUCT CLASSIFICATION

A. Velocity: Low: to 2000 ft. per minute.

B. Pressure:

1. Based on following:

a. Single duct systems: static pressure at respective point in ductwork during normal operation.

b. Variable volume systems: from fan discharge to variable volume units, based on static pressure at beginning of fan discharge duct.

2. Pressure classification: except as noted:

a. Low: to 2 in. w.g.

1.05 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A and NFPA 96 standards.

1.06 SUBMITTALS

A. Submit ductwork shop drawings for review:

1. Coordinated layout duct drawings that differ from ductwork shown on contract drawings.

2. Mechanical equipment room plans and sections showing all equipment, curbs, and accessories.

3. Minimum 3/8 in. scale, double line, showing sizes, transverse joints, transitions, elevations, clearances and accessories; sections where required.

B. Subject shop details and catalog cuts of:

1. Ductwork construction, including gauge and bracing schedule.

2. Supports.

3. Dampers.

4. Turning vanes.

5. Access doors.

6. Louvers.

7. Flexible connections.

8. Other accessories.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Round duct and fittings:

1. United Sheet Metal Division.

2. United McGill Corporation.

3. Flexible ducts (low pressure).

B. Duct Sealants:

1. Benjamin Foster Corp.

2. United Sheet Metal Division.

3. United McGill Corporation.

C. Spin-in Fittings:

1. Young & Co., Manufacturing.

2. Modular Metals.

D. Mechanical Duct Coupling Systems:

1. Ductmate Industries, Inc.

2.02 MATERIALS

A. Metal sheets shall be as follows:

1. Galvanized steel shall be in accordance with ASTM 5261; black or galvanized as herein after specified.

2.03 DUCTWORK

A. Ductwork shall be galvanized steel, except as noted, in accordance with SMACNA HVAC Duct construction Standard, 1985, except as noted. Provide gauges, construction and reinforcement as follows:

1. Pressure class 2 in. w.g.: Sheet metal gauge and reinforcement shall be in accordance with SMACNA Table 1-5 and 1-10 through 1-13 and based on a minimum of 2 in. w.g. duct pressure class regardless of possible lower pressures. Round ductwork shall be spiral or longitudinal seam. Cross breaking shall be as required for rigid support.

B. Outside air, exhaust and relief duct shall be as follows: Galvanized.

2.04 FLEXIBLE DUCTS

A. General:

1. Use only where specified or indicated.

2. UL 181, Class I Air Duct.

3. Labeled for compliance with CMC.

B. Low Pressure:

1. Insulated Flexible Duct:

a. Minimum working pressure 1.5 in. WG.

b. Nominal 1 in. insulation with vapor barrier.

c. Maximum thermal conductivity 0.27 BTUH/sq ft degrees F/in at 75°F.

2. Use at following locations:

a. Connection to ceiling supply air outlets.

b. As indicated.

2.05 FLEXIBLE CONNECTIONS

A. Flexible connections for ductwork shall be in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible, except as noted. Flexible connections with metal collars shall be installed with 2 in. slack in fabric and minimum movement of 1 in. Provide flexible at connections to fans, building expansion joints, at connection between copper and stainless steel ductwork and at penetrations of mechanical equipment room walls.

1. Provide neoprene coated glass fabric, 30 oz. per sq. yd. with sewn and cemented seams, Vent Fabrics, Inc. or equal. For kitchen exhaust, provide wire imbedded glass cloth with sewn seams as manufactured by Vent Fabrics.

2.06 TURNING VANES

A. For galvanized steel ductwork, provide galvanized steel or painted black steel, except as noted. For other ductwork, provide same material as ductwork. Turning vanes shall be in accordance with SMACNA HVAC Duct Construction Standards, except as noted.

1. Install at square duct elbows and as noted on drawings. Maximum unsupported vane length shall not exceed 48 in. Provide separate equal size sections for greater lengths. Refer to turning vane detail. Single vane and short radius vanes are not acceptable.

B. Screws and Rivets: Provide the same material as sheet, except as noted. On aluminum sheets, provide cadmium plated or stainless steel. Zinc or cadmium plated will be permitted on galvanized sheets. Minimum screw size shall be No. 10; maximums pacing shall be 10 in. Minimum rivet size shall be 4 lb; maximum spacing shall be 6 in.

C. Duct Sealants: Provide sealing compound for brush applications, 3M Brand No. 800 or equal and other applications, 3M Brand No. 900 or equal. Provide tape, 3M No. 474 or equal. For gaskets, provide continuous, reinforced, inert self-conforming type, 1/8 in. thick and width to match angle connection, 3M Weatherban 1202-T ribbon sealer or equal.

PART 3 - EXECUTION

3.01 DUCTWORK INSTALLATION

A. General:

1. Construct with gauges, joints, bracing, reinforcing, and other details per latest CMC, ASHRAE, SMACNA, (or NFPA) unless specified otherwise.

a. Comply with most stringent.

2. Construct of galvanized sheet metal, except where otherwise indicated.

3. Diagonally crossbreak all panels on metal rectangular ducts over 18 in. in either direction.

   a. Beading for reinforcing not acceptable.

   b. Crossbreak outward in ducts having positive internal pressure.

   c. Crossbreak inward in ducts having negative internal pressure.

4. Duct dimensions indicated are net, inside, clear, dimensions.

   a. For internally lined ducts, add lining thickness to determine metal duct dimensions.

5. Avoid Penetrations of Ducts: Provide airtight rubber grommets at unavoidable penetrations of hanger rods.

6. Duct Lining: Install lining in ducts and plenums as specified in Section 15258: DUCT INSULATION.

7. Flexible Duct Connections:

   a. Coated glass fabric.

   b. Install at: Connections to fans and air handling units.

8. Volume Dampers: Install damper in every branch.

B. Elbows and Transitions:

1. Construct radius elbows with inside radius not less than duct width.

2. Use square turns in rectangular ductwork, unless indicated otherwise, at following locations:

   a. Exposed elbows.

   b. Immediately upstream from supply air outlets.

   c. Where required to facilitate installation.

3. Provide turning vanes in miter elbows in round and rectangular ducts.

4. Where indicated, provide turning vanes of special size and shape.

C. Rectangular Duct Joints:

1. Standing seams, except where flush drive slip seam called for.

2. Use flush, drive-slip, for:

   a. Exposed ducts:

      1) Except in garages, mechanical rooms.

b. Where required for clearance.

3. "Ductmate" system joints may be used in lieu of standing seams.

a. In ducts no wider than 60 in.

D. Joint Sealing:

1. Seal transverse and longitudinal joints of sheet metal ducts by one of following methods:

a. Six ounce canvas strip, six in. wide.

1) Adhere with lagging adhesive.

b. Hardcast PS-S tape.

c. United Hi-Velocity sealer.

d. Applications as recommended by manufacturer.

2. Seal punched holes and corner cracks.

3. After installation and testing reseal joints found to be leaking.

3.02 DUCT HANGERS AND SUPPORTS

A. General:

1. Support horizontal ducts with hangers of size and spacing as indicated in pertinent SMACNA Duct Construction Standards.

2. Attachment to structure: As specified in Section 15140: SUPPORTS AND ANCHORS.

B. Horizontal Duct Supports:

1. Install hangers at each change in direction of duct.

2. Strap hangers:

a. Extend strap down both sides of ducts.

b. Turn under bottom 1 in. minimum.

c. Metal screw hangers to:

1) Bottom of duct.

2) Upper and lower sides of ducts.

3) Not more than 12 in. on center.

3. Angle hangers:

   a. Provide angle hangers formed by extended vertical bracing angles.

   b. Or by rods connecting to bottom angles if size or bracing angles conform to hanger schedule.

4. Vertical duct supports:

   a. Support vertical ducts at every floor:

      1) Use angles or channels riveted to ducts.

      2) Set angles or channels on floor slab or structural steel members placed in opening, unless otherwise noted.

3.03 FIELD QUALITY CONTROL

A. Testing, adjusting and balancing (TAB) shall be performed by an approved independent TAB Contractor. Contractor qualification shall be Associated Air Balance Council (AABC) membership.

B. Procedure shall be in accordance with the AABC National Standards for Total System Balance. Work shall include, but not be limited to the following:

   1. Balance and adjustment of air distribution systems.

   2. Test of systems to certify compliance with requirements of authorities having jurisdiction for ventilation and proper functioning of operating devices.

C. Before testing, examine air-handling systems: For filters, provide clean filters, free of air bypass and functioning as specified. Lubricate moving equipment.

END OF SECTION

SECTION 15910

DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Access Doors.

B. Balancing Dampers.

C. Combination Fire Smoke Dampers.

D. Fire Dampers.

1.02 SUBMITTALS

A. Submit product data under provisions of Division 1, Section 15010: GENERAL PROVISIONS.

B. Provide shop drawings for shop-fabricated assemblies indicated, including volume control dampers duct access doors. Provide product data for hardware used.

C. Submit manufacturer's installation instructions under provisions of Division 1 for fire dampers and combination fire and smoke dampers.

1.03 QUALITY ASSURANCE

A. Fire dampers shall be UL listed and constructed in accordance with UL Standard 555 Fire Dampers. C.S.F.M. No. 3225-245:102

B. Fusible links on fire dampers shall be constructed to UL Standard 33, Fusible Links for Fire Protection Service.

C. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.

D. Access doors shall be UL labeled.

PART 2- PRODUCTS

2.01 MANUFACTURERS

A. Access Doors, Ducts:

1. Ventfabrics, Inc.

2. Dura Dyne, Corp.

3. Ruskin Mfg. Co.

B. Damper Hardware:

1. Ventfabrics, Inc.

2. Duro Dyne, Corp.

3. Young Regulator Co.

2.02 ACCESS DOORS

A. In accordance with SMACNA Duct Construction Standards, except as noted.

B. In ductwork:

1. Insulated or noninsulated, same as duct.

2. Hinged, except where sliding or removable type required. Latch, Ventlok No. 100 or equal.

3. Size:

a. 20 in. x 14 in.

b. Ducts less than 16 in.: one dimension 20 in.; other dimension 2 in. less than duct width.

c. Larger sizes where required for access.

2.03 DAMPERS

A. Volume Dampers:

1. Provide at following locations:

a. In all splits and branches of supply, return and exhaust ducts, except:

Additional locations where required for balancing.

2. Single blade dampers:

a. Galvanized steel ductwork: galvanized steel, except as noted.

b. Low velocity systems: SMACNA HVAC Duct Construction Standards, except as noted.

1) Bearing at one end of damper rod: Ventlok No. 609 or equal.

2) Accessible quadrant at other end of damper rod:

a) With lever and lockscrew, Ventlok No. 635 or equal.

b) Insulated ducts: quadrants mounted on collar to clear insulation; Ventlok Nos. 637, 638, or 639 or equal, selection based on insulation thickness.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturer's printed instruction.

END OF SECTION

SECTION 15936

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Registers/grilles.

1.02 SUBMITTALS

A. Review requirements of outlets and inlets as to size, finish, acoustics and performance, and type of mounting prior to submitting product data and schedules of outlets and inlets.

1.03 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ASHRAE 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Registers and grilles:

1. Metal Aire
2. Titus
3. Krueger.

2.02 AIR DISTRIBUTION DEVICES

A. General:

1. Manufacturer shall:

a. Examine application of each inlet and outlet.

b. Guarantee that each will provide comfort space conditions without drafts or noise at noted capacity.

2. Noise level at noted capacities: not to exceed criteria specified in 1.03 QUALITY ASSURANCE.

3. Suitable for operation at 5 percent excess and 25 percent less than noted capacity.

B. Grilles and Registers:

1. General:

a. Registers: with adjustable, opposed-blade volume control.

b. Finish: baked enamel to match color sample as approved.

c. Grilles and registers without removable cores, installed in plaster: supply plaster frames for setting under General Construction Work.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Return and exhaust registers:

1. Install with blades oriented to prevent sight through outlets.

END OF SECTION

SECTION 15991

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.02 RELATED SECTIONS

A. See Section 15010: GENERAL PROVISIONS, MECHANICAL, Paragraph 1.02.

1.03 REFERENCES

A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.

1.04 SUBMITTALS

A. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

B. Submit test reports as a submittal under provisions of Division 1.

C. Submit test reports under provisions of Division 1.

D. Prior to commencing work, submit draft reports indicating adjusting, balancing, and equipment data required.

E. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.

F. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

G. Include detailed procedures, agenda, sample report form, and copy of AABC National Project Performance Guaranty prior to commencing system balance.

1.05 REPORT FORMS

A. Submit reports on AABC National Standards for Total System Balance forms.

B. Forms shall include the following information:

1. Title Page:

a. Company name.

b. Company address.

c. Company telephone number.

d. Project name.

e. Project location.

f. Project Architect.

g. Project Engineer.

h. Project Contractor.

2. Instrument List:

a. Instrument.

b. .Manufacturer.

c. Model.

d. Serial number.

e. Range.

f. Calibration date.

3. Air Moving Equipment:

a. Location.

b. Manufacturer.

c. Model.

d. Air flow, specified and actual.

e. Return air flow, specified and actual.

f. Outside air flow, specified and actual.

g. Total static pressure (total external), specified and actual.

h. Inlet pressure.

i. Discharge pressure.

j. Fan RPM.

4. Exhaust Fan Data:

a. Location.

b. Manufacturer.

c. Model.

d. Air flow, specified and actual.

e. Total static pressure (total external), specified and actual.

f. Inlet pressure.

g. Discharge pressure.

h. Fan RPM.

5. Electric Motors:

a. Manufacturer.

b. HP/BHP.

c. Phase, voltage, amperage; nameplate, actual, no load.

d. RPM.

e. Service factor.

f. Starter size, rating, heater elements.

6. V-Belt Drive:

a. Identification/location.

b. Required driven RPM.

c. Driven sheave, diameter and RPM.

d. Belt, size and quantity.

e. Motor sheave, diameter and RPM.

f. Center to center distance, maximum, minimum, and actual.

7. Air Distribution Test Sheet:

a. Air terminal number.

b. Room number/location.

c. Terminal type.

d. Terminal size.

e. Area factor.

f. Design velocity.

g. Design air flow.

h. Test (final) velocity.

i. Test (final) air flow.

j. Percent of design air flow.

1.06 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1 section.

1.07 QUALITY ASSURANCE

A. Agency shall be company specializing in the adjusting and balancing of systems specified in this Section with minimum three years (documented) experience certified by AABC. Perform Work under supervision of AABC Certified Test and Balance Engineer.

B. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

1.08 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before commencing work, verify that systems are complete and operable. Ensure the following:

1. Equipment is operable and in a safe and normal condition.

2. Temperature control systems are installed complete and operable.

3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.

5. Duct systems are clean of debris.

6. Correct fan rotation.

7. Fire and volume dampers are in place and open.

8. Coil fins have been cleaned and combed.

9. Access doors are closed and duct end caps are in place.

10. Air outlets are installed and connected.

11. Duct system leakage has been minimized.

B. Report any defects or deficiencies noted during performance of services to Architect/Engineer.

C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

3.02 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.03 INSTALLATION TOLERANCES

A. Adjust air handling systems to plus or minus 5 percent for supply systems and plus or minus 10 percent for return and exhaust systems from figures indicated.

3.04 ADJUSTING

A. Adjust work under provisions of Division 1.

B. Recorded data shall represent actually measured, or observed condition.

C. Permanently mark settings of dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

G. Check and adjust systems approximately six months after final acceptance and submit report.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

END OF SECTION

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section provides the Basic Electrical Requirements which supplement Document 00700: General Conditions and apply to all Sections in Division 16.

1.02 RELATED SECTIONS

A. Excavating, Backfilling and Compacting for Utilities.

B. Cast-in-Place Concrete.

1.03 BASIC ELECTRICAL REQUIREMENTS

A. Quality Assurance:

1. Electrical work shall be done by an Electrical Contractor holding a C-10 and other licenses and permits required.

2. See other sections of these specifications for other qualification requirements.

B. Drawings and Specifications Coordination:

1. For purposes of clearness and legibility, Electrical Drawings are essentially diagrammatic. Size and location of equipment is indicated to scale whenever possible. Contractor shall verify all conditions, data and information as indicated on Drawings and in Specification Sections where Electrical work is required.

