April 12, 2024

PROJECT MANUAL

SAN JOAQUIN COUNTY OFFICE OF EDUCATION
H+A #23-34-026

CULINARY LAB VENTURE ACADEMY

Architect
Henry + Associates Architects
730 Howe Ave, Suite 450
Sacramento, CA 95825
Contact: Stephen Henry
Voice: (916) 921-2112
stephen@henry-architects.com

Food Service
AMD Food Service Design
PO Box 163
Garden Valley, CA 95633
Contact: Patrick Jones
Voice: (916) 804-9393
patrick@amdfoodservicedesign.com

Structural
RW Consulting Engineers
1450 Harbor Boulevard Suite F
West Sacramento, CA 95691
Contact: Greg Richards
Voice: (916) 229-8345
grichards@rwengineers.com

Civil
Robert A. Karn & Associates.
707 Beck Avenue
Fairfield, CA 94533
Contact: Tony Perfetto
Voice: (916) 396-6656
tperfetto@rakengineers.com

Mechanical
Capital Engineering Consultants, Inc.
11020 Sun Center Drive, Suite 100
Sacramento, CA 95670
Contact: Michael Minge
Voice: (916) 851-3500
mminge@capital-engineering.com

Electrical
M. Neils Engineering, Inc.
100 Howe Ave, Suite 235N
Sacramento, CA 95825
Contact: Sinisha Glisic
Voice: (916) 923-4400
sglisic@mneilsengineering.com

Owner
San Joaquin County Office of Education
2922 Transworld Drive
Stockton, CA 95206
Contact: Tim Sutton
Voice: (209) 468-9102
tisutton@sjcoe.net

Bid Package No.

SUMMARY OF WORK

Section 01 00 10
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 WORK INCLUDED

A. Under a single contract construct the Culinary Lab at Venture Academy including the following but not limited to scope:

1. Sanity sewer site with grease interceptor.

2. Demolition and new construction.

3. Structural concrete and framing

4. Architectural finishes

5. Mechanical, plumbing, fire sprinklers, electrical.

6. Foodservice equipment and installation.

5. Other work as shown in the documents and as required for a complete and operational project.

1.03 WORK BY OTHERS

A. Work on the Project which will be executed prior to start of Work of this Contract, and which is excluded from this Contract, is as follows:

1. District will have identified sources of friable asbestos which will be removed under separate contract.

2. District will remove furniture, supplies, drapes and salvageable items. District will <u>not</u> remove finishes or expose structure in support of Contractor's work.

B. Work in the Project which will be executed after completion of Work of this Contract, and which is excluded from this Contract, as follows:

1. None

C. Work on this Project which will be executed during the Work of this Contract which the Contractor shall coordinate with and facilitate:

1. Installation of data wiring by SJCOE

1.04 CONTRACTORS USE OF PREMISES

A. Specific roads for access to and from building sites will be agreed on with the district. All traffic and materials delivery shall be confined to these roads.

B. Specific areas for storage of materials and site fabrication will be agreed upon. Contractor's activities shall be confined to these areas.

C. Work shall proceed in such manner as to not interfere with Owner's activities in and about nearby facilities. Exceptions will be made only after previous agreement between Owner, Architect and Contractor.

D. Fire alarm, intercom, intrusion alarm and other such tests shall be conducted outside of school hours and shall be coordinated with site personnel, if such tests occur after occupancy.

1.05 WORK SEQUENCE

A. Construct work shall accommodate Owner's use of adjacent premises during construction period; coordinate construction schedule and operations with Owner's Representative.

The three stages of the construction process following the bid award shall be:

1. Pre-construction: Pre-construction activities shall occur from the start date, to the first day of availability.

   Activities shall include, but are not limited to:
   - Identification of long lead materials and equipment
   - Shop drawing submittals
   - Deferred approval submittals
   - Field measuring
   - Color and sample submittals
   - Material ordering (particularly long lead items)
   - Material stock piling
   - Project scheduling/subcontractor coordination

   Activities to be performed by the District shall include:
   - Removal of equipment and personal items from the buildings (although this may not fully occur by the first day)
   - Asbestos abatement

   The architect and engineers will expedite all long lead item submittals as quickly as possible. Such items must be indicated as "critical" when submitted. Substitutions of finishes, materials and equipment will not be permitted due to the lack of availability unless submittals are made early and completely.

2. Construction: Primary construction activities shall occur from the date of availability, through the Date of Substantial Completion. Activities shall include work as described by the construction documents.

   It is the intention of the district to make these buildings available on the dates indicated below. Some work may occur before abatement begins if coordinated with

the abatement contractor. Certain units also may be available earlier than the dates shown. The general contractor must coordinate with the abatement contractor when access will be available.

Due to the nature of the work and the type of facilities, the schedule is fixed and cannot be altered. The premises will not be available prior to date of availability. All primary work **must** be completed prior to Date of Substantial Completion. Critical work, includes life safety, HVAC, plumbing, electrical service, security and general construction. Temporary measures will be required if primary work is uncompleted at start of school date.

As the district needs time for preparing classrooms for the new school session, the Contractor shall turn over spaces in an orderly sequence to allow occupancy and use of the spaces over the final 2 weeks of the construction period. This schedule must be prepared with the district's input.

3. Completion/Close-out: Completion and close-out activities shall occur from Date of Substantial Completion to Final Completion.

   Activities shall include:

   a. Completion of minor finish work. Minor work shall be considered completion or installation of items which will not interfere or hinder the district from utilizing the facility, such as touch-up painting, hardware adjustment, etc.

   b. Punch list work.

   c. Project close-out.

   All work performed during this period must occur outside of normal school hours. Arrangements must be made with the district representative and work schedules approved.

B. Delays:

1. Minor delays: Minor delays caused by parties other than the Contractor, such as the Owner, Architect, or Abatement Contractor, **will not** be considered critical path delays and **will not** result in a time extension to the project schedule. Minor delays shall be defined as delays due to the need for review, clarifications, consideration, detailing, etc. which typically do not last more than 48 hours, are addressed promptly and solved without significant changes to the work, as determined solely by the Architect. Such items which may cause delay must be identified by the Contractor at the time of origin.

2. Other delays: Other delays caused by unknown or unforeseen conditions or significant changes or modifications requested by or required by the Owner, Architect or DSA, will be permitted only if promptly submitted, reviewed and approved by the Architect and Owner. Such delays may result in time extensions to specific work or areas of work only, and not to other unaffected portion of the project. Such delays must directly effect the critical path of the work, be shown as unavoidable and be unable to be made up through rescheduling.

C. Occupancy: The project will be occupied by the School District Staff as shown below. Dates are fixed and cannot be changed. The premises will be occupied whether or not the work is completed regardless of time extensions (if any).

Any work performed after this date will need to be fully coordinated with the district and will be limited to after school hours or weekends.