2. Electrical Drawings indicate required size and points of termination of conduits, number and size of wires, and suggest proper route for conduit. It shall be responsibility of Contractor to install conduits with minimum number of bends to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and meet all applicable code requirements. Routing of conduits may be changed, if approved by the District Electrical Inspector.

3. It is intended that outlets be located symmetrical with Architectural elements notwithstanding fact that locations indicated on Drawings may be distorted for clarity.

4. Architectural and Structural Drawings take precedence over Electrical Drawings in representation of general construction work. Drawings of various trades take precedence in representation of work of those trades. Contractor shall refer to all Drawings to coordinate the Electrical work with work of other trades.

C. Terminology:

1. Term "signal system" shall apply to clock, bell, fire alarm, annunciator, sound, public address, buzzer, public telephone, television, inter-communication, and security systems.

2. Term "low voltage" shall apply to systems operating at 600 volts and under.

3. Term "provide" used on Drawings and elsewhere in the Specifications shall be considered to mean "furnish and install".

4. Term "UL" means Underwriters Laboratories Inc.

D. Regulations:

1. Electrical work shall meet requirements of the authorities having jurisdiction and the California Building Code, 2007 Edition. Material and labor shall conform to Regulations of the National Board of Fire Underwriters for Electrical Wiring and Apparatus. All material shall be new and shall be "UL" listed.

E. Structural Considerations for Conduit Routing:

1. Where conduits are to pass through or will interfere with any Structural member, or where notching, boring or cutting of the structure is necessary, or where special openings are required through walls, floors, footings, or other buildings elements, to accommodate the electrical work, such work shall conform to State Building Code, Part 2, Title 24, Section 1906.3 for conduits and pipes embedded in concrete and Section 2320.11.9 and 2320.11.10 for notches and bored holes in wood; for steel.

2. Where a concrete encasement for underground conduit abuts a foundation wall or underground structure which the conduits enter, encasement shall, rest on a haunch integral with wall or structure, or shall extend down to footing projection, if any, or shall be doweled into structure unless otherwise indicated. Underground structures shall include manholes, pull boxes, vaults and buildings.

F. Electrically Operated Equipment and Appliances:

1. Equipment and Appliances Furnished by Contractor:

a. Electrical work shall include furnishing and installing wiring enclosures for, and the complete connection of all electrically operated equipment and appliances and any electrical control devices which are specified to be furnished and installed in this or other Electrical Sections of these Specifications, except Electrical work specified or indicated to be in the Mechanical work. All wiring enclosures shall be installed concealed except where exposed work is indicated on Electrical Drawings.

b. Connections shall be made as necessary to completely install equipment ready for use. Equipment shall be tested for proper operation and, if motorized, for proper rotation. If outlets of incorrect Electrical characteristics or if any equipment fails to operate properly, Contractor shall report to the District's Inspector in writing, listing buildings and rooms in which located, the name, make and serial number of equipment, and a description of defect.

2. Equipment and Appliances Furnished by Others:

a. Equipment and appliances indicated on Drawings as N.I.C. (Not in Contract),"Furnished by Others", or "Furnished by the District", will be delivered to the Site. Required Electrical connections shall be made for all such equipment and appliances in accordance with accepted trade practices under direction of the District Electrical Inspector. All motorized equipment will be furnished factory wired to a control panel or junction box unless otherwise indicated. Appliances will be furnished equipped with portable cord and cap. Provide disconnect switches where required.

b. Connections to equipment furnished under other Sections of this Specification shall be part of the Electrical Work. Work shall include internal wiring, installation, connection and adjustment of bolted drive motors in which the motor is supplied as a separate unit and connections only for equipment furnished with factory installed internal wiring, except as further limited by Drawings and other Sections of this Specification. Work shall include furnishing and installing suitable outlets, disconnecting devices, starters, push button stations, selector switches, conduit, junction boxes, and wiring necessary for a complete Electrical installation. Work shall also include furnishing and installing conduit and boxes, for HVAC control system, furnished under Mechanical. Devices and equipment furnished shall be of same type used elsewhere on job or as specified.

c. Electrical equipment furnished under other Sections of this Specification for installation and connection under work of this Section shall be delivered to the installation location by the Contractor furnishing the equipment.

d. Mechanical equipment furnished under other Sections of this Specification, and requiring Electrical connection under this Section, will be set in place by Contractor furnishing equipment.

e. Suitability and condition of equipment furnished by other Sections of this Specification, shall be determined in advance of installation. Immediate notice of damage, unsuitability or lack of parts shall be given to the Architect.

G. Protection of Materials

1. Provide for safety and good condition of all materials and equipment until final acceptance of project by the District. Protect all materials and equipment from damage and provide adequate and proper storage facilities during progress of work. All damaged and defective work shall be replaced prior to final inspection.

H. Cleaning

1. Exposed parts of Electrical work shall be left in a neat, clean, usable condition. Finished painted surfaces shall be unblemished and metal surfaces shall be polished.

2. Thoroughly clean all parts of apparatus and equipment. Exposed parts which are to be painted shall be thoroughly cleaned of cement, plaster and other materials. Remove grease and oil spots with solvent. Such surfaces shall be wiped and all corners and cracks scraped out. Exposed rough metal work shall be smooth, free of sharp edges, carefully steel brushed to remove rust and other spots, and left in proper condition to receive finish painting.

3. Contractor shall remove from the Site all debris and rubbish caused by the Electrical work. He shall thoroughly clean building of dirt, debris, rubbish, marks, etc., caused by performance of work.

   I. All programming software, access codes, service/technical manuals, blueprints and revisions shall be District property and shall be provided to the district at time of walkthrough. One copy shall be handed over to the Supervisor of the respective shop/s in addition to all other required copies.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS.

A. Consult with District Electrical Inspector before starting work.

B. All exposed conduits and boxes shall be painted to match the surfaces adjacent to installation.

C. All existing materials removed from buildings shall be removed from site as directed by District Electrical inspector.

D. Coordinate Electrical work with the work of other trades.

E. All trenches outside of barricade limits shall be backfilled and paved no later than 72 hours after being opened. During the time that trenches are open in traffic areas the Contractor shall provide traffic plates.

F. Where existing structural walls are cored for new conduit runs, separation between cored holes shall be three inches from new or existing holes, unless directed otherwise by structural engineer.

G. The seismic anchorage of electrical equipment shall conform to C.C.R. Title 24, 2007 CBC Section 1632A.1 and table 16A-0. Anchorage details for roof/floor mounted equipment weighing less than 400 lbs. and hung equipment weighing less than 20 lbs. may be omitted.

All electrical shall be braced or anchored to resist a horizontal force acting in any direction using the maximum force from either (a) or (b) of the following criteria:

(a) Force determined per section 1632A of the 2007 CBC
(b) Equipment On Grade: 20% Of Operating Wt.
Equipment On Structure: 30% Of Operating Wt.

For Flexibly mounted equipment use 4x the above values, and for simultaneous vertical force, use 1/3x the horizontal force.
The above values are for an importance factor, 1=1.0 and seismic zone, z=0.4.

Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the Electrical Engineer and the field engineer of the division of the State Architect.

H. The representation of physical placement of existing conduits has been developed from the best information available to the District at the time the drawings were prepared. The District provides this information only as a general guideline for the convenience of Bidders/Contractors and does not guarantee or warrant in any way, expressed or implied, the accuracy of these representations. Nothing in this disclaimer affects, in any way, the duty of the Contractor to furnish accurate "As Built" Drawings after completion of the contract.

I. In existing buildings, Contractors shall not work in areas contaminated by asbestos until the asbestos materials have been removed or encapsulated.

J. When trenching for new underground conduits, exercise care to avoid damage to existing underground utilities.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Boxes, Enclosures, Keys and Locks.

B. Receptacles and Switches.

C. Identifications and Signs.

1.02 RELATED SECTIONS

A. Basic Electrical Requirements: Section 16010.

1.03 SUBMITTALS

A. Submit in accordance with Section 01302: Submittals.

PART 2 - PRODUCTS

2.01 BOXES, ENCLOSURES, KEYS AND LOCKS

A. Outlet Boxes and Fittings:

1. Outlet boxes used in concealed work shall be galvanized steel, pressed or welded type, with knockouts.

2. In exposed work, outlet boxes and conduit fittings required where conduit runs change direction or size, shall be cast metal with threaded cast hubs cast integral with box or fitting. Boxes and fittings shall not have unused spare hubs except as otherwise indicated or specified.

3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium plated or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of cracks, gas holes, flaws, excessive shrinkage and burnt-out sand.

4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for particular fitting used.

5. Light fixture outlets shall be 4" octagon, 4" square, 2 1/8" deep or larger, depending upon number of wires or conduits therein, and shall be equipped with 3/8" malleable iron fixture studs, and plaster rings. Plaster rings shall have round opening with 2 ears drilled 2-23/32" center to center.

6. For local switch outlets use 4" square 2 1/8" deep, boxes for single gang, 5" square boxes for two-gang, and special solid gang boxes with gang plaster ring for more than 2 switches.

7. For all receptacle, clock, bell, fire alarm pull station, speaker, thermostat, telephone, and data outlets, use 4" square, 2 1/8" deep boxes or larger, if necessary, with single gang plaster rings. For television outlets, use 4-gang deep boxes and 4-gang plaster rings.

8. Plaster rings shall be provided on all flush mounted outlet boxes except where otherwise indicated or specified. All plaster rings shall be same depth as finished surface.

9. In existing plywood wall or drywall construction, and where flexible steel conduit is fished into walls, one-gang and two-gang outlets for wiring devices may be sectional steel boxes with plaster ears. Boxes shall be fastened to plywood with a flat head screw in each plaster ear screw hole.

10. Factory made knock-out seals shall be installed to seal all box knock-outs which are not intact.

11. At each location where flexible conduit is extended from a flush outlet box, provide and install a weather-proof universal box extension adapter.

B. Junction and Pull-Boxes:

1. Junction and pull-boxes, in addition to those indicated, shall only be used where absolutely necessary with specific direction of the District's Electrical Inspector in each case.

2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsional and deflecting forces. Boxes shall have auxiliary angle iron framing where necessary to ensure rigidity. Covers shall be fastened to box with a sufficient number of brass machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws at Site if boxes are not installed plumb. All surfaces of pull and junction boxes and covers shall be given one coat of metal primer, and one coat of aluminum paint.

3. Weatherproof pull and junction boxes shall conform to foregoing for interior boxes with following modifications: Cover of flush mounting boxes shall have a weather-tight gasket cemented to and trimmed even with cover all around. Surface or semi-flush mounting pull and junction boxes shall be UL approved as rain-tight and shall be complete with threaded conduit hubs. All exposed portions of boxes shall be galvanized and finished with a prime coat and coat of baked-on gray enamel.

4. All junction and pull-boxes shall be rigidly fastened to the structure and shall not depend on conduits for support.

5. Underground Concrete Pull Boxes:

   a. Precast Concrete Pull Boxes. Concrete pull boxes shall be traffic type, reinforced for H-20 Traffic bridge loading, Precast concrete. Pull boxes with inside dimensions 2'-0"x 3'-0" x 3'-0"D shall consist of a base section, top ring and cover. Base section shall have two 10"x10" knockouts in each 3'-0" side, and one 20"x20" knockout in each 2'-0" side. Pull boxes with inside dimension 4'-0 x 4'-0"x 4'-0"D shall consist of a base section, mid section, topping, and cover. Base section shall have two 8"x 16" knockouts on each of two opposite sides, and one 20" x 20" knockout on each of the other two opposite sides. All pull boxes shall have a minimum of 6" diameter sump knockout, and 1" diameter ground rod knockout.

In each pull box, furnish and install cable racks on walls. Each rack shall be equipped with 3 porcelain cable holders on a vertical steel mounting bar. Each pull box shall have 3/4" diameter pull irons. Covers shall be traffic type consisting of steel safety plate bolted to frame. Covers shall be marked "Electrical", "Power" "Telephone", "Signal" or "Ground", as required. Pull boxes shall be as manufactured by Quickset, or approved equal.

b. Provide end bells in all duct entrances. Terminate each metal conduit with insulated bushing having grounding terminal, O.Z. Type "Big".

c. Place pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.

d. Install a floor drain in every concrete pullbox into a sump containing 10 cubic feet of 1" crushed rock; minimum size 48" deep and 36" diameter. Provide 36" length of tile pipe extending down into the sump. Provide a grille over the top opening of pipe.

e. Install a 3/4" diameter, 10'-0" copperweld steel ground rod in every power concrete pull-box. Locate near a wall with 6" projection above floor for ground clamps. Permanently and effectively ground all metal equipment cases, cable racks, etc., in all pull boxes.

f. Provide a 6" deep sand base under each pull box.

g. Identify all power and signal cables by tagging in all manholes and pull boxes. Tie securely to cables with nylon cord or insulated type TW wire. Tie so that turns of wires do not form a closed electrical circuit.

h. Top of steel plate shall have a minimum coefficient of static friction of 0.5 for either wet or dry conditions, when tested for any shoe sole material. Testing and certification of the friction factor shall be conducted by an independent testing laboratory approved by the engineer, under the direction of a registered Civil or Quality Engineer. Testing shall conform to ASTM D1047 or F489 or F609, or other procedure approved by the Engineer.

6. Underground utility boxes shall be reinforced concrete with non-setting shoulders to prevent settlement following installation. Boxes shall be furnished with cast iron cover with finger hole, size as indicated on Drawings. Utility boxes shall be as manufactured by Quickset, or approved equal.

7. Manholes, vaults and pull-boxes required by utility company, and installed by Electrical Contractor, shall meet all requirements of utility company.

C. Floor Outlets:

1. All floor outlets except extension outlets, shall be Harvey Hubbell Inc. #B-2503, adjustable, cast iron, watertight floor boxes with flush brass floor plates, and shall be set to finish flush with final floor covering, whether it be concrete, wood, resilient floor covering, or other.

2. Telephone, above floor outlets shall be equipped with a Harvey Hubbell Inc. #SC-3098 pedestal with #SS309B plate.

3. Plug above floor outlets shall be equipped with a brass 2-1/8" flush cap and a shallow brass extension with 2 back-to-back, 15 ampere, 125 volt, grounding type receptacles, Harvey Hubbell Inc. #SC-3092.

4. Extension floor outlets shall be cast iron floor boxes with cast iron cover and 1/2" offset entry, for above-floor conduit extension; Harvey Hubbell #F3186. Boxes shall be designed to permit access to wiring without disturbing above-floor extension, and shall be set flush with finish floor.

5. Above floor service fitting for surge suppression receptacles shall be equal to Hubbell Cat. No. SC3098 with cover plate SS309DS.

6. Above floor service fittings for data outlets shall be equal to Hubbell Cat. No. SC3098 with required cover plate.

D. Floor Pockets:

1. Three-Gang: Three-gang floor lighting pockets shall be flush floor type, with cast iron floor plate and hinged cast iron door notched for cables. Three-gang floor pockets shall be C.W. Cole TLS-353-6 for wood floors and C.W. Cole TLS-353-6-C for concrete slabs. Each floor pocket shall contain three 20 ampere, 3 wire, 125-volt receptacles with matching caps.

2. Single Gang:

a. Receptacle floor pockets shall be single gang, flush floor type, with cast iron floor plate, hinged cast iron door notched for cable and cast iron box; Cole #TLA-362-1-FE. Equip each pocket with a standard single grounding type receptacle unless otherwise indicated. Use C.W. Cole #TLS-362-1, in wood floors.

b. Microphone or projector floor pockets shall be single gang flush floor type with cast iron floor plate, hinged cast iron door, notched for cable and cast iron box, C.W. Cole #TLA-362-3-FE. Use C.W. Cole #TLS-362-3, in wood floors.

E. Keys and Locks:

1. Contractor shall provide 2 keys with each door lock furnished, including cabinet door locks, switchboard locks, etc.; and shall provide 2 keys for each lock switch on a switchboard or control panel; and shall provide 2 keys with each interlock or other lock switch furnished. Deliver keys to the District's Inspector. Unless otherwise specified, keys shall be Corbin 60.

2. Locks shall be keyed to a Corbin 60 key for access to operate equipment and Corbin 70 key for service access. Special keys and locks shall be provided where specified.

2.02 RECEPTACLES AND SWITCHES

A. Receptacles:

1. Duplex receptacles shall be specification grade, 15 amperes, 125 volts, 3 wire, side wired with binding screws, parallel slots, U-ground, plaster ears and captive mounting screws. Body shall be phenolic, plastic or bakelite. Receptacles shall be heavy duty, 3-blade current carrying contacts and double wide flat blade ground contacts. Receptacles shall be Arrow-Hart 5242-I, Hubbell 5242-I or Leviton 5242-I or approved equal.

2. Single receptacles shall be specification grade, grounding type, side wired, with binding screws, receptacles shall have standard size ivory bakelite base. For circuits consisting of one single receptacle only, ampere rating of receptacle shall be the same as circuit breaker or fuse. 15 ampere, 125 volt receptacles shall be NEMA 5-15R, Arrow-Hart 5251-I. 20 ampere, 125 volt receptacles shall be NEMA 5-20R, Arrow-Hart 5721-I.

3. Kiln receptacles and range receptacles shall be 3-pads, 4-wire, grounding type, rated 50 amperes at 125/250 volts, polarized, Arrow-Hart #5754, and shall be provided with a 2-gang, stainless steel plate, Arrow-Hart #9336.

4. Dryer receptacles shall be 3-wire, non-grounding type, rated 30 amperes at 125/250 volts, polarized, with "L" shaped and angled straight contacts and ivory bakelite baselite base, Arrow-Hart #9344N with a 2-gang stainless steel plate Arrow-Hart S703.

5. Ground fault interrupter type receptacles shall consist of a single receptacle and reset device manufactured in a standard configuration for use with a duplex plate. Receptacles shall be feed-thru, 20 ampere, NEMA 5-20R, ivory in color and shall be Leviton 6399-I, or equal. Exterior mounted receptacles shall be weatherproof.

6. Weatherproof receptacles shall, except where otherwise indicated or specified, consist of a duplex receptacle as specified herein and a metal plate with die cast hinged lid and weatherproof mat, Arrow-Hart #5252-WP.

7. Surge suppression receptacles for electronic and computer equipment shall be 20 ampere, 125 VAC, NEMA 5-20R, Hubbell #IG5252S or approved equal.

8. Tamper resistant receptacles shall be 15 amp, 125 volts, Hubbell Cat. No. HBLSG62HI, Nema 5-15R.

B. Switches:

1. Local Switches:

a. Local switches shall be tumbler type, specification grade, rated 20 amperes at 120-277 volts AC only, with plaster ears, binding screws for side wiring, and standard size composition cups which fully enclose the mechanism. Switches shall be approved for use at currents up to the full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80% of the rating for motor loads. Switches shall be single pole, double pole, 3-way, 4-way, non-lock type. Non-lock type switches shall have ivory handles, and switch shall be Hubbell HBL 1221-I single pole, HBL 1222-I double pole, HBL 1223-I 3-way, and HBL 1224-I 4-way.

b. All lock type switches shall have metal or nylon key guides with ON/OFF indication, and shall be operable by the same key. Key switches shall be Hubbell1209

c. Rotary lock switches shall incorporate a tumbler type lock to prevent unauthorized operation. Lock shall be tumbler type by P & F Corbin, keyed to a HH41 key. Lock switch shall be installed with pin tumblers facing downward. Key shall be removable in all positions. Each device shall be complete with 2 keys. Keys shall be delivered only to the District's Electrical Inspector. Switches shall be rated at 20 amperes, 120-277 volt AC. Switches shall be as follows: single pole switches shall be Arrow-Hart 1191; double pole switches shall be Arrow-Hart 1192; 3-way switches shall be Arrow-Hart 1193. Switch plates shall be of stainless steel, engraved with "ON" and "OFF" positions. Switch plates shall be Arrow-Hart 1187. For switch plates of 2 or more gangs, provide special order plates equal to the single gang plate.

d. Pilot light switches shall be rated 20 amps and shall conform to the specifications for "local switches". The switches shall have red, rugged "Lexan" handles that are lighted by long-lasting neon lamps. Pilot light shall light when load is on. Single pole, 120 volt switches shall be Hubbell HBL1221-PL. Single pole, 277 volt switches shall be Hubbell HBL1221-PL7.

e. Remote control switches for mechanically held contactors arranged for 3-wire control shall be tumbler type, momentary contact, single pole, 3-position with center "OFF", rated 20 amperes at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclose mechanism, and ivory handles; Hubbell HBL1556-I.

2. Time Switches and Photo Electric Controls:

a. For outdoor lighting control, time switches shall be digital with astronomic capabilities. Time switches shall have 365 day with holiday capabilities with 16 single dates and 5 holiday blocks of unlimited duration utilizing 8th and 9th day schedules. Time switch shall have 2 separately controllable relay closure output circuits. Each circuit shall be single pole, double throw, with contacts rating of 10 amp. resistive at 120/250 Vac and 7.5 amp inductive at 120/250 Vac. Time switch shall have 48 events per circuit per week; separate scheduling for each day of week. Time switch shall have user selectable daylight saving or standard time, automatic leap year correction, and 72 hour memory backup with rechargeable battery. Time switch shall be equal to Tork Series DZS-200.

b. Where more than 2 timed circuits are required, time switch shall be equal to Tork K Series, digital, 4, 6 or 8 circuits, with following features:

1) Liquid Crystal Display Panel.

2) Holiday Scheduling: Up to 40 dates may be assigned special holiday schedules, up to one year in advance.

3) Automatically adjusts to and from daylight savings time and for leap year.

4) Contact Ratings: 10 amp at 240 Vac.

5) Safety override switch for each circuit to provide shut down of circuit, or override ON.

6) Selective Review: All or part of schedule shall be displayed at touch of a key.

7) Battery backup for up to one year.

8) Supply Voltage: 120V.

9) 365 Day Advance Scheduling.

c. Photoelectric Control: Photoelectric control shall be rated 2000 watts, 120V with single pole, single throw, normally closed contact, enclosed in a die-cast aluminum gasketed enclosure with 1/2" conduit fitting, equal to Tork Series 2100.

4. School Main Entrance Intercom Station:

a. Wiring for base and remote stations shall be 2/C #18 unshielded for speaker, and #22 drain, West Penn Catalog No. 360.

2.03 IDENTIFICATION AND SIGNS

A. Identification Plates:

1. Following equipment shall be provided with identifications plates unless otherwise specified: switchboards, unit substations, motor control centers, control panels, push button stations, time switches, contactors, motor starters, motor switches, panelboards, and terminal cabinets.

2. Identifications plates shall adequately describe function, voltage and phase of particular equipment involved. Where identification plates are detailed or described on Drawings, inscription and size of letters shall be as indicated. For lighting and power panels, identification plates shall indicate panel designation, voltage and phase of panel. For terminal cabinets, identification plates shall indicate system housed therein.

3. Identification plates shall be black and white nameplate stock of bakelite with characters cut through black exposing white. Plates shall have beveled edges and shall be securely fastened in place with #4 Phillips head, cadmium plated steel, self-tapping screws. Characters shall be 3/16" high, unless otherwise indicated.

B. Markings:

1. Following equipment and controls shall have markings:

a. Surface-mounted starters, switches, disconnect switches, contactors, and other devices controlling motors and appliances. Abbreviations acceptable to the District's Electrical Inspector, along with an identifying number, shall be used. Markings shall be done with locking type stencils using paint of a contrasting color. Figures shall be 3/8" high unless otherwise indicated. Dymo Industries, Inc., self-sticking plastic labels, having embossed characters made with a typewriter, may be used, in lieu of stencils and paint.

2. High Voltage: High voltage switchboards, cabinets, boxes, and conduits exposed in accessible locations, including under buildings and in attics, shall be marked "DANGER-HIGH VOLTAGE". Markings for switchboards shall consist of an #18 gauge steel, porcelain enamel sign, of standard manufacture. Markings for boxes, cabinets and conduits shall be by means of stenciling or printed self-adhesive markers, Westline "Tel-A-Pipe". Letters shall be black on orange background and not less than 1-7/8" high. On conduit runs, marking shall be applied at intervals not exceeding 10' in any individual area. Markings shall be done only after other painting has been completed.

C. Warning Signs:

1. Provide a warning sign on outside of each door or gate to rooms or enclosures containing high voltage equipment. Signs shall read: "WARNING-HIGH VOLTAGE-KEEP OUT". Lettering shall be 2" high.

2. Provide a warning sign on each high voltage non-load break disconnect and fused cutout (not oil filled). Signs shall read: "DO NOT OPEN UNDER LOAD". Lettering shall be 2" high.

3. Signs shall be of standard manufacture #18 gauge steel, with porcelain enamel finish. Letters shall be red on white background.

PART 3 - EXECUTION

3.01 BOXES; INSTALLATION AND SUPPORT

A. Outlet boxes shall be flush with finished surface of wall or ceiling. They shall be plumb and securely fastened to structure, independent of conduit. Except where otherwise indicated, factory-made bar hangers shall be used to support outlet boxes.

B. Outlet boxes installed in suspended or furred ceilings with steel runner or furring channels, shall be supported, except where otherwise indicated, by a Unistrut #P-4000 channel spanning main ceiling runner channels. Each box shall be supported from its channel by a 3/8" 16 threaded steel rod with a Unistrut #P-4008 nut and a Tomic #711-B Adapta-Stud. Rod shall be tightened to a jamb fit with channel and its nut. Box shall be locked to the rod by means of a 1/2" locknut on stud and a 3/8" 16 hex nut-locking stud to rod.

C. Heights of outlets and equipment indicated on Drawings shall govern, but absence of such indications, following heights shall be maintained, (Heights are to centerline unless otherwise noted):

1. Wall mounted telephone, light switch, other switches, and fire alarm pull stations: 48" above finished floor.

2. Bell outlets in corridors: 12" below ceiling.

3. Clock, speaker, and bell outlets in classrooms and offices: 8'-0" above finished floor.

4. Fire alarm strobe lights: 80" minimum AFF to bottom of lens and 96" maximum AFF to top of lens.

5. Outside bell and yard light outlets: 4'-0" above second floor level for 2 or more story buildings, 12" below top plate level for one story buildings without covered porch or arcade, and 12" below covered porch and arcade ceilings.

6. Desk telephones, receptacle outlets and data outlets: 15" above finished floor.

7. Panelboards and terminal cabinets: 6'-6" to top above finished floor.

8. Television outlets shall be located at a height corresponding to location of TV monitor, or a minimum of 15" above finished floor.

3.02 PLATES

A. Provide a plate on each new switch, plug, pilot light, data, interphone, public telephone, and television outlet, and on existing and reset outlets where so indicated. Plates shall be of stainless steel unless otherwise specified.

B. Flush wiring device and signal system outlets indicated to be blank covered, shall be covered with blank stainless steel plates. Flush lighting outlets to be capped shall be covered with Wiremold # 5736 steel covers, painted to match the surrounding finish. Surface-mounted outlets indicated to be capped shall be covered with blank stainless steel covers.

C. Switch and receptacle plates shall be provided with engraved designations under any one of following:

1. Three gang and larger gang switches.

2. Lock switches.

3. Pilot Switches.

4. Switches so located that operator cannot see one of the fixtures or items for equipment controlled with his hand on the switch.

5. Switches not in same room with fixtures or items of all unit heaters, air curtains, fly fans, etc.

6. Receptacles operating at other than 120 volts.

7. Switches operating on 277 volts.

8. Where indicated on Drawings.

D. Designations shall be as indicated on Drawings or as specified and shall be engraved in plates with 3/16" high block type letters filled with black enamel. Where designations are not indicated or specified they will be given after Contract is awarded. For estimating purposes, they may be assumed not to exceed more than 10 letters per gang.

3.03 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

A. Switchboards, motor control centers, transformers, panelboards, circuit breakers, disconnect switches, starters, pushbutton control stations and other apparatus used for operation or control of circuits, appliances or equipment, shall be properly identified by means of descriptive nameplates or tags permanently attached to apparatus or wiring.

B. Nameplates shall be engraved laminated bakelite or etched metal. Shop drawings with dimensions and format shall be submitted to the Architect before installation. Attachment to equipment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates are not acceptable.

C. Tags shall be attached to feeder wiring in conduits at every point where runs are broken or terminated, and shall include pull wires in empty conduits. Circuit, phase and function shall be indicated. Branch circuits shall be tagged in panelboards and motor control centers. Tags may be made of pressure-sensitive plastic or embossed self-attached stainless steel or brass ribbon.

D. Cardholders and cards shall be provided for circuit identification in panelboards. Cardholders shall consist of metal frame retaining a clear plastic cover permanently attached to inside of panel door. List of circuits shall be typewritten on a card. Circuit description shall include name or number of circuit, area, and connected load.

E. Junction and pullboxes shall have covers stenciled with box number when indicated on Drawings, or circuit numbers according to panel schedules. Data shall be lettered in a conspicuous manner with a color contrasting with finish.

F. Name shall be correctly engraved with a legend indicating function or areas, when required by Codes, or indicated on Drawings.

END OF SECTION

SECTION 16110

RACEWAYS, FITTINGS AND SUPPORTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Raceways.

B. Conduit Installation.

1.02 RELATED SECTIONS

A. Section 16010: Basic Electrical Requirements.

1.03 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

PART 2 - PRODUCTS

2.01 RACEWAYS

A. Conduit Materials:

1. Metallic conduit and tubing shall be manufactured under supervision of UL, Factory Inspection and Label Service Program. Each 10'-0" length of conduit and tubing shall bear UL label and manufacturer's name.

2. Rigid metallic conduit shall be rigid steel, heavy wall, mild steel, zinc coated with an inside and outside protective coating. Couplings, elbows, bends, and other fittings shall be same materials and finish as the rigid metallic conduit. Fittings, connectors, and couplings shall be threaded type.

3. Electrical metallic tubing shall be steel tubing, zinc coated with a protective enamel coating inside. Fittings, couplings, and connectors shall be gland compression type. Electrical metallic tubing is designated hereinafter as "EMT".

4. Flexible steel conduit shall be of flexible interlocking strip construction with continuous zinc coating on strips. Connectors and couplings shall be approved fittings of type which thread into convolutions of flexible conduit.

5. Liquid-tight flexible metal conduit shall be galvanized heavywall, flexible locked steel strip construction with a smooth moisture and oil proof, abrasion-resistant, extruded plastic jacket. Connectors shall be approved for use with liquid-tight flexible conduit and shall be installed to provide a liquid-tight connection.

6. Nonmetallic conduit shall be rigid PVC electrical conduit extruded to schedule 40 dimensions of Type II. Grade 1 high impact, polyvinyl chloride, sweeps, couplings, reducers and terminating fittings shall be listed under the UL re-examination service, and shall bear the manufacturer's listed marking.

B. Sleeves for Conduits: Sleeves shall be adjustable type, of #26 gauge galvanized iron, Adjus-to Crete Co., Adjus-to-Crete, or Jet Line Products Inc., Jet-Line.

C. Where conduit enters a building through a concrete foundation below grade, or ground water level, or where it is necessary to seal around a conduit where it passes through a concrete floor or wall, Contractor shall provide O-Z/Gedney type FSK Thru Wall and Floor Seal.

D. Expansion Joints: Where conduits embedded in masonry or concrete cross seismic separations between buildings, expansion joints, or at locations indicated, Contractor shall provide a sliding or a sliding and deflecting fitting, as conditions require, in each conduit. Sliding fittings shall be O-Z Electrical Mfg. Co. Inc. Type AX, with bonding strap and clamps. At exterior locations use O-Z Electrical Mfg. Co. Inc. Type EX.

E. Conduit Seal Fittings:

1. Provide conduit seal fittings where indicated on the Drawings. All conduit seals shall be of rigid galvanized steel. Seals in horizontal runs shall be Appleton Type ESU or Crouse Hinds Type EYS. Seals in vertical runs shall be Appleton Type SF, Crouse Hinds Type EYD, or equal, with continuous drain.

2. Install sealing compound after wire has been installed. Ensure drain is not blocked in vertical seals when installing compound. Where conduit seals are used in hazardous area applications, there shall be no conduit coupling, fitting, etc., between seal and boundary of hazardous area.