D. Project Schedule:

The following schedule summarizes the major activity dates (Dates are approximate and actual start dates are subject to change):

Bid	**Dates**
Advertise to Bid (first)	April 15, 2024
Pre-Bid Meeting	April 25, 2024
Addendum (last)	May 3, 2024
Bids Due	May 7, 2024
Contracts	
Award	
Bonds/Insurance Preparation	
Contract Execution	
Completion/Close-out	
Begin Construction	June 3, 2024
Substantial Completion Date	January 24, 2025
Complete Punch List Work	February 7, 2025
Occupancy	February 10, 2025
Close-out/Completion	February 2025

1.06 EXTENDED LIQUIDATED DAMAGES

A. At conclusion of Punch List Work Complete date, all items are to be 100% finalized. Should work remain uncompleted beyond this date, the Owner may re-instate liquidated damages until all such work has been accepted. In addition, work uncompleted may, at the Owner's option, be completed by others and charged against the contract amount.

1.07 OWNER OCCUPANCY

A. Owner will occupy nearby adjacent premises during construction.

B. Refer to General Conditions for requirements for partial occupancy by Owner.

C. Owner will not occupy the specific space within the building included in this scope of work during the primary construction period. However, occupancy will occur as shown above. Contractor to provide scaffolding and other protective measures to ensure the safety of the occupants.

D. Owner may occupy other buildings on premises during construction and may be present on

site during summer construction period. Refer to General Conditions for requirements for partial occupancy by Owner.

1.08 EXISTING UTILITIES

A. It is recognized by the District and the Contractor that the location of existing utility facilities as shown on contract drawings and specifications are approximate; their exact location is unknown.

B. Recognition is given to the fact there may be additional utilities existing on the property unknown to either party to the Contract. Location of utilities as shown on drawings and specifications represent the best information obtainable from utility maps and other information furnished by the various agencies involved. The District warrants neither the accuracy nor the extent of actual installations as shown on the drawings and specifications.

C. Because of this uncertainty, it may become necessary for the Architect to make adjustments in the line or grade of sewers or storm drains. Installation of such adjusted lines shall be made at the regular unit price bid for the work, and no additional compensation will be paid therefor, unless the scope and character of the work has been changed.

D. The Contractor agrees and is required to coordinate and fully cooperate with the District and utility owners for the location, relocation, and protection of utilities. The Contractor's attention is directed to the existence of utilities, underground and overhead, necessary for all buildings within the area of work. Prior to start of trenching operations, the Contractor shall meet with District Representative(s) to fully review known utility locations which may affect the work.

E. In accordance with Section 4215 of the Government Code of the State of California, the District shall make provisions to compensate the Contractor for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating such main and trunk line utility facilities not indicated in the plans and specifications with reasonable accuracy, and for equipment on the project necessarily idled during such work. Compensation will be in accordance with the provisions of these specifications providing for change orders. Nor shall the contractor be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the District or the owner of the utility to provide for removal or relocation of such utility facilities.

F. Nothing herein shall be deemed to require compensation to the Contractor or to relieve him from being assessed liquidated damages for such delay when the presence of unidentifiable utilities can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of construction, and the damage to existing utilities or delay was caused in whole or in part by a failure of the District to indicate the presence of such service laterals or appurtenances.

G. In the event the Contractor discovers utilities not identified in the Contract plans or specifications, the Contractor shall immediately notify the Architect and the utility owner by the most expeditious means available and later confirm in writing.

H. Existing building utilities shall not be interrupted during normal operating hours.

1.09 ASBESTOS

A. Prior to start of work, the Contractor shall obtain and review the District's asbestos report on any existing facilities to become familiar with existing conditions.

B. Should asbestos materials identified in the report not be fully addressed in the contract documents, the contractor shall bring this to the attention of the Architect prior to start of construction for clarification.

C. Should asbestos materials outside of the scope of work be discovered during construction operations, the contractor shall immediately notify the IOR and Architect and shall suspend work in the area until necessary identification, testing and abatement (if required) is completed.

END OF SECTION

ALTERATION PROJECT PROCEDURES

Section 01 00 31
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 00 45, Cutting and Patching.

B. Section 01 50 00, Construction Facilities and Temporary Controls.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

1.04 GUARANTEE

A. Refer to General Conditions and Section 01 30 00.

1.05 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

1.06 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

1.07 PROJECT RECORD DOCUMENTS

A. Provide per Section 01 70 00, Project Close-out Procedures.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK

A. New Materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspection and testing products where

necessary, referring to existing work as a standard.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that demolition is complete and areas are ready for installation of new work.

B. Beginning of restoration work means acceptance of existing conditions.

C. Prior to installation of the work of this Section, carefully inspect and verify that installed work of all other trades is complete to the point where this installation may properly commence.

D. Verify that specified items may be installed in accordance with the approved design.

E. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 PREPARATION

A. Cut, move or remove items as necessary for access to alterations and renovation work. Replace and restore at completion.

B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished work.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Prepare surface, and remove surface finishes to provide for proper installation of new work and finishes including blocking, framing, insulation, etc.

E. Close openings in exterior surfaces to protect existing work and salvage items for weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.

3.03 INSTALLATION

A. Coordinate work of alternations and renovations to expedite completion sequentially and to accommodate Owner occupancy.

B. Complete Project in all respects including operational mechanical and electrical work.

C. Remove, cut and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition.

D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

E. Install products as specified in individual specifications Sections.

F. Where materials or equipment are removed, but no new finish is scheduled, patch and repair any damage to match existing wall surface.

3.04 TRANSITIONS

A. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work is to match existing adjacent work in texture and appearance.

B. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural point of division and make recommendation to Architect.

3.05 ADJUSTMENTS

A. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls and ceilings to a smooth plane without breaks, steps or bulkheads.

B. Where a change of plane of 1/8" or more occurs, submit recommendation for providing a smooth transition for Architect review.

C. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.

D. Fit work at penetrations of surfaces as specified in Section 01045.

3.06 REPAIR OF DAMAGED SURFACES

A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

B. Repair substrate prior to patching finish.

3.07 FINISHES

A. Finish surfaces as specified in individual Product Sections.

B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.08 CLEANING

A. Upon completion of installation, remove manufacturer's temporary labels and marks of identification. Thoroughly clean surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition. Replace damaged parts and surfaces which are not free from imperfections.

3.09 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 00 10, Summary of Work.

B. Section 01 00 31, Alteration Project Procedures.

C. Section 01 30 00, Submittals.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

1.04 SUBMITTALS

A. Refer to Section 01 30 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Samples: The following samples are required. Submit per Section 01 30 00.

1. Submit sample for each type of material used to Architect for review.

2. Manufacturer's full range of colors for Architect's selection.

D. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

E. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:

1. Work of the Owner or any separate contractor.

2. Structural value or integrity of any element of the Project.

3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or

systems.

4. Efficiency, operational life, maintenance or safety of operational elements.

5. Visual qualities of sight-exposed elements.

6. No cutting of structural elements is allowed unless per the Division of the State Architect's approved drawings.

F. Request shall include:

1. Project identification.

2. Description of affected work.

3. Necessity for cutting, alteration or excavation.

4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of Project.

5. Description of proposed work:

a. Scope of cutting, patching, alteration, or excavation.
b. Trades who will execute the work.
c. Products proposed to be used.
d. Extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. Cost proposal, when applicable.

8. Written permission of any separate contractor whose work will be affected.

G. Should conditions of work or schedule indicate change of products from original installation, Contractor shall submit request for substitution specified in Section 01300.

H. Submit written notice to Architect designating date and time work will be uncovered.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 30 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

1.07 QUALIFICATIONS

A. Employ specially qualified installers or fabricators to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.

1.08 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

1.09 PROJECT RECORD DOCUMENTS

A. Provide per Section 01 70 00, Project Close-out Procedures.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with these specifications, standards and manufacturer's recommendations for each specific product involved.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that installed work of all other trades is complete to the point where this installation may properly commence.

B. Inspect existing conditions of Project, including elements subject to damage or to movement during cutting and patching.

C. After uncovering work, inspect conditions affecting installation of products, or performance of work.

D. Verify that specified items may be installed in accordance with the approved design.

E. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.

B. Provide devices and methods to protect other portions of Project from damage.

C. Provide protection from elements for that portion of Project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.03 INSTALLATION

A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

C. Execute fitting and adjustment of products to provide finished installation to comply with specified products, functions, tolerances and finishes.

D. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.

E. Fit work airtight to pipe, sleeves, ducts, conduit and other penetrations through surfaces.

F. Refinish entire surfaces as necessary to provide even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.

2. For an assembly, refinish entire unit.

3.04 CLEANING

A. Upon completion of installation, remove manufacturer's temporary labels, marks of identification. Thoroughly wash surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition. Replace damaged parts and surfaces which are not free from imperfections.

3.05 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

END OF SECTION

1.01 LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACS	Access Compliance Section
AGA	American Gas Association
AIA	American Insurance Association (successor to NBFU)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
ANSI	American National Standards Institute
ASTM	American Society for Testing & Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
CBC	California Building Code
CEC	California Electrical Code
CLFMI	Chain Link Fence Manufacturing Institute
CPC	California Plumbing Code
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard (US Dept. of Commerce)
DSA	Division of the State Architect
FLS	Fire & Life Safety
FS	Federal Specification
IOR	Inspector of Record
NBFU	National Board of Fire Underwriters (See AIA)
NEC	National Electric Code of NFPA
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
SMACNA	Sheet Metal & Air Conditioning Contractors National Association
SPR	Simplified Practice Recommendation (US Dept. of Commerce)
SWPPP	Storm Water Pollution Prevention Plan
TCA	Tile Council of America
Title 19	California Code of Regulations - Public Safety
Title 24	California Code of Regulations - Building Code
UL	Underwriter's Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau (successor to WCLA)
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this section.

1.03 DESCRIPTION OF REQUIREMENTS

A. **General**: This section specifies procedural and administrative requirements for compliance with governing regulations and the codes and standards imposed upon the work. These requirements include the obtaining of permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes and standards.

B. **"Regulations"** is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the work regardless of whether they are lawfully imposed by governing authority or not.

C. **Governing Regulations**: Refer to General and Supplementary Conditions for requirements related to compliance with governing regulations.

1.04 DEFINITIONS

A. **General Explanation**: A substantial amount of specification language consists of definitions for terms found in other contract documents, including the drawings. (Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon.) Certain terms used in contract documents are defined in this Article. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the work to the extent that they are not stated more explicitly in another element of the Contract Documents.

B. **General Requirements**: The provisions or requirements of Division 1 sections apply to entire work of Contract and, where so indicated, to other items which are included in project.

C. **Indicated**: The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specification, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

D. **Directed, Requested, etc.:** Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by Architect", "requested by Architect", and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

E. **Approve:** Where used in conjunction with Architect's/ Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's/Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect/Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.

F. **Project Site**: The term "project site" is defined as the space available to the Contractor for performance of the work, either exclusively of in conjunction with others performing other work as part of the project. The extent of the project site is shown on the drawings, and may or may not be identical with the description of the land upon which the project is to be built.

G. **Furnish**: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, unloaded, ready for assembly, installation, etc., as applicable in each instance.

H. **Install**: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

I. **Provide**: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

J. **Installer**: The term "installer" is defined as the entity (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (installers) be expert in the operations they are engaged to perform.

K. **Testing Laboratory:** The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.

L. **Minimum Quality/Quantity:** In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are either minimums or maximums as noted, or as appropriate for context of the requirements. Refer instances of uncertainty to Architect for decision before proceeding.

M. **Specialists, Assignments:** In certain instances, specification test requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the work; they are also not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

N. **Trades:** Except as otherwise indicated, the use of titles, such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

O. **Abbreviations:** The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual work abbreviations of a self-explanatory nature have been included in texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in sections at first instance of use. Trade association names and titles of general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular.

1.05 DRAWING SYMBOLS:

A. **General:** Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., seventh edition.

B. **Mechanical/Electrical Drawings:** Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

1.06 INDUSTRY STANDARDS:

A. **General Applicability of Standards**: Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, applicable standards of the construction industry have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies where bound herewith. Refer to other contract documents for resolution of overlapping and conflicting requirements which result from the application of several different industry standards to the same unit of work. Refer to individual unit of work sections for indications of which specialized codes and standards the Contractor must keep at the project site, available for reference.

B. **Referenced Standards** (referenced directly in contract documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work.

C. **Non-referenced Standards** are hereby defined as having no particular applicability to the work, except as a general requirement of whether the work complies with standards recognized in the construction industry.

D. **Publication Dates**: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.

E. **Copies of Standards:** The contract documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with recognized industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents.

1. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.

2. Although certain copies of standards needed for enforcement of the requirements may be required submittals, the Architect/Engineer reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.

F. **Abbreviations and Names**: Where acronyms or abbreviations are used in the specifications or other contract documents they are defined to mean the industry recognized name of the trade association, standards generating organization, governing authority or other entity applicable to the context of the test provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.

1.07 GOVERNING REGULATIONS/AUTHORITIES

A. **General**: The procedure followed by Architect/Engineer has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing contract documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of the work.

1.08 SUBMITTALS

A. **Permits, Licenses, and Certificates:** For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipt for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION

CONSTRUCTION ALLOWANCE

Section 01 02 00
Project Number

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 GENERAL

A. Allowances have been included in the bid to permit the Owner to add to or modify contract work at a later date. Specific allowance types and amounts are described herein.

B. Base Bid shall include full allowance amounts as noted below. Bidder shall acknowledge inclusion of these costs by initial on Bid Form.

1.03 ALLOWANCE TYPES

A. Contingency Allowance.

1. Use of the contingency allowance shall be only as directed for the Owner's purposes, and only by written authorization signed by Owner's and Architect's "representative", which designate amounts to be charged to the allowance.

2. Change Orders authorizing use of funds from the contingency allowance will include the Contractor's related costs and reasonable overhead and profit margins. The Contractor will submit a contingency summary with each payment application until a time that the contingency is depleted. The Architect will determine which change order items are to be included in the contingency.

3. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

4. Contingency Allowance Amount: Included in the Contract, a stipulated sum/price of 10% OF BASE BID AMOUNT as an allowance for Unforeseen Conditions within the limits set forth in the Bridging Documents. This Allowance shall not be utilized without written approval by the District.

B. Material/Equipment Allowance.

1. Selected material and equipment, and in some cases, their installation are shown and specified in the Contract Documents by allowances. Allowances have been established in lieu of specific requirements and defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by Change Order.

2. Material/Equipment Allowance Amount: $0.00 (none).

1.04 ALLOWANCE SCOPE

A. Where specific material/equipment allowances are used, the cost shall include the complete material, installation, overhead, profit and all other related costs, including subcontractor

expenses.

B. Quantities shall be as noted in the Documents.

1.05 UNUSED ALLOWANCE

A. All unused allowance shall be returned to the Owner via a credit by deductive Change Order adjustment.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 GENERAL

A. The Architect shall make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies to the Owner, IOR Contractor, participants, and others affected by the decisions made.

B. **Attendance required:** Project superintendent, project manager (if any), major subcontractors (as requested), architect, inspector, and others as appropriate to the meeting topics.

1.03 PRE-CONSTRUCTION MEETING

A. The Architect will schedule a pre-construction meeting upon issuing a notice of intent to award the contract. Agenda may include discussion of the following items:

1. Temporary facilities and use of the site.
2. Schedule of values.
3. Construction schedule.
4. Designation of personnel representing the parties to the contract; lines of communication.
5. Submittals; submittal schedule.
6. Record drawings.
7. Progress payments.
8. Change orders and time extensions.
9. Inspection and testing.
10. Accepted alternates.

1.04 WEEKLY PROJECT MEETINGS

A. The Architect will schedule and run weekly project meetings throughout the project to review the short-term project schedule and to discuss issues requiring resolution. It is the duty of the Contractor to attend, participate in, and comply with the agreements reached and direction set at these meetings.

1.05 MONTHLY MEETINGS

A. The Architect shall schedule and run monthly meeting for the purpose of assessing progress, approving payment, resolving problems, and addressing mid-range and long-range scheduling issues.

1.06 SPECIAL MEETINGS

A. The Architect may occasionally schedule special meetings for the purpose of discussing

work requiring a significant coordination effort or for resolving issues which require more attention than they can be given in the regularly scheduled meetings. The Contractor shall attend these meetings along with representatives of subcontractors, suppliers, and/or manufacturers when appropriate for the subject matter to be discussed.

PART 2 - MATERIALS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 DESCRIPTION

A. Work Included:

1. To ensure that specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its review and acceptance or rejection by Architect.

2. Make all following submittals to Architect for review, in strict accord with provisions of this Section:

   a. Progress Schedule
   b. Schedule of Values
   c. Shop Drawings
   d. Product Data/Material Lists
   e. Samples
   f. Substitutions
   g. Maintenance/Operating Manuals
   h. Guarantees
   i. Extra Stock
   j. Subcontractor List
   k. Request for Information (RFI)

B. Related Requirements:

1. Test reports: Pertinent Specification Sections.

2. Individual submittals required: Pertinent Specification Sections.

PART 2 - PRODUCTS

2.01 SCHEDULE OF VALUES

A. Before first Application for Payment, submit for Architect's approval a Schedule of Values of various portions of work, aggregating total Contract sum, divided so as to facilitate payment to Subcontractors, prepared in such form as Architect and Contractor may agree upon, and supported by such data to substantiate its correctness as Architect may require. Breakdown shall include separation of sitework from building work for all main categories including electrical, plumbing, concrete, etc. Separations shall also be provided for each building of a multiple building contract. Include proper share of overhead and profit with each item in Schedule of Values. This Schedule, when approved by Architect, shall be used as basis for Contractor's applications for payment. **Payment shall not be released until a Schedule of Values is approved.**

B. Schedule of Values shall appear similar to the following list. It shall be detailed at least as

shown and portions shall not be more largely grouped so as to reduce its length unless appropriate to the scope of the Work. Mobilization/Start-up is limited to 2% on contracts greater than $1,000,000 and 4% on contracts less than $1,000,000.

Mobilization/Start-up
Temporary Facilities
Grading
Paving
Building Concrete
Site Concrete
Concrete Reinforcement
Lumber
Trusses
Millwork/Trim
Structural Steel/Metals
Rough Hardware
Hollow Metal Doors
Wood Doors
Roof Hatches
Built Up Roofing
Composition Shingles
Single Ply Roofing
Metal Roofing
Water Proofing
Insulation
Glass and Glazing
Caulking and Sealants
Ceramic Tile
Lath and Plaster
Drywall
Acoustical Ceiling
Paint/Wall Coverings
Finish Flooring
Finish Hardware
Toilet Accessories
Metal Lockers/Benches
Chalk/White/Tack Boards
Window Coverings
Flagpole
Fire Extinguishers
Signage
Athletic Equipment
Telescopic Bleachers
Toilet Partitions
Kitchen Equipment
Plumbing - Site
Plumbing - Building
HVAC/Sheet Metal
Electrical - Site
Electrical - Building
Relocatable Building
Landscaping - Irrigation
Landscaping - Planting

Chain Link Fencing
Asphalt Striping
Labor/Supervision
Cleanup

2.02 CERTIFICATIONS

A. Where specifically indicated by pertinent Specification Sections, submit proper certification of recognized producer or association in lieu of or in addition to testing. Certification shall attest to product's compliance with requirements of Contract Documents. Provide certifications on enclosed forms.

B. Certifications for this project shall include:

1. Weighmaster's Certificate.

2. Fire System Test Certificate.

3. Certificate of Chlorination and Sterilization.

4. Certificate of Compliance for Building Materials.

2.03 SHOP DRAWINGS

A. Submit all shop drawings as PDF electronic files. Mark all drawings pages with name of project and name of Contractor, and number consecutively. Make drawings legible and complete in every respect. Do not reproduce bid document drawings in lieu of complete shop drawings.

B. If shop drawings show variations from Contract requirements because of standard shop practice or other reason, make specific mention of such variations in letter of transmittal, as well as on drawings, in order that (if acceptable) suitable action may be taken for proper adjustment of Contract Documents. Unless specific changes have been noted and approved, no deviations from Contract Documents will be accepted.

C. One set will be retained by Architect for his file. If accepted, electronic sets will be distributed by Architect as follows: One to Inspector, one to General Contractor. If rejected, one electronic will be forwarded to General Contractor. Make corrections and send revised PDF’s to Architect for checking. Secure final acceptance prior to commencing work involved.

2.04 PRODUCT DATA/MATERIAL LISTS

A. Manufacturer's Standard Schematic Drawings:

1. Modify drawings to delete information which is not applicable to Project.

2. Supplement standard information to provide additional information applicable to Project.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.

1. Clearly mark each copy to identify pertinent materials, products or models. Mark out or

remove all extraneous information.

2. Show dimensions and clearances required.

3. Show performance characteristics and capacities.

4. Show wiring diagrams and controls.

2.05 SAMPLES

A. Samples: Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.

1. Include identification on all samples including product and material and location of proposed work.

B. Samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of product or material, with integrally related parts and attachment devices.