F. Surface Metal Raceway:

9. Provide surface raceway as indicated on Drawings and paint to match surfaces where installed. Surface raceway shall be by Wiremold or Hubbell. Provide toggle bolts or red head anchors to support surface raceway, plastic anchors are not acceptable. Single pole switch box shall be 4-1/8" long by 2" wide by 1-3/8" deep, by Wiremold. Wiremold type bushings shall be installed at end of Wiremold run.

10. Surface raceway for single circuit outlets shall be 3-wire, grounded with outlets spaced 12" on center, Wiremold 2000 Series. Two-circuit outlet surface raceway shall be 4 wire, grounded, with outlets wired alternately spaces 18" on center.

11. Combination surface metal raceway for power and low voltage cable shall be wiremold 4000 series.

G. Wireways: Wireways shall be #16 gauge galvanized steel enclosed hinge/screw wiring troughs, surface metal raceway, wireway and auxiliary gutter designed to house electrical wiring. Wireway fittings shall have removable covers and sides to permit complete lay-in of conductors throughout entire wireway run. Cover shall have keyhole slots to accept captive screws locking the cover securely closed. Wireways shall be Underwriters Laboratories listed and shall be equal to Square D type LDG Nema Type 1 enclosure, or type RD Nema Type 3R enclosure.

H. Penetration in Fire Rated Structures: Provide 3M caulk and fire barriers for making fire rated seals around penetrations through floors, walls, and elevator shafts. Firestop system must be UL classified for through-penetration applications of metallic conduits and busways.

I. Pull Wires: A 1/8" polypropylene cord shall be installed in each empty conduit. Underground service conduits shall include pull cords, as required by utility company.

J. Conduit shall be ¾" minimum, unless otherwise noted.

PART 3 - EXECUTION

3.01 CONDUIT INSTALLATION

A. General Requirements:

1. Provide complete and continuous systems of rigid metallic conduit, outlet boxes, junction boxes, fittings and cabinets for all systems of electrical wiring including lighting and power, and signal systems, except as otherwise specified.

2. Within buildings EMT may be used in lieu of rigid metallic conduit where permitted by ordinance. EMT shall not be used in the following cases: in concrete; underground; outdoor; below 6'-0" above finished surface; where subject to damage; in runs longer than 100'-0"; where conduit size is 1-1/4" or greater; in boiler rooms; underground parking garages; in equipment rooms.

3. Within buildings flexible steel conduit may be used in lieu of rigid steel conduit where permitted by the School District's Electrical Engineer. Flexible steel conduit shall not be used in the following cases: For runs longer than 50'-0"; at exposed conduits; where conduit size is 1-1/4" or greater.

4. Liquid-tight flexible steel conduit shall be used, except where otherwise specified, for final connection of all motor terminal boxes, Shop equipment, Cafeteria equipment, HVAC equipment and other equipment, and shall be of sufficient length (not to exceed 36") to allow full travel or adjustment of motor on its base.

5. Connectors for flexible metal conduit shall be the type which threads into convolutions of conduit. Connectors for water-tight flexible metal conduit shall be approved for such use and shall be installed to make a water-tight connection.

6. All exposed conduit shall be run vertically and horizontally following general configuration of the equipment, using cast threaded hub conduit fittings where required and shall be clamped to equipment with suitable iron brackets and one hole pipe straps.

7. If connection is from a flush wall-mounted junction box, install a weatherproof universal box extension and adapter and extend with rigid steel conduit to motor starter or junction box on equipment.

8. Underground feeder distribution conduits for all systems may be nonmetallic conduit in lieu of rigid conduit except where otherwise specified or indicated.

9. Conduit shall be concealed unless otherwise indicated. Conduits exposed to view, except those in attic spaces and under buildings, shall be installed parallel or at right angles to structural members, walls, or lines of building. Conduits shall be routed to clear access openings.

10. Bends or offsets will not be permitted unless absolutely necessary. Radius of each conduit bend or offset shall be as required by ordinance except for underground conduits, for public telephone conduits, and where otherwise indicated or specified. Bends and offsets shall be made with standard tools and equipment made especially for purpose or may be factory made bends or elbows complying with requirements for radius of bend specified herein. Public telephone conduit bends

and offsets shall have a radius which is not less than 10 times trade size of conduit unless otherwise approved by telephone company. Refer to "Underground Conduit Installation" for radius of bends and offsets required for underground installations.

11. Running threads will not be permitted. Provide approved conduit unions where union joints are necessary. Conduit shall be kept at least 6" from covering on hot water and steam pipes and 18" from flues and breechings. Open ends of conduits shall be kept closed with approved conduit seals during construction of buildings and during installation of underground systems.

12. Joints in conduits installed in concrete, wet locations, exposed to weather or underground shall be made liquid tight. Conduit threads shall be filled with approved pipe joint compound before screwing into couplings and threaded fittings.

13. Where conduits are terminated in groups at panelboards, switchboards and signal cabinets, etc., provide templates or spacers to hold conduits in proper position and to preserve alignment. Conduits terminating at signal cabinets shall enter cabinets in following approved locations only: Conduits entering top, side, and bottom of cabinets shall be aligned in a single row, centered 2" from rear of cabinet; conduits entering back of cabinet shall be aligned in a single row centered 2" from top of cabinet. Conduits shall not be spaced closer than 3" on centers.

14. 1" and smaller conduits above metal lath ceilings shall be tied to ceiling channels. 1-1/4" conduits above metal lath ceilings shall be rigidly suspended with pipe hangers or pipe racks or shall be secured to superstructure with factory made pipe straps. Conduits in metal lath or steel stud partitions, shall be tied to furring channels or studs. In ceiling spaces and in partitions, tie wires shall be spaced not more than 5'-0" apart, shall hold conduit tight against channels and studs at point of tie and shall not bear any of weight of conduit. Tie wire shall be #16 gauge galvanized double annealed steel tie wire.

15. Where auxiliary supports, saddles, brackets,, etc., are required to meet special conditions they shall be made rigid and secure before conduit is attached thereto.

16. Conduit in ceiling spaces, in stud walls and under floors shall be supported with factory made pipe straps or shall be suspended with pipe hangers or pipe racks. Pipe straps shall be attached to and shall hold conduit tight at point of support against ceiling and floor joists, rafters, and wall studs, or 2" x 4" headers fitted between joists or wall studs.

17 Conduits installed on exposed steel trusses and rafters shall be fastened with factory made conduit straps or clamps which shall hold conduit tight against supporting member at point of support.

18. Conduits under buildings shall be strapped with factory made conduit straps to underside of concrete floor or joists, or wood floor joists, or shall be suspended with pipe hangers or pipe racks. Conduits under building shall not rest on ground but shall be suspended from building or shall be buried below surface of ground. 1" and larger conduits under buildings shall be suspended with conduit hangers or racks.

19. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. Pipe ring shall be malleable iron, split and hinged, and shall securely hold conduit, or shall be springable wrought steel. Rings shall be bolted to or interlocked with suspension rod socket. Rods shall be 3/8" for 2" conduit hangers and smaller and shall be 1/2" for 2-1/2" conduit hangers and larger.

20. Pipe racks for groups of parallel conduits and for supporting total weights not exceeding 500 pounds shall be trapezed type and shall consist of a cross channel, Steel City Kindorf #B-900, Unistrut #P-1000 suspended with a 3/8" minimum diameter steel rod at each end. Each rod shall be fastened with nuts, top and bottom to cross channel and with a square washer on top of channel. Each conduit shall be clamped to top for cross channel with conduit clamps, Steel City Kindorf #C-105 or Unistrut Nos. P-1111 through P-1124. Conduits shall not be stacked one on top of another, but a maximum of 2 tiers maybe on same rack providing an additional cross channel is installed. Where a pipe rack is to be longer than 18", or if weight it is to support exceeds 500 pounds, submit details of installation to the Architect for approval.

21. Conduits which are suspended on rods more than 2'-0" long shall be rigidly braced to prevent horizontal motion or swaying.

22. Factory-made pipe straps shall be one or 2-hole formed galvanized clamps, heavy duty type, except where otherwise specified.

23. Hangers straps, rods, or pipe supports under concrete shall be attached to inserts set at time concrete is poured. Under wood use bolts, lag bolts, or lag screws; under steel joists or trusses use beam clamps.

24. Conduits shall be supported at intervals required by ordinance, but not to exceed 10'-0". 1" and smaller conduits installed exposed shall be fastened with one-hole malleable iron straps. Perforated straps and plumber's tape shall not be used in support of conduits.

25. Each conduit stubbed up through a roof or an arcade shall be flashed with a waterproof flashing which shall be constructed of #24 gauge galvanized sheet metal or of aluminum not less than .030" thick. Base of flashing shall extend on roof not less than 10" from conduit. Flashing shall extend up conduit not less than 6" and shall be in contact with conduit for 1" at top.

26. Bushings for all sizes of rigid steel conduit shall be threaded insulating type. Set screw bushings are not acceptable.

27. All flex conduits shall be cut square and not at an angle.

28 It shall be responsibility of Contractor to install conduits with a minimum number of bends, and in such a manner as to conform to structure and meet all applicable code requirements.

29. Routing of conduits may be changed if approved by the District Electrical Inspector, providing length of any conduit run is not increased or decreased more than 10% of the length indicated on Drawings.

30. Equipment Anchorage:

    a. All mechanical and electrical equipment shall be anchored or braced to meet the horizontal and vertical forces prescribed in the 2007 CBC, Section 1614A.1.13 and ASCE 7-05 Section 13.3, 13.4, 13.6 and Chapter 6.

b. The attachment of the following items shall be designed to resist the forces prescribed above, but need not to be detailed on the plans, and the project inspector will verify that these items (equipment) have been anchored:

- Equipment weighing less than 400 pounds supported directly on the floor or roof.
- Furniture required to be attached in accordance with ASCE 7-05, Section 13.5.
- Temporary or movable equipment with flexible connection to power utilities.
- Equipment weighing less than 20 pounds supported by vibration isolators.
- Equipment weighting less than 20 pounds suspended from a roof or floor or hung from a wall.

c. For those elements that do not require details on the approved drawings, the installation shall be subject to the approval of the Mechanical/Electrical Engineer.

31. Piping, Ductwork, and Electrical Distribution System Bracing:

a. Piping, ductwork and electrical distribution systems shall be braced to resist the forces prescribed in ASCE 7-05 Section 13.3 as defined in ASCE 7-05 Section 13.6.9, 13.6.7, 13.6.5.5 Item 6, and 2007 CBC 1614A.1-13.

b. The bracing and attachments to the structure shall comply with one of the OSHPD Pre-Approvals with an OPA #, such as Mason Industries (OPA 349), or ISAT (OPA 485) as modified to satisfy anchorage requirements of ACI 318, Appendix D.

c. Copies of the manual shall be available on the jobsite prior to the start of hanging and bracing of the pipe, ductwork, and electrical distribution systems.

d. The Structural Engineer of Record shall verify the adequacy of the structure to support the hanger and brace loads.

B. Underground Requirements:

1. All conduits installed underground shall be entirely encased in concrete 3" thick on all sides with multiple conduits spaced not less than 1-1/2" apart, except where otherwise specified. Provide approved conduit spacers as required to prevent any deflection of conduits when concrete is placed and to preserve position and alignment of conduits in concrete. Conduits shall be tied to spacers. Anchors shall be installed to prevent floating of conduits during pouring of concrete. Red concrete shall be used to encase conduits of systems operating above 600 volts.

2. All underground conduits shall be buried to a depth of not less than 24" below finished grade to top of the concrete envelope, unless otherwise specified.

3. Assemble sections of conduit with approved fittings and stagger all joints. Cut ends of conduit shall be reamed to remove all rough edges. Joints in all conduits shall be made liquid-tight. All bends at risers shall be completely below surface where possible.

4. Two or more conduit runs in a common trench shall be separated by at least 1-1/2" of concrete. Electric conduit runs installed in a common trench with other utility lines shall be separated from such lines by at least 12" horizontally. Public telephone conduits shall be separated from electric conduits or other utility lines by not less than 3" of concrete.

5. The District's Electrical Inspector shall be called to site for approval of all underground installations before and during concrete pour. Where considered necessary by the District's Electrical Inspector, a mandrel shall be drawn through each run of conduit in presence of the Inspector, before and after pouring concrete. Mandrel shall be 6" in length minimum, and have a diameter which is within 1/4" of diameter of conduit to be tested.

6. Nonmetallic conduit installations shall comply with following additional requirements: All joints in PVC conduit shall be sealed by means of approved solvent-weld cement supplied by conduit manufacturer. All nonmetallic conduit bends and deflections shall comply with requirements of applicable electrical code, except that minimum radius of any bend or offset for conduits sized from 1/2" to 1-1/2" inclusive shall not be less than 24". All bends at risers and risers shall be rigid steel conduit. Radius of curve of any bend or offset, in nonmetallic conduit for public telephone system shall be not less than 10 times trade size of conduit, unless otherwise specifically approved by public telephone system.

7. Furnish and install a 6" wide polyethylene red underground barrier type 12" above full length of concrete "CAUTION ELECTRIC LINE BURIED BELOW".

8. All underground conduit systems for use by serving utility company shall meet all requirements of utility company.

C. In Slabs on Grade:

1. Unless specifically approved by the Division of the State Architect, conduits 1-1/4" size and larger shall not be installed in structural concrete slabs. Where conduits are permitted, and are installed in concrete slabs on grade, slabs shall be thickened at bottom where conduits occur to provide 3" of concrete between conduit and earth. Required excavation shall be part of work of this Section.

2. If concrete slab is 5" or more in thickness with a moisture barrier plastic sheet between earth and slab, 1" and smaller conduits shall be installed in slab with a minimum of 1" concrete between earth and conduit.

D. Penetration In Concrete Walls, Beams and Floors: Provide sleeves where conduits pierce concrete walls, beams and floors, except floor slabs on earth. Sleeves shall have 1/2" clearance around conduits. Sleeves shall not extend beyond exposed surfaces of concrete and shall be securely fastened to forms. Where conduits pass through walls below grade, calk with approved sealant and backer materials between conduit and sleeve to obtain a watertight joint. Sealant shall be as indicated in Section 07920: Sealants and Calking.

3.02 STUBS

A. Panelboard: Install two 1" conduits from each flush mounted Panelboard to accessible underfloor space and to accessible above ceiling space where these conditions occur. Cap conduits with standard galvanized pipe caps.

B. Floor: At each point where floor stubs are indicated in open floor areas, for connections to machines and equipment, conduits shall be terminated with couplings, tops flush with finished floor. Stubs shall extend above couplings the indicated distance. Where capped stubs are called for, couplings shall be closed with cast iron plugs with screw drive slots.

C. Underground:

1. Underground conduit stubs shall be terminated at locations indicated, except if necessary, they shall extend 5'-0" beyond building foundations, steps, arcades, concrete walks and paving. Rigid metallic conduit stubs and nonmetallic conduit stubs shall be capped by installing a coupling flush in end wall of concrete encasement and plugging with an approved plug. As-Built Drawings shall show location of ends of underground conduit stubs fully dimensioned with reference to buildings or permanent landmarks. These dimensions including depth below finished grade, shall be marked on As-Built Drawings in presence of the District's Inspector before Backfilling trench. Where extending existing concrete encased stubs, clean, chip and wire brush end of existing concrete and brush on a heavy coat of neat cement paste or epoxy bonding agent.

2. Over ends of individual underground conduit stubs or groups of conduit stubs, install 4"x18" deep PVC filled with concrete, flush with finished grade in asphaltic concrete or lawns, and 2" above finished grade in planting areas. Cast a 3" x 3" brass plate engraved "ELECT" flush in top of concrete. Secure plate to concrete with brass dowels or other approved anchorage methods.

END OF SECTION

SECTION 16120

LOW VOLTAGE WIRE 600-VOLT AC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Low voltage wire, splices, terminations and installation.

B. This Section describes single conductor THWN or THNN, a general purpose building wire insulated with polyvinyl chloride (PVC) and covered with a tough protective sheath of nylon intended for lighting and power circuits at 600 volts or less. The wire may be operated at 90 °C in dry locations and is listed by Underwriters Laboratories for use in accordance with Article 310 of the California Electrical Code 2007 Edition.