2. After review, samples may be used in construction of project.

C. Field samples and mockups:

1. Erect at project site at location acceptable to Architect.

2. Construct each sample or mockup complete, including work of all trades required in finished work.

2.06 SUBSTITUTIONS

A. Architect's Approval Required:

1. Contract is based on materials, equipment and methods described in Contract Documents.

2. Architect will consider proposals for substitution of materials, equipment and methods only when such proposals are accompanied by full and complete technical data and all other information required by Architect to evaluate proposed substitution. Substitution shall be submitted with completed Substitution Request Form.

3. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this work by Architect.

B. "Or Equal": Whenever, in Contract Documents, any material, process or specified patent or proprietary name and/or by name of manufacturer is indicated, such name shall be deemed to be used for purpose of facilitating description of material and/or process desired, and shall be deemed to be followed by words "or equal" and Contractor may offer any material or process which shall be equal in every respect to that so indicated or specified; provided, however, that if material, process or article offered by Contractor is not, in opinion of Architect, equal in every respect to that specified, then Contractor must furnish material, process or article specified or one that in opinion of Architect is equal thereof in every

respect.

C. Coordination: Approval of substitution shall not relieve Contractor from responsibility for compliance with all requirements of Drawings and Project Manual, and Contractor shall be responsible at his own expense for any changes in other parts of his own work or work of others which may be caused by approved substitution.

D. DSA Approval: Substitutions of certain items may cause such items to require Deferred Approval by DSA. Should Deferred Approval be required, the Contractor shall provide all information and documents necessary and complete the process without additional costs to the Owner, including engineering, calculation and modification of substitute products.

2.07 MAINTENANCE/OPERATION MANUALS

A. General: Contractor shall incorporate in Maintenance/ Operating Manual(s) brochures, manufacturer's catalogs and written instructions for equipment and materials needing regular care or maintenance; i.e., carpets, resilient flooring, architectural finishes, mechanical and electrical equipment and others as required elsewhere in project documents. Prepare all such manuals in durable plastic loose leaf binders size to accommodate 8-1/2 x 11 sheets with following minimum data:

1. Identification on, or readable through, front cover stating general nature of manual.

2. Neatly typewritten index of all contents.

3. Site plan and building plans indicating location of equipment referenced (reduced scale).

4. Complete instructions regarding operation and maintenance of all equipment involved.

5. Complete nomenclature of all replaceable parts, their part numbers, current cost and name and address of nearest vendor of parts.

6. Copy of all guarantees and warranties issued.

7. Copy of approved shop drawings with all data concerning changes made during construction.

B. Extraneous Data:

1. Where contents of manuals include manufacturer's catalog pages, clearly indicate precise items included in this installation and delete, or otherwise clearly indicate, all manufacturer's data with which this installation is not concerned.

C. Materials shall be organized in a logical and consistent manner, by specification section number, with separating tabs clearly marked.

2.08 RECORD DRAWINGS

A. General:

1. At time of installation, installed locations of all underground work, including plumbing and electrical, shall be recorded on prints by Contractor, and reviewed with Inspector.

Record drawings are to be maintained and adjusted on a daily basis by the Contractor.

2. Notify Architect when underground work has been completed. On such notice, Architect will furnish reproducible prints to Contractor. Contractor will transfer installed locations to reproducible prints, obtain Inspector's approval and signature, and submit prints for review and acceptance by Architect.

3. All information entered on reproducible prints shall be neat, legible and emphasized by drawing "clouds" around changed items. Changes shall be made in an accurate manner by a qualified draftsperson acceptable to Architect. Reproducible drawing shall be signed by the Contractor.

4. Locate and dimension all work, including stubs for future connections with reference to permanent landmarks or building and indicate approximate depth below finish grade.

5. All symbols and designations used in preparing record drawings shall match those used in Contract Drawings.

6. Record drawing shall be up-dated monthly, prior to and pursuant to approval of the progress payment application.

7. Site and underground work shall be surveyed by a licensed surveyor.

B. Conditions of Payments: Evidence of maintenance of Record Drawings shall be presented to Inspector and/or Architect monthly before progress payments are authorized.

2.09 GUARANTEES

A. Standard Guarantee: Provide individual as well as overall guarantees for all work executed under this Contract or any extra work to be absolutely free of all defects of workmanship and materials for a period of one year after completion and acceptance by Owner. Repair and make good all such defects and repair any damage to other work caused thereby which may occur during same period.

B. Additional Guarantees: Provide additional guarantees (in excess of one year) where specifically required by pertinent Specification Sections.

2.10 DEFERRED APPROVAL

A. Certain specified products require the manufacturer to design the product after the Owner-Contractor agreement is signed, and since the selection of manufacturers of these products resides with the Contractor, it is not possible to anticipate the actual product supplied prior to bidding. However, since no Contract can be executed between the Owner and the Contractor without prior approval of the Contract Documents by DSA, "Deferred Approval" of these products must be obtained after the contract is executed. This requires complete design documents and calculations be submitted to DSA through the Architects. The manufacturer is responsible for prompt submission of the submittals to the Architect, and for making any changes required by DSA, at no cost to the Owner, and prior to incorporation of the product into the work. The items requiring "Deferred Approval" are noted on the General Information or Cover Sheet of the drawings.

B. Submit to the Architect for processing all items identified as deferred approval on the drawings or within the specifications. Approval of these items is contingent upon approval of

the submittal by DSA.

C. Submit Deferred Approval Submittals as outlined for Shop Drawings above and as described herein.

D. Submit complete drawings, details, specifications, calculations and other information necessary to fully describe and substantiate the submittal, signed and stamped by a Structural Engineer licensed in the State of California.

E. Deferred Approval items will be checked for general design concept conformance only and will be submitted to the Division of the State Architect for review. If necessary, submittals will be returned to the Contractor for corrections and/or additional information, as required by DSA. The Contractor shall make necessary changes and resubmit.

F. As the review procedure is beyond the control of the Architect, it must be recognized by the Contractor that the review process may take longer than other submittals. The Contractor has the option to obtain approval from DSA as required and submit approved documents to the Architect for review and comment. Approval by DSA does not waive the Architect's review requirement nor any other requirement of the documents.

G. The Architect and Engineer will review the submittal one time only and will not perform extensive calculations nor prepare drawings required for DSA. If the Contractor fails to provide proper information for approval or the Architect or Engineer is required to perform additional duties, such services will be reimbursed by the district and back-charged to the Contractor.

H. Do not proceed with fabrication until deferred approval documents have been approved by

2.011 EXTRA STOCK

A. Provide all extra stock and materials as described in specification sections to Owner at time of final acceptance. Materials shall be inventoried in writing, clearly marked and packaged neatly with quantities as required. Contractor to obtain written acceptance of delivery from Owner's representation.

2.12 SUBCONTRACTOR LIST

A. Provide a typed list of all subcontractors within 5 days of award of contract. Include Subcontractor name, address, phone number, license number and area of work.

2.13 REQUESTS FOR INFORMATION (RFI)

A. Requests for additional information (RFI's) beyond that set-forth in the Contract Documents will be considered when the request is in writing and fully documented. Requests must state the source and reason for the request; identify specific references within the Contract Documents pertinent to the request; and supply all supporting information to assist the Architect in his response. Verbal responses to such requests are to be considered informational; official response will only be given in writing.

1. Submit all RFI's on standard form provided, numbered consecutively.

2. Allow minimum 72 hours for review by Architect. Additional time may be required for complex issues.

3. Provide suggested solution on form.

4. Provide detailed estimate for all RFI's that exceed $500.

B. As the use of RFI's is for clarification or questions regarding interpretation, and the response is typically via Architect's Supplemental Instruction, this process shall not be used to address simple or minor coordination or construction issues which should normally be addressed by the Contractor. RFI's deemed unnecessary or frivolous by the Architect will be returned to the Contractor for reconsideration or will be rejected. RFI's so returned shall be removed from the RFI log and noted as unnecessary.

PART 3 - EXECUTION

3.01 SUBMISSION REQUIREMENTS

A. Schedule submittals to avoid impact to the construction schedule and the timely sequence of work. Allow minimum 15 working days for submittal review by Architect. Complex submittals or submittals which are not provided as complete packages may take longer than 15 working days. For submittals which differ from products specified allow time for potential rejection and resubmittal.

B. All mechanical and all electrical submittals, excluding underground work, shall be collected together so that all submittals for those two major disciplines are transmitted to the Architect, each as a single package for review.

C. Contractor shall review submittals for completeness, coordination and conflicts between subcontractors and other work in the contract documents. Submittals made by contractor which are not thoroughly reviewed by contractor will be returned. Submittals which vary significantly from the contract documents and are not identified prior to submission will be returned without review.

D. Make submissions within following number of days from issuance of Notice to Proceed:

1. Items needed in initial stages of Work or requiring long lead-time for ordering: 15 calendar days.

2. All electrical, mechanical and equipment items: 21 calendar days.

3. All other items including all samples; can not choose 1 item without all submittals: 30 calendar days.

4. Deferred Approval Items: 21 calendar days.

E. All submittals shall be accompanied by Submittal Transmittal (copy included) addressed to the Architect. Each submittal transmittal shall:

1. Be consecutively numbered.

2. Resubmittals to have same number as original submittal with alphanumeric suffix.

3. Indicate specification section number. (Separate submittals are required for each

specification section involved).

4. Include proper number of copies, as required in “Number of Copies Required” below.

5. Contain index of items submitted, properly identified with drawing numbers, etc.

6. Identify substitution requests and reason for request.

F. Before submitting a shop drawing or any related material to Architect, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of the Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it. Architect shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Architect otherwise via a written instrument which is acknowledged by the Architect in writing.

G. Architect will check submittals for conformance with design concepts of project. Approval by Architect covers only such conformance. Effort will be made by Architect to discover any errors, but responsibility for accuracy and correctness of all submittals shall be Contractor's.

H. Approval of submittals will be general and shall not relieve Contractor from responsibility for proper fitting and construction of work, nor from furnishing materials and work required by the Contract which may not be indicated on submittals when approved.

I. No portion of the work requiring submittals shall be commenced until submittal has been approved by Architect. All such portions of work shall be in accordance with approved submittals. Any work performed without approved submittals is at the Contractor's risk. Work not in compliance with approved submittals shall be removed and corrected at the Contractor's expense.

J. Number of Copies Required - Contractor shall submit following number of copies:

1. Progress Schedule: 1 electronic copy

2. Schedule of Values: 1 electronic copy

3. Certifications: 1 electronic copy

4. Shop Drawings: 1 electronic copy.

5. Product Data/Material Lists: 1 electronic copy

6. Samples: As specifically indicated in pertinent specification section.

7. Samples for Color/Pattern Selection: One set of manufacturer's complete range for initial selection; and four (4) samples as requested of selected color/pattern for inclusion in final color schedule. As color selection is dependent on multiple submittals, it is critical to submit all items requiring color decisions as early as possible and at the same time. Selections will not be finalized until all color dependent submittals are received.

8. Substitutions: 1 electronic copy.

9. Maintenance/Operations Manuals: 3 copies and 1 electronic copy

10. Guarantees: 1 copy in Architect's Standard format.

11. Deferred Approvals: 1 copy in Architect's standard format.

K. Submittals shall include (where applicable):

1. Date and revision dates.

2. Project title and number.

3. The names of Architect, Contractor, Subcontractor and supplier or manufacturer.

4. Identification of product or material.

5. Relation to adjacent structure or material.

6. Field dimensions, clearly identified as such.

7. Specification section number.

8. A blank space for Architect's stamp.

9. Contractor's stamp on each, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with contract documents.

L. Incomplete, inaccurate or non-complying submittals returned for revisions or corrections as well as resubmitted review time, shall not be considered grounds for time extension to the contract time.

3.02 REQUIRED SUBMITTALS

A. Various specification sections specifically state information to be submitted.

B. Where submittals are indicated, they are required even though submitted material is as specified.

END OF SECTION

Culinary Lab Venture Academy
San Joaquin County Office of Education

SUBMITTAL NO. ☐

Architect's Project #23-34-026

Re-Submittal of Original No. _____
Date: _____

1. SUBMITTAL TRANSMITTAL

To: Henry + Associates Architects
730 Howe Ave, Suite 450
Sacramento, CA 95825
Attn.: Stephen Henry

Please submit only one trade per submittal!

Contractor:
[edit address]
[edit city, state zip]
Contact: [edit name]

Sub Contractor: _____
_____
_____
Contact: _____

Description Of Submitted Materials:

Quantity	Specification Section Number	Specification Section Name	Description

Contractor Statement:
This submittal has been reviewed and approved with respect to the means, methods, techniques, and procedures of construction, safety precautions, and program incidentals thereto. This submittal complies with the contract documents and comprises no variations thereto, unless accompanied by a substitution request.

By: _____ Date: _____

Architect's Received Stamp

2. TRANSMITTAL TO CONSULTANT(S):

Date: _____
Civil: _____
Struct: _____
Mech: _____
Elect: _____
Other: _____
_____

Consultant's Received Stamp

Architect's Received Stamp

3. RE-TRANSMITTAL TO CONTRACTOR:

☐ NO EXCEPTIONS TAKEN ☐ REJECTED ☐ FURNISH AS CORRECTED
☐ SUBMIT SPECIFIED ITEM ☐ REVISE AND RESUBMIT ☐ NO ACTION REQUIRED

Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the Drawings and Specifications. This general check is only for the review of conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating his work with that of all the other trades, and performing his work in a safe and satisfactory manner.