1.02 SUBMITTALS

A. Submit in accordance with Section 01302: Submittals.

PART 2 - PRODUCTS

2.01 WIRE

A. Wire shall be single conductor type THHN or THWN insulated with polyvinyl chloride (PVC) and covered with a tough protective sheath of nylon, rated at 600 volts. The wire may be operated at 90° C. maximum continuous conductor temperature in dry locations and 75° C. in wet locations and shall be listed by Underwriters Laboratories under Standard 83 for Thermoplastic Insulated Wires. Conductors shall be solid copper for #10 AWG and smaller conductors and stranded copper for #8 AWG and larger conductors. Each conductor shall be insulated with PVC and sheathed with nylon. Each wire shall be identified by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Wire shall be tested in accordance with the requirements of UL Standard for types THWN or THHN.

B. Conductors shall be solid Class B or stranded Class C, annealed uncoated copper per UL Standards 83 or 1063.

2.02 STANDARDS

A. THWN/THHN wire shall comply with the following standards:

1. UL 83 for thermoplastic insulated wires.

2. UL 1063 for machine tool wires and cables.

PART 3 - EXECUTION

3.01 WIRE INSTALLATION

A. Wire shall not be installed until all plastering throughout building is completed, and all debris and moisture removed from conduits, boxes, and cabinets.

B. Wire-pulling compounds used as lubricants in installing conductors in raceways shall only be talc or other compounds approved and listed by UL. No oil, grease, graphite, or similar substances may be used. Pulling of #1/0 or larger conductors shall be done only with an approved cable pull machine.

C. The District's Electrical Inspector shall be called to site and shall supervise installation of all feeder cables. The District's Construction Inspection Branch shall be notified not less than 2 working days in advance of proposed time of installation.

D. At all outlets for light, power and signal equipment, pigtail splices with 8" circuit conductor leads shall be provided for connection to fixtures, equipment and devices.

E. Pressure cable connectors, pre-insulated "Scotchlok", 'Y', 'R', or 'B' spring-loaded twist-on type, may be used for splicing # 8 gauge or smaller conductors, for all wiring systems, except public address, telephone system, or system clocks.

F. All joints, splices, taps and connections for cables, #6 gauge and larger shall be made with high-pressure cable connectors approved for use with copper conductors. The connector shall be insulated with a heavy wall heat shrink "WCSM", or a cold applied roll-on sleeve "RVS". Insulation level shall be a minimum of 600V, and the joints, splices, and taps shall be qualified to ANSI C119.2, and UL listed for pressure connectors.

G. Wire switchboards, panel cabinets, pull boxes and other cabinets shall be neatly grouped and tied in bundles with nylon ties at 10" intervals. At switchboards, panels and terminal blocks, wires shall be fanned out to terminals.

H. Keep conductor lengths to a minimum within the wiring space. Conductors must be long enough to reach the terminal location in a manner that avoids strain on the connecting lug.

I. Exercise care to maintain the conductor required bending radius.

J. Each neutral conductor larger than #6 gauge which is not color identified throughout its entire length shall be painted white or taped white wherever it appears in a switchboard, cabinet, gutter or pull box. Neutral conductors #6 gauge and smaller shall be white color identified throughout their entire length.

K. Fire Alarm, Clock, Security Intrusion Detection, Public Address, and Telephone Systems wiring shall be continuous from terminal cabinets or from equipment to each device. Wire shall be thin. Splices are not allowed between devices and/or terminal cabinets at junction and pull boxes. Wiring shall be terminated at approved terminal blocks only.

L. All systems of wiring shall be so installed that, when completed, systems will be free from short circuits and grounds, other than required grounds. Electrical contractor shall include in his bid cost of services an approved independent testing laboratory to test all feeders insulation resistance.

The tests to be performed are as follows:

1. With a megger insulation tester, use the time-resistance method (Sometimes referred to as absorption test) to test each feeder and branch circuit wire. Tests must be conducted with wire disconnected at each end in order to test the wire itself. A second test must be conducted with the wire connected at each end and the circuit breakers or switches in the closed positions.

2. Tests shall be performed in presence of the District Electrical Inspector.

Three copies of the test results shall be submitted to the District Electrical Inspector. Test results shall be submitted on an official form from the independent testing laboratory showing project location, test engineer, test conditions, test equipment data, and final test results.

3.02 WIRE COLOR CODE

A. Color Code for Clocks, Program Bells, Program Selector and Fire Alarm System Devices.

B. Color Code, Signal Systems: Wires for signal systems shall be color coded and shall be installed under direction of the District's Electrical Inspector. Except where otherwise specified, color coding shall be as follows:

SYSTEM	COLOR CODE
Clocks	Pink, Gray and Orange
Program Bells (Elementary Schools)	White (Common) Black
Program Bells (Secondary Schools)	White (120 volt common) Black (C.R. Program) Blue (Shop Program) Brown (Gym Program) Yellow (Aud. Fire Alarm)
Fire Alarm Bells or Horns	Black (-) and Red (+)
Fire Alarm Strobe	Brown and Yellow
Fire Alarm System Feeder or Service	Black and White
Fire Alarm Pull Stations (Non-Addressable)	Orange and Blue
Smoke Detectors, Heat Detectors (Non-Addressable)	Red (+) and Yellow (-)
Duct Smoke Detectors (Non-Addressable)	Red (+) and Yellow (-)
Fire Sprinkler Flow Switch (Non-Addressable)	Red (+) and Purple (-)
Fire Sprinkler Tamper Switch (Non-Addressable)	Red (+) and Brown (-)
White Visual Program Signal	Yellow with White Stripes, White (common)
Program Switching Unit	Blue (Hot) White (common) 4 - Black (C.R. Program) 4 - Yellow (Shop Program) 4 - Blue (Gym Program) Blue ("All" Button) 2 - Black (Spares)
Spare Wires	Black

3.03 FEEDER IDENTIFICATION

A. Lighting, power, low voltage feeder wires and cables shall be identified at each point conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of a heat shrink wire marker, which provides terminal strain relief, Raychem Shrinkmark, or Brady Permasleeve markers. Identification in other areas shall be by means of wraparound tape markers Raychem Cable Markers, or Brady Perma-Code. All markers shall include the feeder designation, size and description.

3.04 TAPE

A. Splices, joints and connectors joining conductors shall be covered with insulation equivalent to that on conductors. Free ends of conductors connected to an energized source shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL for use as sole insulation of splices shall be used and shall be applied according to manufacturer's printed specifications.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section Includes: Provide and install a grounding system as indicated.

1.02 RELATED SECTIONS

A. See related Sections for their system grounding Requirements.

B. Section 16010: Basic Electrical Requirements.

1.03 SYSTEM DESCRIPTION

A. All metallic objects on the premises that enclose electrical conductors or that are likely to be energized by electrical currents shall be effectively grounded.

B. All metal equipment parts such as enclosures, raceways, and equipment grounding conductors and all earth grounding electrodes shall be solidly joined together into a continuous electrically conductive system.

C. All metallic systems shall be solidly interconnected to the electrical system as provided by the service entrance and for each grounded separately derived system that is installed.

D. A separately derived A.C. source shall be grounded to the equipment grounding conductor and to a separate made electrode.

E. Electrical continuity to ground metal raceways and enclosures, isolated from equipment ground by use of non-metallic conduit or fittings, shall be provided by a green insulated grounding conductor of approved size within each raceway connected to isolated metallic raceways, or enclosures at each end. Each flexible conduit over 6'-0" in length shall be provided with a green insulated grounding conductor of approved size.

F. Cold water or other utility piping systems shall not be used as grounding electrodes, due to the District's use of insulating couplings and nonmetallic pipe in such installations. Grounding electrodes shall be "made electrodes" specified as follows:

1. Grounding electrodes as specified in Article 2.01, Paragraph B of this Specification.

2. Concrete enclosed electrode, which is made up of at least 20'-0" of #4 AWG, minimum size, copper conductor, encased by at least 2" of concrete, located within or near bottom of a concrete foundation, or footing, which is in direct contact with earth. Footing rebar must be connected to copper wire using approved connections. An external electrode as specified in Article 2.01, Paragraph B of this Specification Section must be installed and connected to foundation or footing rebar.

G. Non-current-carrying metal parts of high voltage equipment enclosure, signal and power conduits, switchboard and panelboard enclosures, motor frames, equipment cabinets, and metal frames of buildings shall be permanently and effectively grounded.

H. Metallic or semi-conducting shields, and lead sheaths of cables operating at high voltage, shall be permanently and effectively grounded at each splice and termination.

I. Neutral of service conductors shall be grounded as follows:

1. Neutral shall be grounded at only one point within school site for that particular service. Preferable location of grounding point shall be at service switchboard, or main switch.

2. Equipment and conduit grounding conductors shall be bonded to that grounding point.

3. If other buildings on campus are served from a switchboard or panelboard in another building, power supply is classified as a feeder and not as a service.

4. Equipment grounding conductor is carried from switchboard to each individual building. At building, grounding conductor is bonded with power equipment enclosures, metal frames of building, etc., to "made electrode" for that building.

5. Neutral of feeder shall not be grounded.

J. If there is a distribution transformer at a building, secondary neutral conductor shall be grounded to "made electrode" serving building.

K. Within every building, main switchboard or panel, shall be bonded to the cold water line. Metallic piping systems (gas, fire sprinkler, etc.) shall be bonded to cold water line.

1.04 SUBMITTALS

A. Submit in accordance with Section 01302: Submittals.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Yard boxes shall be pre-cast concrete and shall be approximately 14" wide, 19" long, and 12" deep (outside dimensions), or larger, if necessary, to obtain required clearances. Boxes shall be equipped with bolt-down, checkered, cast iron covers and a cast iron frame cast into box. Yard boxes shall be Christy or approved equal.

B. "Made" electrodes shall be approved copper-clad steel ground rods, minimum 3/4" diameter, 10'-0" long.

C. Grounding shall be in accordance with CEC Article 250.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Grounding electrodes shall be located in nearest usable planting area, where not otherwise indicated on Drawings, and each electrode shall terminate within a concrete yard box installed flush with finish grade. In planting areas, concrete yard box shall be 2" above planting surfaces.

B. If concrete enclosed electrode is used, grounding wire shall terminate to a suitable copper plate with grounding lugs.

C. Grounding rods shall be driven to a depth of not less than 8'-0". A permanent ground enhancement material shall be used at each ground rod to improve grounding effectiveness. The manufacture's guidelines shall be used for each installation.

D. Grounding electrodes shall have a resistance to ground of not more than 5 ohms.

E. When using grounding rods, if resistance to ground exceeds 5 ohms, 2 or more rods connected in parallel shall be provided to meet grounding resistance requirement.

F. Ground rods shall be separated from one another by not less than 10'-0".

G. Parallel grounding rods shall be connected together with approved fittings and approved grounding conductors in galvanized rigid steel conduit, buried not less than 12" below finish grade.

H. Electrical Contractor shall include in his bid, cost of services of an approved independent testing laboratory, to test grounding resistance of all made electrodes, ground rods, and bonding of building steel, water pipes, gas pipes and other utility piping. Tests to be performed are as follows:

1. Visually and mechanically examine ground system connections for completeness and adequacy.

2. Perform "fall of potential" tests on each ground rod or ground electrode where suitable locations are available per IEEE Standard No. 81, Section 8.2.1.2. Where suitable locations are not available, measurements will be referenced to a known dead earth or reference ground.

3. Perform the two point method test per IEEE No. 81, Section 8.2.1.1 to determine ground resistance between ground rod and building steel, and utility piping - such as water, gas and panelboard grounds. Metal railings at building entrances and at handicapped ramps shall also be tested.

4. Test shall be conducted in presence of the District Electrical Inspector.

I. Three copies of test results shall be submitted to the District Electrical Inspector. Test results shall be submitted on an official form from the independent testing laboratory showing project location, test engineer, test conditions, test equipment data, ground system layout or diagram, and final test results.

END OF SECTION

SECTION 16470

PANELBOARDS AND SIGNAL TERMINAL CABINETS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Lighting and power distribution facilities, including panelboards.

1.02 RELATED SECTIONS

A. Section 16010: Basic Electrical Requirements.

B. Section 16050: Basic Electrical Materials.

C. Section 16509: General Lighting.

1.03 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Shop Drawings: Include a front elevation, indicate cabinet dimensions, make, location and capacity of equipment, size of gutters, type of mounting, finish, and catalog number of locks.

1.04 DESIGN REQUIREMENTS

A. Panelboards:

1. Panelboards shall be wall-mounted, enclosed safety type with 120/240 volt, 3-wire solid neutral 277/480 volt, 4-wire or 120/208 volt, 4-wire solid neutral mains as indicated on Drawings or specified. First panelboard of each building shall be provided with main or sub-feeder circuit breakers where so indicated.

2. Single pole branches shall be molded case, thermal magnetic circuit breakers with inverse time delay, trip free, quick-make, quick-break mechanism and silver alloy contacts. Circuit breakers shall be rated as indicated on Drawings, with ampere rating marked on handle and shall indicate "ON - OFF" and tripped positions. Ground fault interrupters shall be incorporated into circuit breakers where indicated. They shall be listed by UL as a ground fault device.

3. Two and 3 pole branches shall be enclosed, and shall be thermal magnetic circuit breakers with inverse time delay, non-tamperable, ambient compensated, single handle, internal common trip, and quick-make, and quick-break mechanism with silver alloy contacts. Circuit breakers shall be rated as indicated on the Drawings.

4. Main and subfeeder circuit breakers shall be enclosed, thermal magnetic type with inverse time delay, single handle common trip, quick-make, quick-break mechanism, corrosion resistant bearings and silver alloy contacts. Ampere frame size and trip rating shall be as indicated on Drawings. Breakers over 225 amperes shall have interchangeable trip units. Handles of main and subfeeder circuit breakers shall be under cabinet door. Voltage rating shall be as indicated on Drawings.

5. All circuit breakers shall be one-piece, bolt-on type and shall meet short circuit interrupting capacity requirements indicated on Drawings.

6. All internal connections shall be made with plated copper bus bars and the busses shall extend for full length of space available for branch circuit breakers. Feeder cable connectors shall be installed at point of feeder entrance. All terminals shall have copper conductors. Panel boards fed by conductors having overcurrent protection greater than 200 amperes shall be protected on supply side by overcurrent devices having a rating not greater than that of panelboard.

7. Except where otherwise indicated, circuit breakers shall be in 2 vertical rows connected to bus bars in a distributed phase arrangement. Two pole branches shall be balanced on busses. Each single pole branch shall be numbered adjacent to its circuit breaker with odd numbers on left and even numbers on right.

8. All specified circuit breaker spaces shall include necessary hardware required for future installation of circuit breakers.

9. Provide locking devices for each individual circuit breaker. Padlocking device shall be secured to circuit breaker and by panel deadfront plate.

B. Panelboard Cabinets:

1. Panelboard cabinets shall be code gauge galvanized steel or blue steel; fronts, doors, and trims shall be code gauge furniture steel. Cabinets shall have at least 6" high gutters at top and bottom where feeder cable size exceeds #4 or where feeder cable passes through cabinet vertically. Cabinets shall have top and bottom gutters sized as required by inspection department having jurisdiction, but never less than 6" where more than one feeder enters top or bottom of cabinets. Side gutters shall not be less than 4" wide. Width of cabinets shall be 20", unless indicated different on Drawings.

2. Doors shall be cut true, shall accurately fit opening and finish smooth across joints. Rabbets shall be inside. Hinges shall be entirely concealed except for barrels and pins. Hinge flanges shall be welded to door and trim. Each door shall be equipped with flush type lock, spring latching, Corbin lock for metal door, keyed to a Corbin CAT 60 key.

3. Where contactors, time switches, and control devices are specified or indicated to be installed within panelboard cabinets, a separate compartment and door shall be provided at top of cabinet for such devices. Door shall be sized as required to permit removal of contactor and other devices intact. Gutters shall be provided at sides and top of compartment. Door shall be equipped with flush type lock, spring latching, Corbin lock for metal door, keyed to a Corbin Cat 60 key.

4. Outdoor cabinets shall be NEMA 3R. Construction shall be formed from code gauge galvanized steel with an ANSI #61 gray enamel finish. Provide a heavy-duty 3 point latching vault type door handle with padlocking provisions. Provide stainless steel butt hinges on each door. Padlocks must be furnished, keyed to a Corbin Cat 60 key.