Henry + Associates By: _____ Date: _____

Comments:

_____
_____
_____
_____
_____
_____

Distribution:

Date: _____
Copies to :
Contr: _____
IOR: _____
Owner: _____
File: _____
Other: _____
_____

See Specification Section 01300 for use of this form

SUBSTITUTION REQUEST

Project Number: 23-34-026

PROJECT: Culinary Lab Venture Academy

SPECIFIED ITEM: _____

Section No.: _____ **Page No.:** _____ **Paragraph No.:** _____

Reason for Request: _____

_____

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

_____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request; applicable portions of data are clearly identified. Attached data also includes a description of changes to Contract Documents which proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on drawings and does not require design changes in the Contract Documents.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on the work, the schedule, or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by: _____

Signature: _____

Contractor: _____

Address: _____

_____

Date: _____ Telephone: _____

Attachments: _____

For use by Architect:

[ ] Accepted

[ ] Not Accepted

[ ] Accepted as noted

By: _____

Date: _____

Remarks: _____

Culinary Lab Venture Academy
San Joaquin County Office of Education

Architect's Project #23-34-026

RFI NO. ☐

Date: _____

1. REQUEST FOR INFORMATION

To: Henry + Associates
730 Howe Ave, Suite 450
Sacramento, CA 95825
Fax: (916) 921-2212
Attn.: Stephen Henry

From: Contractor: _____
Contact: _____
Sub Contractor: _____
Contact: _____

Reference:
Dwg./Spec No.: _____ Rev.: _____ Title: _____

Location: _____ Elevation: _____

2. Existing Condition: _____

3. Recommended Action (s): _____

4. Owner / A/E Resolution (s): _____

Date of Response: _____ *By:* _____

Extra Work Involved in the Above Described Change – Yes: _____ *No:* _____
Distribution: _____

See Specification Section 01300 for use of this form

PROGRESS SCHEDULES

Section 01 31 00
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 GENERAL STATEMENT

A. It is the intent of this specification to provide a means by which to insure timely completion of the Work of the Contract.

B. The Contractor shall be responsible for planning, scheduling and reporting the progress of the Work. Planning, scheduling and reporting will incorporate the input of the various Subcontractors, Suppliers, Manufacturers, etc., that are responsible to the Contractor of the Work.

C. This Schedule is defined as the network diagram, or diagrams and includes the various reports, narratives and charts required by this specification. Each is considered to be part of the Schedule. Submittal of one without the other shall constitute non-compliance of contract requirements unless previously approved or directed by the Architect in writing.

D. Float or slack time is not for the exclusive use or benefit of either the Owner or the Contractor, but is a resource available to both parties. To this end it is considered both responsible and reasonable that the schedule contain no more than fifteen (15) percent of the activities to be critical or near-critical. Near-critical is defined as float or slack time for one (1) to ten (10) work days.

E. The schedule shall be submitted within fifteen (15) calendar days after the date of the Notice to Proceed (Start Letter) and shall include a complete critical path schedule with detailed network diagrams or sub-network diagrams for all the work. Interdependencies between the various detailed network diagrams shall be clearly indicated.

F. The schedule shall include the following features:

1. Each diagram shall show the activities, order and interdependence of the activities, and the sequence of work, as planned by the Contractor.

2. The Schedule shall include, in addition to construction activities, such tasks as mobilization, demobilization, submittal, and approval of samples of materials and shop drawings, procurement of significant materials and equipment, fabrication of special items as well as installation and testing.

3. The Activities shall be described and organized so as to conform to the Payment Schedule.

G. Upon the Architect's request, the Contractor shall participate in the review and evaluation of his submissions. Any revisions deemed necessary or desirable as a result of this review shall be resubmitted within ten (10) calendar days after the review. The Schedule, as revised, shall be used by the contractor for planning, organizing, and directing the work and for reporting of progress.

H. Acceptance by the Owner and/or Architect of the reasonableness of the Contractor's scheduling and cost allocations shall be a condition for authorization of monthly payments to the Contractor.

I. Update: The Contractor shall update the Schedule and Payment request under the following circumstances or as requested by the Architect:

1. If the Contractor desires to make significant changes in his method of proceeding, or major changes are required due to changes or delays to the work or any part thereof, he is to notify the Architect in writing of his intent and state reasons for making the change. A change may be considered to be of a significant or major nature if the activity or activities of the logic sequence of activities is varied from his prior submittal to a degree that there is reasonable doubt as to the effect on the contract completion date or dates. Delays requiring an update schedule include rain delays, only as approved by Owner and Architect.

2. The Contractor shall submit for review by the Architect at each regular progress meeting an update of the Schedule by marking in red on a current print of the network diagram the actual progress to date. The detailed network diagrams shall require re-plotting if the time frame shown for the activities on the diagram are more than ten (10) working days out of phase with the time frame for the same activities indicated in the updated schedule report or if for any reason the sequences or duration of work are revised.

J. Approval and/or acceptance of the schedule by the Owner and Architect is not to be construed as approval of the contractors methods nor shall it relieve the contractor from full responsibility for the proper scheduling and sequencing of the work.

1.03 ADMINISTRATION

A. Each diagram and report submitted under this section shall be furnished in three (3) copies. After review of each successive monthly update the Contractor shall revise the original diagram and resubmit within seven (7) calendar days.

B. Submissions of the Contractor's schedule is not to be construed as granting, rejecting, or in any other way acting on the Contractors' requests for time extensions. Such requests shall be processed in strict compliance with all relevant provisions of the Contract Documents.

C. Failure of the Contractor to comply with the requirements of this Section may be grounds for a determination by the Architect that no further progress payments are to be made until the Contractor is in compliance.

D. The Contractor and Architect shall meet monthly to review progress, the updated network diagram and payment request. Agreements reached at this meeting shall be recorded and shall, as they affect progress and/or payment, be incorporated into the updated reports.

E. The monthly update of the Schedule shall be an integral part and basic element of the estimate upon which progress payments shall be made pursuant to the General and Supplementary Conditions of the Contract. The Contractor shall be entitled to progress payments only upon approval of the estimate as determined from the currently approved updated Schedule.

F. The Contractor agrees that whenever it becomes apparent from the current monthly progress evaluation and updated schedule data that any milestone interface completion date and/or contract completion date will not be met, he will take some or all of the following actions (and any others he may deem necessary) at no additional cost to the Owner:

1. Increase construction manpower in such quantities and crafts as will substantially eliminate the lag in schedule progress.

2. Increase the number of shifts per work day, work days per week, or amount of construction equipment, or any combination of the foregoing, sufficient to substantially eliminate the lag in scheduled progress.

3. Re-schedule activities to achieve maximum practical concurrency of accomplishment.

4. Those actions determined necessary to re-establish the original scheduled progress shall be incorporated into the next schedule update. Should the results of the planned corrective actions prove insufficient, additional corrective actions shall be taken.

5. The submission of an amended schedule will not relieve the Contractor of the responsibility to notify the Architect in writing of all experienced or anticipated delays in the prosecution of the work.