C. Panelboard Schedule: Contractor shall prepare a neatly typewritten schedule with number or name of room or area, or load served by each panelboard circuit. Room numbers or names used shall be determined at site and shall not necessarily be those used on Drawings. Schedule shall also indicate panel designation, voltage and phase, building and distribution panel or switchboard from which it is fed. Schedule shall be mounted in a frame under transparent plastic 1/32" thick on inside of each panelboard cabinet door.

D. Panelboard Standards: All panelboards shall meet latest revisions of following standards:

1. California Electric Code, Article 384.

2. UL 67, Panelboards.

3. UL 50, Cabinets and Boxes.

4. UL 943, GFCI.

5. UL 489, Molded case circuit breakers.

6. NEMA PBI.

7. Federal Specifications W-P-115 and WC-375B.

8. Panelboards must be UL labeled.

E. Terminal Cabinets, Signal:

1. All signal terminal cabinets shall conform in every respect to the Specifications for panelboard cabinets, except as modified herein.

2. All terminal cabinets shall be flush type, with 2" trim or surface mounted type, as indicated on Drawings. All terminal cabinets shall have section. Cabinets shall be provided with barriers to separate each system. Sections over 24" in width shall be provided with double door and lock. Each terminal cabinet, or section of a terminal housing a separate system, shall measure 12" long x 18" high x 5-3/4" deep, unless otherwise indicated on Drawings. Trims for sectional cabinets shall be of one-piece construction.

3. All terminal cabinets shall be equipped with 3/4" thick plywood backboards within cabinets, and fastened in place with machine screws. Backboards shall be largest size cabinet and conduit terminations will permit.

4. Flush mounted terminal cabinets shall be finished as specified for flush mounted panelboard cabinets. Surface and semi-flush mounted terminal cabinets shall be finished as specified for surface mounted panelboard cabinets.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Panelboards shall be manufactured by Square D, Siemens, General Electric, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Panelboards shall be located so that they are readily accessible and not exposed to physical damage.

B. Panelboards installed outdoors shall be specifically approved for wet locations and shall be weatherproof in a Nema 32 cabinet.

C. The Panelboard location shall have sufficient working space around the panel to comply with the California Electrical Code.

D. Panelboards shall be securely fastened to the mounting surface.

E. Unused openings in the cabinet shall be effectively closed.

F. Cabinets shall be grounded as specified in Article 250 of the California Electrical Code.

G. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the enclosure.

H. Lugs shall be suitable and approved for use with the conductor being connected.

I. Conductor lengths shall be kept to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

J. Maintain the required bending radius of conductors inside the cabinet.

K. Clean the cabinet of all foreign material such as cement, plaster, paint.

L. Distribute and arrange conductors neatly in the wiring gutters.

M. Use the manufacturer's torque values to tighten all lugs.

N. Before energizing the panelboard the following steps must be taken:

1. Retighten all connections to the manufacturer's torque specifications. Verify that all required connections have been made.

2. All blocks used for shipment must be removed from all component devices and the panelboard interior.

3. Manually exercise all circuit breakers to make certain they operate freely.

4. Remove all debris from panelboard interior.

O. Follow all manufacturer's instructions for installation.

END OF SECTION

SECTION 16479

MOTOR CONTROL AND CONTROL DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The connection to the terminals of motors, the furnishing and installation of disconnect switches and motor starters for motors or equipment.

1.02 RELATED SECTIONS

A. Division 15: Mechanical.

B. Section 16010: Basic Electrical Requirements.

C. Section 16050: Basic Electric Materials.

D. Section 16429: Switchboards and Protective Devices.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300: Submittals.

1. Shop Drawings: Include a front elevation, show dimensions, make, location and capacity of equipment, type of wiring, size of gutters, type of mounting and finish for motor control centers.

2. Product Data: Submit catalogs indicating make, ratings, dimensions and catalog number for disconnect switches, motor starters and control devices.

3. Record Drawings: A single reproducible set of record drawings showing the motor control center exactly as it was installed, including wiring diagrams of all components.

1.04 DESIGN REQUIREMENTS

A. Motor overload protection of manual reset type, as part of a motor starter and set at not to exceed 125% of motor full load current rating, shall be provided for each motor exceeding 1/8 hp. in size except where indicated otherwise and except for following: Motors of sufficient impedance to prevent overheating on failure to start (such as clock motors), and motors provided with an approved built-in manual reset type device, responsive to motor current and set at not to exceed 125% of the motor full load current rating, which will interrupt all current to motor.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. MOTOR CONTROL CENTERS

1. Motor control centers shall be of metal-clad, free floor-standing dead-front type, totally enclosed with one or more vertical sections.

Arrangement and construction shall be as indicated on Drawings and as specified. Design, construction and testing shall comply with requirements of latest NEC, UL publication UL-845, NEMA publication ICS-2-322 and applicable standards of ASA, AIEE and NEMA. Equipment shall be completely fabricated, wired and tested at factory, and shall be shipped in sections ready for installation, complete with all required assembly bolts and mounting channels. General construction shall consist of modular vertical sectioned cubicles, approximately 90" high and 20" wide. Sectional cubicles shall be bolted together to form required arrangement having the appearance of a single assembly. Cubicle sections shall be fabricated from a minimum of #12 gauge P & O mill prime sheet steel, shaped, reinforced and welded to form a rigid structure. Sections shall contain required number of modular spaces for various starter units. Wiring gutters shall extend through cubicles with front accessible bolted filler plate covers.

2. Bus bars and connections shall be copper. Vertical buses shall be rated at not less than 300 amperes and shall be placed to allow starter units to be connected by pushing into place. Bus connections shall be free-fitting and bolted, with silver plated connecting areas rated at 200-amperes per square inch. Bus work bracing and support shall withstand the short circuit stresses indicated on Drawings without damage to buses or structure.

3. Main horizontal and vertical buses shall be made of copper and entire length shall be electrolytically silver plated. A copper ground lug shall be provided in each incoming line vertical section. A horizontal tin plated copper ground bus shall be provided in each section of the Motor Control Center. Horizontal ground bus shall run continuously throughout control center. RMS amperes symmetrical bus bracing shall be as indicated on Drawings. Vertical sections shall support horizontal and vertical buses, combination started units, covers and doors. Vertical sections shall have structural supporting members formed of a minimum of #13 gauge hot-rolled steel. Reinforcement for structural parts shall be of #10 gauge steel to provide a strong, rigid assembly. Vertical sections shall be designed to accommodate plug-on units 20" wide and 20" deep, and shall be provided with horizontal and vertical wireways.

4. Separate control cell compartments of sizes indicated on Drawings must be provided for future interlocking relays and transducers.

5. Starters shall be of the plug-in combination magnetic type, as indicated on Drawings, each with a separate hinged door. Starters shall be provided with a separate overload in each phase.

   a. Combination magnetic starters shall be circuit breaker magnetic across-the-line type, or as indicated on Drawings, and shall be furnished with suitable thermal overload elements for controlled motor. Breaker shall be bussed with copper bus bars. Covers shall be mechanically interlocked with circuit breakers to prevent opening when energized. Circuit breaker handles shall be capable of being padlocked in the "Off" position with one to 3 padlocks.

   b. Each motor starter shall have a red pilot light, HOA selector switch or pushbutton station, and a control circuit transformer, unless otherwise indicated on Drawings.

6. All units shall be provided with unit doors, unit support pans, unit saddles, and unit disconnect operators. Each unit shall be designed and constructed so that any fault will be localized within compartment.

7. Control devices and wiring of motor control centers shall be in accordance with functional wiring diagrams indicated on Drawings and requirements of controlled equipment.

8. Motor Control Center wiring shall be NEMA class I, type B.

9. Motor control center shall be as manufactured by Square D company, General Electric, Siemens or approved equal.

B. Disconnect Switches:

1. Switches shall be 240 volt or 480 volt as required totally enclosed, externally operated, with quickmake, quickbreak operating mechanism, interlock cover, and provisions for locking cover in closed position and locking switch in "ON" and "OFF" positions. Switches shall be single throw, unless otherwise indicated or specified. Switches controlling direct current loads shall be DC rated.

2. All switches shall have switch blades which are fully visible in "OFF" position when switch door is open. All current carrying parts shall be plated to resist corrosion and promote cool operation. Switches shall have removable arch suppressors where necessary to permit easy access to line side lugs. Lugs shall be front removable and UL listed for 75° C., copper wires.

3. Switch enclosure shall be general purpose NEMA Type 1 for indoor locations and raintight, NEMA Type 3R, rainproof for outdoor locations. NEMA Type 3R enclosures shall be manufactured from galvanized steel with gray baked enamel and shall be furnished complete with rainproof bolt-on hubs. Covers shall be attached with pin type hinges. Removable closing cap type is not acceptable. Quick release latches shall be acceptable only when furnished "tamper-resistant" to prevent breakage due to vandalism, and furnished with Corbin 66 locks keyed to Corbin 60 key. Switches shall be fusible or non-fusible as indicated on Drawings. Fusible switches shall accept cartridge fuses. Current rating of switches, number of poles, solid neutral facilities, and current rating of fuses shall be as indicated on Drawings. Switches shall have proper horsepower rating equal to or greater than horsepower of motor controlled. Only lower horsepower rating of dual rated switches will be accepted as a switch rating. Switches shall accept Class H, Class J and Class R fuses.

4. Padlocking device shall lock operating handle and cover with one padlock regardless of "ON" or "OFF" position. Switches shall be heavy-duty type, as manufactured by Square D, General Electric, Cutler-Hammer or approved equal. Furnish a minimum of 2 padlocks and 2 keys with each switch. Padlocks shall be SR135.

5. Switches shall be UL listed and shall comply with NEMA Standard KSI.

6. Furnish one spare fuse for each fusible disconnect switch installed. Spare fuses shall be same type and rating as those installed.

C. Motor Starters:

1. Motor starters shall be AC magnetic across-line starters unless otherwise indicated on Drawings.

2. AC magnetic across-the-line starters shall have manual reset thermal overload protective devices including heating elements. Starters shall be furnished in a NEMA 1, NEMA 3R or other type of enclosure as indicated on Drawings. Starters shall be furnished with HOA selector switches or push-buttons, as indicated on Drawings. NEMA size, voltage rating, number of poles, and special features shall be as indicated on Drawings. Horsepower rating of each starter shall be equal to or greater than motor horsepower. Starters for motor circuits rated at 208 volts and above shall be provided with a control circuit transformer, having a 120-volt secondary. Combination magnetic starters are acceptable. Three-phase starters shall have three-element protection.

3. Manual across-line starters shall have manual reset thermal overload protective devices, including heating elements, start-stop-reset device or H.O.A. switch as indicated on Drawings, operable from front. Nema type enclosure shall be as indicated on Drawings. NEMA size, voltage rating and number of poles shall be determined by motor horsepower, voltage and phase indicated on Drawings. Horsepower rating of each starter shall be equal to or greater than motor horsepower. Combination manual starters are acceptable.

4. Thermal switch starters shall be tumbler type with plaster ears, binding screws for wiring, standard size composition cups which fully enclose mechanism, and shall be designed to fit standard outlet boxes. Thermal switches shall be fractional horsepower motor starters with thermal overload protective devices including heating elements and with handle providing "ON-OFF-RESET" control. Horsepower rating, voltage rating, and number of poles shall be determined from motor horsepower and voltage indicated on Drawings. Switches shall be key operated where so indicated on Drawings. Furnish one key with each key type switch. Horsepower rating of each switch shall be equal to or greater than motor horsepower.

5. Relays used for directly controlling motors shall have general purpose enclosures unless otherwise indicated or specified and shall be horsepower rated. Relay size, voltage rating and number of poles shall be determined from motor horsepower and voltage indicated on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Motor control centers installed outdoors, or below grade, shall be installed on a concrete pad as described under Cast-In-Place Concrete: Section 03300, and as indicated on Drawings.

B. Anchor bolts for free-standing equipment shall be designed to meet State seismic requirements. Equipment shall be anchored to new slab with 3/4" redhead wedge anchor bolts. All 3/4" anchor bolts shall be tested to withstand 150 ft.-lbs. torque. A minimum of 4 anchor bolts per motor control section are required.

C. Equipment shall be located so that it is readily accessible and not exposed to physical damage.

D. Equipment locations shall have sufficient working space around the equipment to comply with the California Electrical Code.

E. Equipment installed outdoors shall be specifically approved for wet locations and shall be in a weatherproof NEMA 3R enclosure.

F. Equipment shall be securely fastened to the mounting surface.

G. Equipment enclosure shall be grounded to comply with Article 250 of the California Electrical Code.

H. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the equipment enclosure.

I. Lugs shall be suitable and approved for use with the conductor being connected.

J. Conductor lengths shall be kept to a minimum within the wiring space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

K. Maintain the required bending radius of conductors inside the cabinet.

L. Distribute and arrange conductors neatly within the equipment space.

M. Tightening of wire lugs or any conductor connections shall be performed in the presence of the District Electrical Inspector. Torque values shall be those recommended by manufacturer.

N. Remove all blocks used for shipment from all component devices.

O. Manually exercise all switches and circuit breakers to make certain they operate freely.

P. Remove all debris from equipment interior.

Q. Follow all manufacturers instructions for installation.

R. Furnish spare fuses: One spare fuse shall be furnished for each fusible switch installed. Spare fuses shall be of the same type and rating as those installed.

END OF SECTION

SECTION 16509

GENERAL LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnishing and installing lighting fixtures (including lamps) and lighting controls.

1.02 RELATED SECTIONS

A. Raceway, wiring, boxes, switches and connections are specified under Section 16050: Basic Electrical Materials.

1.03 SUBMITTALS

A. Submit in accordance with Section 01302: Submittals.

1. List of Materials: Submit a complete list of materials proposed for this Section.

2. Shop Drawings: Provide detailed and dimensioned Working Drawings showing kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size of lamps, and complete details of method of fitting suspension and securing fixtures in place. Provide wiring diagrams for lighting control equipment. Drawings shall contain sufficient information to enable a workman to assemble and install equipment without further instructions.

1.04 MOUNTING REQUIREMENTS

A. Comply with State of California earthquake requirements for hanging fixtures.

1.05 QUALITY ASSURANCE

A. Work shall be done by a qualified Contractor holding a C-10 and other licenses and permits required by authorities.

B. Components shall be listed by Underwriters Laboratories (UL).

1.06 GUARANTEE

A. Guarantee ballasts, lamps and components against service failure for 2 years. Indicate installation date on each ballast by inscribing month, day and year on housing.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Each lighting fixture shall be the "Type" indicated on Drawings. Fixtures of same "Type" shall be of identical make, design, and appearance. Size of each lighting fixture, lamp and fixture wattage shall be as indicated on Drawings.

B. Design of lighting fixtures, accessories, and supports, as well as method of hanging fixtures shall comply with requirements for earthquake resistant construction of the State of California and the city of Los Angeles City Electrical Testing Laboratory.

2.02 FLUORESCENT FIXTURES

A. Ballasts, Lamps and Components For Fluorecent Light Fixture:

1. Fluorescent ballasts shall be electronic type parallel lamp operation and shall operate lamps at a frequency above 20 KHz. Ballast manufacturer must have a minimum of 10 years experience manufacturing electronic ballasts. Minimum starting temperature shall be 0° C. Ballasts shall be Class "P" with automatic thermal protectors, and guaranteed against service failure for 5 years. Contractor shall indicate installation date on each ballast by inscribing month, day and year on ballast housing. Ballasts shall be 265 milliamperes, A sound rating, high power factor type and shall be UL listed. Ballast shall be by Advance.

2. Ballast shall comply with all applicable State, Federal and industry performance safety standards including F.C.C. requirements governing electromagnetic and radio frequency interference, IEEE standards for line voltage transient protection and harmonic distortion.

3. Fluorescent lamps shall be 265 milliampere, T-8, rapid start, 32 watt, medium base bi-pin cool white, Eco and Extended Life unless otherwise specified. Lamps shall be rated not less than 20,000 hours average life based on 3 burning hours per start, and shall be furnished for each fixture in number and sizes specified. Fluorescent lamps shall have color rendering index of 80 at 4100°K color temperature, 2950 lumens output.

B. Lighting Fixture: shall be completed with 100% acrylic lens with T8ECO lamps (Lithonia or Prudential).

C. Exterior light shall be completed with metal halide lamps (Coopers or Hubbell).

D. Exit lights shall be die cast metal (Lithonia or approved equal) red colored led.

E. Parking lot lights shall be “Shoe Box” type (Coopers or Hubbell).

2.07 LIGHTING CONTROL COMPONENTS

A. All components shall meet California Code of Regulations, Title 24 requirements, shall be UL listed and have a 3-year warranty.

B. Unit Inverter: Each rapid start unit inverter shall consist of an emergency fluorescent power pack that installs in channel of new or existing lighting fixtures. Power pack construction shall be of durable polycarbonate housing having same size as a low profile rapid start ballast. Unit shall include test switch and pilot light. Unit shall automatically power one fluorescent lamp in fixture to provide a minimum of 90 minutes of emergency service upon failure of utility power. Upon return of utility power, battery shall automatically recharge for future emergency use. Unit shall produce a minimum of 20% of rated lamp lumens in emergency mode. Battery shall be field-replaceable, sealed, rechargeable, spillproof, maintenance-free nickel cadmium. High efficiency inverter/charger design shall include low voltage disconnect to prevent deep discharge of battery and dual voltage designed for connection to either 120 or 277 volts.

Charger shall recharge fully discharged batteries to provide full 90 minutes operation within 24 hours. An additional hot wire shall connect to unit in order to signal unit in event of a power failure. Power pack will not operate if it is shut off manually. Unit shall have an unconditional 3-year warranty, and shall be Dual Lite UFP-5 series, or approved equal.

C. Occupancy Sensors: Shall be by Mytech dual technology series or Leviten ODC or ODW series only.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install a lighting fixture for each lighting outlet indicated.

B. Fixture voltage shall be as indicated on Drawings.

C. Install recessed and surface-mounted fixtures, with plaster frames compatible with ceiling and wall systems employed; secure fixtures mechanically to frames.

D. Align rows of suspended and surface-mounted fluorescent fixtures to form straight lines at uniform elevations.

E. Recessed fixtures shall fit snugly against ceilings to prevent light leakage.

F. Support suspended recessed fixtures in a "T-bar" ceiling as follows: All fixtures shall be attached to ceiling grid to resist a horizontal force equal to weight of fixtures. For heavy-duty grid systems, fixtures weighing less than 56 pounds must also have 2 #12 gauge slack safety wires from diagonal corners to the structure above; fixtures weighing more than 56 pounds shall be independently supported by not less than 4 taut #12 gauge wires capable of supporting 4 times load. For intermediate duty grid systems, fixtures shall be independently supported by not less than 4 taut #12 gauge wires capable of supporting 4 times load. All fixture hanger wire ends shall be twisted 3 tight turns within a 2" distance. Fixture installation shall be coordinated with acoustical ceiling installation.

G. Light Standard Installation:

1. Set standards plumb and straight, in concrete footings. Grout and drypack after leveling standards. Concrete, grout and drypack requirements and procedures are specified in Section 02520: Site Concrete Work

2. Ground floodlight fixtures and poles.

3. Soldered and taped splices are required for installation of floodlight fixtures.

4. Each standard shall be 29'-0" high, tapered galvanized steel, with handhole, anchor bolts, fixture mounting-brackets and accessories.

5. Poles shall be designed to withstand a sustained wind velocity of 80 mph, and 104mph gusts.

6. Provide a fuse assembly in handhole of each light standard; Bussmann Type KTK in hex. holder, or approved equal. Fuse assembly shall easily disconnect power to pole standard for servicing. Fuse ratings shall be as required by applicable codes.

H. Install occupancy sensors and light level controllers per manufacturer's instructions.

3.02 CLEANING

A. Clean surfaces of all dirt, cement, plaster and other debris. Use cleansers compatible with material surfaces being cleaned.

3.03 TESTING

A. Check and adjust fixtures for even illumination.

B. Replace defective lamps and ballasts with new.

C. Test and adjust lighting control equipment for proper operation.

3.04 SPARE PARTS

A. Furnish 100% spare lamps. Furnish one spare lamp for each lamp installed.

B. Furnish 30% spare motion detectors of each type. (Minimum one spare detector of each type).

C. Furnish 30% spare ballasts of each type. (Minimum one spare ballast of each type).

END OF SECTION

SECTION 16605

EMERGENCY SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnishing, installing and connecting emergency system to lighting fixtures, signal systems and electrical loads as indicated on Drawings.

1.02 RELATED SECTIONS

A. Section 16050: Basic Electrical Materials

1.03 DESIGN REQUIREMENTS

A. Emergency systems shall be supplied from storage batteries with charging unit with a minimum of 90 minutes back-up capacity for lighting systems, and a minimum of 2 hours back-up for PABX-PA Systems. These 2 systems shall be separate and independent of each other. Systems shall be installed in accordance with requirements of all codes and regulations.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300: Submittals.

1. Shop Drawings: Submit a materials list for this system with catalog cuts, technical data and manufacturer's specifications.

B. Contractor shall submit to the District as a condition of final payment and acceptance 5 copies of service manuals including the following:

1. A detailed explanation of operation of system.

2. Instructions for routine maintenance.

3. Detailed instructions for repair of all major components of system.

4. Pictorial parts list and part numbers.

5. Pictorial and schematic electrical drawings of wiring systems, including operating and safety devices, and major components.

6. Installation instructions for all system components.

7. Programming Instructions.

8. Program listing.

9. Final test report.

10. A single reproducible set of record drawings showing the system exactly as it was installed including exact location of components.

1.05 QUALITY ASSURANCE

A. Work shall be done by a qualified Contractor holding C-10 license, with a minimum of 5 years experience in this type of work.

B. The manufacturer shall provide warranty for equipment specified to be free from defects in materials and workmanship for a period of two years after system is installed and accepted by the District.

C. The manufacturer shall have been producing inverter system equipment for at least five (5) consecutive years.

D. Each system shall undergo full load burn in testing at the factory.

E. Entire system shall be UL listed.

F. Local full-time factory authorized personnel shall be available for system start-up, warranty work, and service calls.

PART 2 - PRODUCTS

2.01 COMPONENTS

A. Central Inverter System (IPS) and Uninterruptible Power System (UPS).

1. General: Each system shall have following features:

a. System shall automatically protect itself against damage from overloads and short circuits while powered from either utility AC or during emergency inverter operations. It shall automatically recover from such overloads or short circuits. System shall automatically disconnect load when battery voltage drops below approximately 85 percent of nominal battery voltage.

b. Batteries of system shall be maintenance-free type, with front access battery lugs and with lead calcium grids, and shall be provided with a 20-year warranty. Batteries shall have sufficient capacity to power inverter at full rated load for a minimum of 90 minutes for lighting loads, 2 hours for PABX and PA systems, 30 minutes for computer loads without battery voltage dropping below 85 percent of nominal battery voltage. Battery manufacturer's data sheets shall be provided showing recommended charge rates and operating conditions. Batteries shall be connected and installed in conformance with all recommendations of battery manufacturer, and shall be individually labeled with make and model identification. Contractor shall secure batteries to withstand seismic vibrations.

c. System shall be enclosed in a heavy gauge, commercial grade, steel cabinet, including hinged and lockable doors. Locks shall be keyed to Corbin CAT60. Contractor shall provide external local disconnect switches for all line and load circuits. Contractor shall also provide complete operating service, and parts manuals including, but not limited to, all electrical diagram and factory test data.

2. Central Inverter System (IPS) shall have following additional features:

a. A microprocessor shall oversee the inverter, and provide programmable functional self-test per NFPA 101 to ensure optimal system and sub-system performance. If abnormal conditions or failure occur, warning messages shall be issued and alarms shall be sounded so that timely action maybe taken to alleviate the problem or repair the system. If inverter becomes inoperable, the microprocessor shall be capable of shutting down components to prevent further damage.

b. The unit shall include a self/diagnostic facsimile system that performs the following:

(1) Programmable self-test with facsimile of results to a designated location.
(2) Automatic facsimile of an abnormal condition to a designated location.
(3) Test on demand from a touchtone phone with facsimile to a designated location.

c. System shall be self contained, UL-listed, designed to provide emergency sine wave power to operate the specified loads: 90 minutes for LIGHTING, and 2 hours for PA systems on any power outages including brownouts (85%) of utility voltage. Once power is restored, the level shall be transferred back after a specified time delay expired.

d. A digitally controlled high frequency pulse width modulated inverters shall provide a filtered sine wave with normally less than 3% total harmonic distortion. Loads maybe mixed up to .4 lead or lag power factor and allows operation in 120% continuous overload condition. Multiple inverters shall be balanced for equivalent load sharing. DC output shall drop no more than 5% at full load operation. The inverter output maybe split between normally off equipment and normally on equipment up to the capacity of the unit in any combination.

e. Battery charger, shall be microprocessor controlled to optimally maintain the batteries within the stations 40° C. operating range. Computer sub routines shall be monitor and prevent battery or charger damage from faulty operation, battery deterioration, overload condition or low voltage. Multiple chargers in some systems shall be balanced and battery recharge shall be within specified time by UL, NFPA, and NEC.

f. Microprocessor shall log in tests, abnormal events, and emergency operation by date and time in a retrievable memory. It shall also incorporate a service program that allows trouble shooting without activating the inverters or disconnecting batteries.

g. Start Up and Maintenance: The microprocessor shall contain commissionary data including unit size, serial number, order number, and battery configuration. Software shall be included to assist in installation of the equipment, brownout selection, time delay, and functional self-test.

h. Unit shall be furnished with 12 output circuit breakers.

i. Central Inverters System shall be ELV Series by Lititonia or approved equal.

j. System shall have UL listing separate at batteries.

3. Uninterruptible power system (UPS) shall have following additional features:

a. System shall be a self-contained, UL-listed system designed to provide continuous AC power; it shall be fully compatible with all connected loads and shall provide a sinusoidal output waveform with 5% of maximum total harmonic distortion. System input and output ratings shall be as indicated on Drawings. System shall have a throughput efficiency (with utility power on) of at least 90%, excluding charger and shall include, but not be limited to, AC sensing equipment, automatic transfer switch, battery charger, batteries, DC to AC inverter, and ferroresonant transformer.

b. Sensing and transfer equipment shall operate as follows:

(1) Under normal operating conditions, load shall be powered by normal AC line supply that has been filtered through ferroresonant transformer. When AC line power is present inverter shall be off; battery charger shall be off if batteries are fully charged.

(2) When AC line power fails, inverter shall supply AC power to transformer from series. There shall be no interruption or reduction in output of system during transfer from normal AC line supply to inverter battery supply, or back to line.

c. Battery charger shall have solid state circuitry and shall provide a high charge rate, capable of restoring batteries to full rated capacity within 12 hours. High charge and float charge characteristics shall be fully compatible with all specifications and recommendations of battery manufacturer. Battery charger shall operate properly throughout an input voltage range of 5% above and below nominal line voltage. Battery charger shall operate at 85% minimum efficiency.

d. Solid state DC to AC inverter shall be capable of driving full rated load at a power factor of 0.85 leading to 0.85 lagging, and shall maintain a frequency between 59 and 61 cycles per second at rated output voltage, throughout all operating conditions.

e. Ferroresonant transformer shall provide filtered AC power to load and protect it against following abnormal conditions-spikes, sags, surges, noise, lightning and "brownouts".

f. System shall be provided with a standard RS232 port to allow interface with computer or remote monitoring station. Additionally, system shall be equipped with a front panel keyboard and LCD display having following metering and control capabilities:

(1) Meter functions: AC volts out, AC volts in, battery voltage, AC current in, AC current out, VA load, DC current, frequency, heat sink temperature, ambient temperature, time, number of power outages, log of power outages, projected run time available, system hours, inverter hours, number of overloads.

(2) Alarm messages for: high AC out, low AC out, near low battery, low battery voltage, high battery voltage, ambient over temperature, heat sink over temperature, inverter on, overload, DC disconnect, charger on to long, charger off too long.

(3) Setpoints for: high AC voltage, low AC voltage, high battery voltage, low battery voltage, near low battery, high heat sink temperature, high ambient temperature, frequency tolerance, band rate (300 or 1200), battery capacity, battery charge voltage, charger equalize hours, equalize cycle.

g. For computer loads, UPS must allow for automatic, safe shutdown of systems for power outages longer than 30 minutes duration.

h. Uninterruptible power system shall be Liebert Series, or approved equal by MGE.

PART 3 - EXECUTION

3.01 SYSTEM SHIPPING AND START-UP

A. System (excluding batteries) may be shipped to job site at any time for installation. Batteries shall be shipped to job site directly from battery supplier, and shall remain in their sealed cartons until opened and examined, in presence of the District Electrical Inspector. Batteries shall not be shipped to job site more than 30 days prior to system start-up. System start-up shall be performed by factory authorized personnel, in presence of the District Electrical Inspector, with all loads connected, and shall include all necessary testing and adjusting to assure proper operation of all of system's functions. System start-up shall include follow-up visits as necessary. Following start-up, Contractor shall maintain system on a normally "ON" input circuit, and power to system shall not be turned off at night or on weekends.

3.02 BATTERIES

A. Batteries shall be complete with all necessary connectors and accessories, fully charged and ready for service.

3.03 ACCEPTANCE TESTING

A. Prior to final acceptance, Contractor shall conduct, in presence of the District Electrical Inspector, complete performance testing of system. Testing shall include operating system in emergency mode for at least 90 minutes, with all loads connected, while monitoring battery voltage, output voltage, and output frequency. Power factor of load shall be measured to ascertain compatibility with system. Contractor shall supply and operate all necessary test equipment. Test equipment shall be for testing purposes only and shall remain property of Contractor.

B. Final acceptance will be given after successful acceptance testing and performance of all operations related to work, as indicated on Drawings or, as specified herein.

END OF SECTION

SECTION 16721

INTELLIGENT FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manual and automatic fire alarm and smoke detection system.

1.02 CONTRACTOR QUALIFICATIONS

A. All work specified in Section 16721 shall be performed (furnished, installed and connected) by a Notifier Engineered Systems Company. The fire alarm contractor shall provide the following documentation to show compliance with contractor qualifications. The documents shall be bound, indexed in the order listed below and provided during the submittal process. Equipment order, release or installation shall be not be placed without stamped approvals from the Project Architect.

1. Contractor's License: A copy of the electronics contractor's valid State of California License.

2. Proof of Experience: Proof that the fire alarm contractor has been regularly engaged in the business of fire alarm contracting consisting of, but not limited to, engineering, fabrication, installation, and servicing of fire alarm systems of the type specified herein for at least the past ten (10) consecutive years. Provide a statement summarizing any pending litigation involving any officer or principal of/or the company, the nature of the litigation and what effect the litigation may carry as it relates to this work in the worst case scenario. Non-disclosure of this item, if later discovered, may result, at the Owner's discretion, in the contractor bearing all costs and any cost related to associated delays in the progress of the work.

3. Insurance Certificates: Copy of fire alarm contractor's current liability insurance and state industrial insurance certificates in conformance with the contract documents.

4. Project List: A List containing at least ten (10) California installations completed within the last five (5) years by the fire alarm contractor that are comparable in scope and nature to that specified in the contract document.

5. Service Capability: Documentation indicating in detail that the fire alarm contractor has competent engineering, installation, service personnel and facilities with reasonable stock of service parts within 100 air miles of the job site.

6. Authorization Letters: Letters from the fire alarm equipment manufacturer stating that the fire alarm contractor is the Factory Authorized Distributor, and is trained and certified for the equipment he proposes to use on this project, and is licensed to purchase and install that software required to provide the specified functions.

7. Certification:

a. Proof that the fire alarm contractor is Underwriters Laboratories, Inc. (UL) listed under the classification of "PROTECTIVE SIGNALING SERVICES-LOCAL, AUXILIARY, REMOTE STATION AND PROPRIETARY (UUJS).

b. Copy of the following (NICET) Certificates. Proof that the certificate holders are a part of the fire alarm contractor's local facility servicing this project and will be actively involved in this project.

1) Certified Technologist or Registered Fire Protection Engineer.

2) Technician Level 4 minimum of (1)

8. Proof of Trained Personnel: Documentation that the fire alarm contractor has on staff personnel factory-trained and certified for the equipment proposed for this project. Also, a statement that personnel meeting these qualifications are in the local facility, and will be maintained at that facility throughout the project and the warranty period.

1.03 DESCRIPTION

A. This section of the specifications included that furnishing, installation, and connection of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 2002 Edition for protected premised signaling systems, except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

C. The system is that of **Notifier Company**, substitutions of equal product by Silent Knight shall be considered.

1.04 CODES

A. The installation shall be made in accordance with the drawings, specification and the following:

1. California Electrical Code, Article 760

2. National Fire Protection Association Standards

3. California State Fire Marshall

4. U.L. 1971

5. Authorities having jurisdiction

6. Codes as listed on the drawings.

7. California Building Fire Code.

B. The system including all components shall be listed by the State Fire Marshal and Underwriters Laboratories Inc. for use as a fire protective signaling system.

1.05 APPROVALS

A. The system must have proper listing and/or approval from the following nationally recognized agencies:

UL Underwriters Laboratories, Inc.
CSFM California State Fire Marshal
FM Factory Mutual
ISO International Standards Organization

B. The Fire Alarm Contractor shall submit shop drawings to the Project Architect before commencing work.

1.06 RELATED SPECIFICATIONS

A. Basic Electrical Materials Section.

B. Mechanical and Fire Protection Sections.

1.07 SCOPE

A. Provide a new intelligent reporting, microprocessor controlled fire detection system. It shall be installed in accordance with the specifications and drawings.

B. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

C. All required special programming equipment shall be furnished by the fire alarm contractor, turned over to the District and shall remain on site and shall be covered during the warranty period.

D. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto a (Class B) signaling line circuit.

2. Initiation device circuits shall be wired (Class B).

3. Indication appliance circuits shall be wired (Class B).

4. Digitized electronic signals shall employ check digits or multiple polling.

5. A Single ground of open on any system signaling line circuit, initiating device circuit, or indicating appliance circuit shall indicate a trouble condition at the control panel.

6. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

E. Basic System Functional Operation: When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

1. The system Alarm LED shall flash.

2. A local signal in the control panel shall sound.

3. Both INA Network Annunciators (new and existing east campus) display shall indicate all information associated with the Fire Alarm condition, including the type of alarm point and its location within the protected premises.

4. Printing and history storage equipment shall log the information associated with Fire alarm Control Panel condition, along with time and date of occurrence.

5. All system output programs assigned via control by event equations to be activated by the particular point in alarm shall be executed, and the associated System Outputs (alarm indicating appliances an/or relays) shall be activated.

F. Circuiting Guidelines:

1. All system smoke detectors shall be of the Addressable Analog type. Although each individual device point number and message shall be displayed on the LCD, the initiating devices shall be zoned as follows to provide the appropriate indication on the LED Annunciator.

2. Provide one alarm initiating zone per device as shown on the plans and annunciator(s).

a. Manual stations per floor and building.

b. Area smoke/heat detectors per floor and building.

c. Duct mounted smoke detectors per floor and building.

1.08 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings in accordance with the provisions in Section 01300.

B. The construction documents have been designed based on School District Standards. The system shown on the drawings is a Notifier networked system.

C. Provide all documentation as required in Section 1.02.

D. Provide shop drawing containing the following but not limited to:

1. Riser Diagram.

2. Typical Device Wiring Diagram.

3. Wire Legend.

4. Battery Calculation for each control panel, power supply, field power supply and network annunciator.

5. Worst Case Voltage drop for each circuit type per building.

6. Scaled floor plans showing all conduits, sizes, quantity of conductors.

7. Mounting Height of each devices and back box requirement.

8. Zoning and address description legend.

E. Provide product data booklets with the following but not limited:

1. Wire.

2. Battery Calculation for each control panel, power supply, field power supply and network annunciator.

3. Size of Batteries to be used in each panel.

4. Worst Case Voltage drop for each circuit type per building.

5. CSFM listing sheet for each component.

1.09 INSTALLATION COMPANY

A. The fire alarm contractor shall be a UL listed company under the UL classification of (UUJS). The installation company shall UL certify this installation.

B. The fire alarm contractor shall have a NICET Certified Engineering Technologist and Technicians on staff in their facility directly involved with this project to ensure technical expertise to this project and adherence with these specifications.

C. The fire alarm contractor shall maintain sufficient stock on hand and have a fully equipped service organization capable of guaranteeing response time within 8 hours of service calls, 24 hours a day, 7 days a week to service completed systems.

D. Equipment, wire and materials shall only be installed by the fire alarm contractor.

E. The fire alarm contractor shall provide, install and test all equipment related to this section.

PART 2 - PRODUCTS

2.01 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS

A. All equipment shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials, accessories, devices, and other facilities covered by this specification or noted on contract drawings and installation specifications shall be the best suited for the intended use and shall be provided by a single manufacturer or if provided by different manufacturers, recognized as compatible by both manufacturers.

2.02 EQUIPMENT MANUFACTURERS

A. The Fire Alarm System shall be limited to the following manufacturers and suppliers:

1. Notifier Company.

2. Silent Knight.

B. To ensure that compatibility and continuity is maintained throughout the existing School District, no other manufacturers or system suppliers will be considered.

C. Shall be ISO 9001 certified.

2.03 EQUIPMENT MANUFACTURERS

A. Description: Provide a Notifier model #AFP200 Intelligent Fire Detection and Alarm System as indicated on the plans.

B. Mechanical Design:

1. The control panel shall be housed in a UL cabinet designed for mounting directly to a wall or vertical surface. The back box shall be suitable for surface or flush mounting.

2. The door shall provide a key lock and shall include a transparent opening for viewing of all indicators.

C. System Capacity and General Operation:

1. Control panel shall be capable of accommodating all devices shown on the drawing and additional 50% initiating and alarm devices.

2. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LED's, and an alphanumeric keypad for the Field Programming and Control of the Fire Alarm System.

3. All programming or editing of the program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.

4. The FACP shall provide the following features: Drift Compensation to extend detector accuracy over life. Sensitivity Test, meeting requirements of NFPA 72, Maintenance Alert Verification, with verification counters. PAS pre-signal, meeting NFPA 72 requirements. Rapid manual station reporting (under 2 seconds). Non-Alarm points for general (non-fire) control. Periodic Detector Test, conducted automatically by software. Pre-alarm for advanced fire waning. Counting "cross-zone" options. March time and temporal coding options. Walk Test, with check for two detectors set to same address. Security Monitor Points, meeting requirements of UL 1076. Control By Time for non-fire operations, with holidays. Day/Night automatic adjustment of detector sensitivity. Device Blink Control for sleeping areas.

D. Central Microprocessor:

1. The Microprocessor unit shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage; non-volatile memory for building-specific program storage; and a "watch dog" timer circuit to detect and report microprocessor failure.

2. The Microprocessor unit shall contain and execute all control by event programs for specific action to be taken if an alarm condition is detected by the system. Suck control by event programs shall be held in non-volatile programmable memory, and shall no be lost even if system primary and secondary power failure occurs.

3. The Microprocessor Unit shall also provide a Real Time Clock for time annotation of system displays, printer, and history file. The Time of Day and date shall not be lost if system primary and secondary power supplies fail. The Real Time Clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

E. Display:

1. The Display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.

2. The Display shall include status information and custom alphanumeric labels for all Intelligent Detectors, Addressable Modules, and Software zones.

3. The Display shall provide an 80 character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide Light Emitting Diodes (LED's), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, SIGNAL SILENCED, SUPERVISORY, and PRE - ALARM.

4. The Display shall provide key touch keypad with control capability to command all system functions, entry of any alphabetic of numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

5. The Display shall include the following operator functions: SIGNAL SILENCE, RESET, DRILL, and ACKNOWLEDGE.

F. SLC Loop Interface: The SLC Interface shall provide power to, and communicate with, all of the Intelligent/Addressable Detectors and Addressable Modules over a single pair of wires. This SLC Loop shall be capable of operation as NFPA Style 4, Style 6, or Style 7.

G. Serial Interfaces:

1. An EIA-232 interface between the Fire Alarm Control Panel and UL Listed Electronic Data Processing (EDP) peripherals shall be provided (1AM-WF).

2. The EIA-232 interface shall allow the use of printers, CRT monitors, and PC compatible computers.

3. The EIA 485 port for the serial connection of the optional Annunciators and remote LCD displays shall be provided.

4. The EIA-485 interface may be used for network connection to a Proprietary Receiving Unit.

H. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include and integral charger designed to charge 7.0 amp hour batteries and to support 24-hour standby.

2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall bee available for connection to the Notification devices.

3. The Field Charging Power Supply shall include the ability to delay the AC fail delay per 2002 Edition NFPA requirements.

4. Provide quantity sufficient for a complete and operable system with no voltage drop to a signal device exceeding 8%.

I. Printer:

1. Printers shall be of the automatic type, printing code, time, date, location, category, and condition.

2. The Printer shall provide hard copy printout of all changes in status of the system and shall time stamp such printouts with the current time of day and date. The printer shall be standard carriage with 80 characters per line and shall use standard pin feed paper.

3. The printer shall be enclosed in a separate cabinet suitable for placement on a desk top or table. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA 232D. Power to the printer shall be 120 VAC 60 Hz.

J. Field Programming:

1. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.

2. All programming may be accomplished through the standard FACP keypad.

3. All field defined programs shall be stored in non volatile memory.

4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disabled or manual on/off commands. A second (higher-level) is used for actual change of program information.

5. A special program check function shall be provided to detect common operator errors.

6. An Auto-Program (self-learn) function shall be provided to quickly program initial functions and make the system operational.

7. An off-line programming function, with batch upload/download, shall also be provided.

2.04 SYSTEM COMPONENTS

A. Main Fire Alarm Control Panel (FACP)

1. Notifier Model #AFP-200

2. Control Panel enclosure.

B. Programmable Electronic Horns: (Indoor/Outdoor)

1. Electronic horns shall operate on 24 VDC nominal.

2. Shall be suitable for mounting on the wall or ceiling.

3. Shall be semi-flush or surface mounted as shown on plans.

4. Flush mounted devices on the exterior of buildings; device shall be installed in a (finish red) back box with a Soundolier VP-161 cover.

5. Manufacturer: Gentex-GX90-4 (mini-horn), system sensor – MA12/240 (horn)

C. Strobe Lights:

1. Shall operate on 24 VDC nominal.

2. Shall meet the requirements of the ADA and UL 1971.

a. The maximum pulse duration shall be 2/10ths of one second

b. Intensity shall be as specified on the drawings.

c. The flash rate shall be one flash per every second.

3. Shall meet the requirements of the NFPA 72 Edition:

a. No portion of the lens shall be less than 80: AFF.

b. No portion of the lens shall exceed 96" AFF.

c. Candela rating shall be as required per each space.

4. Manufacturer: Gentex GES series.

D. Audible/Visual Combination Devices:

1. Shall meet the applicable requirements of Section A listed above for audibility.

2. Shall meet the requirements of Section B listed above for visibility.

3. Audible and visual devices shall operate on separate circuits.

4. Manufacturer: Gentex GES series

E. Addressable Manual Stations:

1. Addressable Manual Stations shall be provided to connect to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops.

2. All operated stations shall have a positive, visual indication of operation that cannot be reset without the use of a key.

3. Stations shall be suitable for surface mounting, or semiflush mounting as shown on the plans, and shall be installed at 48 inches above the finished floor. Manual pullstations must comply with CBC Sections 1117B.6 and 1118B.

4. Manufacturer: Notifier NBG-12LX

F. Intelligent Photoelectric Smoke Detectors: (Low Profile)

1. Smoke detectors shall be intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel Signaling Line Circuit loops.

2. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control pane, send data to the panel representing the analog level of smoke density.

3. The detector shall be ceiling mount and shall include a twist lock base.

4. The detector sensitivity shall be set through the Fire Alarm Control Panel, and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.

5. Detectors located above finished ceiling or in areas which are not readily visible shall be provided with remote indicator LED's.

6. Manufacturer: Notifier NBG-12LX

G. Intelligent Heat Detectors

1. Heat Detectors shall be Intelligent and Addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel Signaling Line Circuits.

2. The detectors shall use and electronic sensor to measure thermal conditions caused by a fire.

3. The detectors shall be ceiling mount and shall include a twist lock base.

4. Detectors located above finished ceiling or in areas which are not readily visible shall be provided with remote indicator LED's.

5. Manufacturer: Notifier FST-751

H. Duct Smoke Detectors:

1. In-Duct Smoke Detector Housing shall be completed with an Intelligent Photoelectric Sensor, that provides continuous analog monitoring and alarm verification from the panel.

2. When sufficient smoke is sensed, and alarm signal is initiated at the FACP, and appropriate action taken to shut down air handling systems.

3. Detectors located above finished ceiling or in areas which are not readily visible shall be provided with remote indicator LED's.

4. Manufacturer: Notifier FSD-751

I. Monitor Module:

1. Addressable Monitor modules shall be provided to connect one supervised IDC zone of conventional Alarm Initiating Devices (any NO. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops.

2. The Monitor Module shall mount in a 4-inch square, 2 1/8" deep electrical box.

J. Control Module:

1. Addressable Control Modules shall be provided control functions with Form "C" contracts.

2. The Control Module shall mount in a 4-inch square 2 1/8" deep electrical box.

K. Network Annunciator:

1. Furnish and install an alphanumeric, liquid crystal display, annunciators.

2. Shall be capable of displaying each individual addressable point. Minimum point capacity shall be not less than 200,000 points.

3. Provide a separate power supply and battery system for this annnunciator.

2.05 BATTERIES

A. Battery:

1. Shall be Gel-Cell type.

2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus five minutes of alarm upon a normal AC power failure.

3. The batteries are to be completely maintenance free.

2.06 CONDUIT AND SURFACE RACEWAY

A. All conduit, surface raceways, outlet boxes, junction boxes, pull boxes, terminal cabinets, and similar devices required in this section of the work shall be provided under Division 16000 and as shown on drawings.

B. Conduit and surface raceways shall comply with the requirements of Sections as described in the applicable specification sections.

C. Conduit shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backbox, except where conduit entry is specified by the FACP manufacturer.

2.07 WIRE

A. All low voltage wire required in this section shall be furnished and installed by the fire alarm contractor.

B. All wire shall be installed in conduit. Wiring installed in underground conduits shall be approved for wet applications in accordance with the National Electric Code.

C. All fire alarm system wiring shall be new.

D. Wiring shall be in accordance with local stated and national codes (e.g., CEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 14 AWG for Initiating Device Circuits and Signaling Line Circuits, and 12 AWG for Indicating Appliance Circuits.

E. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

F. Wiring used for the multiplex communication loop shall be 18AWG twisted and shielded and installed in conduit. The system shall permit use of IDC and IAC wiring in the same conduit with the communication loop.

G. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.

2.08 TERMINAL CABINETS AND JUNCTION BOXES

A. All boxes and cabinets shall be UL listed for their use and purpose.

B. Terminal cabinets shall comply with the requirements of Section 16160 Terminal Cabinets.

C. Provide terminal blocks for all conductors entering and/or exiting each terminal cabinet.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The entire system shall be installed in a workmanlike manner in accordance with approved manufacturer's manuals and wiring diagrams. The contractor shall furnish all wiring, conduit, outlet boxes, junction boxes, terminal cabinets and similar devices necessary for the completed installation.

B. Installation of conduit, outlet boxes, junction boxes, terminal cabinets, special back boxes and similar devices shall comply with the requirements of Division 16000 sections.

C. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas an may be exposed in unfinished areas. Smoke detector heads shall not be installed prior to the system programming and test period. If construction is on going during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

D. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Verify with the Project Architect prior to any surface mounted installations.

E. All penetrations of floor slabs and fire walls, shall be fire stopped in accordance with the electrical specifications.

F. Duct mounted Smoke Detectors shall be furnished and wired by this Contractor and installed by the Mechanical Contractor. All shutdown and interface wiring shall be performed by the Electrical Contractor. All air pressure differential testing shall be performed by the Mechanical/Air Balance Contractor.

3.02 DOCUMENTATION

A. Contractor shall provide "as-built" drawings.

B. Contractor shall submit the NFPA Certificate of Compliance to the School District, the local fire official and Division of the State Architect (DSA).

3.03 TRAINING

A. The manufacturer shall provide factory training to the two technicians from the School District. These technicians shall be trained and certified as manufacturer's certified technicians to perform any work on the system after the installation of the system.

END OF SECTION