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

TESTING LABORATORY SERVICES

Section 01 40 00
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED SECTIONS AND DOCUMENTS

A. Geologic Hazards & Soils Report.

B. Section 01 30 00, Submittals.

C. Section 01 70 00, Contract Closeout.

D. Mechanical Work - Testing, adjusting, and balancing of systems.

E. Individual Specification Sections: Inspections and tests required, and standards for testing.

1.03 REFERENCES

A. Title 24, Part 1, CCR.

B. Title 24, Part 2, CCR, California Building Code, current edition.

1.04 SELECTION AND PAYMENT

A. Testing laboratory shall be approved by both the Architect and the Division of the State Architect.

B. Owner will employ and pay for services of an independent testing laboratory to perform specified inspection and testing. Retesting costs for failed tests will be the Contractors responsibility and will be back-charged against the contract.

C. Under provisions for Relocatable Building construction, Owner limits his exposure to in-plant inspection and testing costs. Refer to other Specification Sections related to such specific construction.

D. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.05 LABORATORY REPORTS

A. After each inspection and test, promptly submit two copies of laboratory report to Owner, Architect, Contractor and DSA.

B. Include:

1. Date of issue,
2. Project title and number,
3. Name of inspector,
4. Date and time of sampling or inspection,
5. Identification of product and Specification Section,
6. Location in the Project,
7. Type of inspection or test,
8. Date of test,
9. Results of test,
10. Conformance with Contract Documents.

C. When requested by Architect, provide interpretation of test results.

1.06 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop the work.

1.07 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs. Allow reasonable time for review and testing.

B. Arrange for, and coordinate with, laboratory for all required testing and inspection. Provide adequate notice, in advance, for proper scheduling and processing of testing. The Inspector **will not** be responsible for scheduling or arranging for testing and inspection services.

C. Cooperate with laboratory personnel, and provide access to the work and to manufacturer's facilities.

D. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at the source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.

E. Notify Architect, Inspector, Structural Engineer (when applicable) and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

Section 01 50 00
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 WORK INCLUDED

A. Furnish and install temporary facilities and controls as hereunder specified, plus other unspecified temporary facilities, including labor, materials, services, utilities and equipment, as may be required for proper performance of the Contract, except as otherwise provided. Temporary facilities and controls required for this work include, but are not necessarily limited to:

1. Temporary utilities.
2. Field office.
3. Sanitary facilities.
4. Construction equipment.
5. Enclosures, fencing and barricades.
6. Temporary signs.
7. Site controls and parking.
8. Existing conditions.

B. Related Work Specified Elsewhere

1. Permanent utilities: Pertinent Specification sections.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. General: Temporary facilities and controls shall be approved by local, state and federal authorities and regulatory agencies having jurisdiction, including insurance companies, with regard to safety precautions, operation and fire hazard. Contractor shall contact local authorities prior to start of work to coordinate local requirements.

B. Refer to General Conditions.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect and maintain temporary facilities and controls in proper and safe condition throughout progress of work.

B. Replacements: In event of loss or damage, immediately make necessary repairs and replacements; as approved by Architect at no additional cost to Owner.

PART 2 - PRODUCTS

2.01 TEMPORARY UTILITIES

A. General: Provide water, electricity, gas and other specified utility services required during construction and extend temporary service lines to construction areas to allow use by all trades and subcontractors.

B. Temporary Water:

1. Owner will provide source and pay for water for construction purposes from existing available source(s) on site. This does not include use of hydrants or off-site sources. If necessary provide and pay for these services.

2. Provide temporary connections to source and sufficient hose or pipe to carry water to every required part of construction.

C. Temporary Electrical Facilities:

1. Electrical Service: Provide such temporary electrical power and facilities as necessary to supply lighting for work operations and power for portable power driven tools and for testing.

2. Payment for Electrical Energy Used: Owner will provide temporary power free of charge from existing outlets. If existing sources are insufficient, provide and pay for temporary service from off-site.

3. Construction Requirements: Construct and maintain all temporary electrical facilities in accordance with division of Industrial Safety "Electrical Safety Orders" (ESO), Public Utilities Commission "Rules for Overhead Line Construction" (G.O. 95), and requirements of equipment used for these facilities shall be in good and safe condition, but need not be new.

D. Temporary Heat and Ventilation:

1. Provide heat and ventilation as required to protect work and materials and to keep humidity down to extent required to prevent corrosion of metal and to prevent dampness or mildew which is potentially damaging to materials and finishes. In addition, provide heat and ventilation prior to and during specific work operations, as follows:

a. For 7 days previous to placing of interior finish materials and throughout application of drywall, painting and laying of resilient flooring materials, provide sufficient heat to produce temperature of not less than 65 degrees F.

b. After finishing trades are completed and until final acceptance or occupancy by Owner, provide sufficient heat to maintain temperature of not less than 60 degrees.

2. Fuel, equipment and method of heating and ventilating shall be approved by Architect.

E. Telephone: Maintain telephone in field office for joint use of Contractor, Architect and Inspectors for duration of operations under this Contract. Provide answering machine and facsimile on-site for use by IOR, Architect and others.

1. Pay all charges for telephone service.

2. Make mutually agreeable arrangement with sub-contractors to provide them with telephone accommodations for duration of construction and completion.

2.02 FIELD OFFICE

A. Provide field office on site. Include separate office space of sufficient size for use by Architect and Inspector. Office shall be of temporary form of construction with wood floor; water proof; weather-tight, and well lighted and ventilated; or equivalent trailer office; as approved. Inspector office shall be fitted with 3'-0" counter along one side under a window, shelves, desk, filing cabinet, chairs, and such other minor items of equipment needed. Office and equipment shall remain property of Contractor and shall be removed by him upon completion of work.

B. Provide electric outlets for lighting and power and make provisions for adequately heating and cooling field office.

2.03 SANITARY FACILITIES

A. Toilet Facilities: Provide sufficient suitably enclosed chemical toilets with urinal for use by all crafts engaged on project. Location shall be approved by Architect.

B. Washing Facilities: Provide properly mounted and adequate wash sinks connected to water supply; in location as approved by Architect.

C. Drinking Water Facilities: Provide clean, sanitary and adequate drinking water.

2.04 CONSTRUCTION EQUIPMENT

A. General: Erect, equip, operate, and maintain all construction equipment in strict accordance with applicable statutes, laws, ordinances, rules, and regulations of authorities having jurisdiction; including insurance companies, with regard to safety, operation and fire hazard.

B. Provide and maintain scaffolding, staging, runways and similar equipment, as needed. Coordinate use and furnishing with subcontractors.

C. Provide and maintain hoists and construction elevators, including elevators for hoisting workmen; complete with operators, power and signals, as required; in accordance with

Safety Orders of State of California Division of Industrial Safety; until completion of the work under this Contract or until no longer required.

2.05 ENCLOSURES, FENCING AND BARRICADES

A. General: Provide and maintain barricades, fencing, shoring, pedestrian walkways including attached lights, other lights, and other safety precautions to properly guard against personal injury and property damage as prescribed by authority having jurisdiction; including insurance companies.

B. Attention is directed to Safety Orders issued by State of California, Division of Industrial Safety. Contractor shall obtain copies of such Safety Orders as are applicable to type of work to be performed, shall be governed by requirements thereof in all construction operations, and shall fully inform subcontractors and material suppliers as to the requirements of applicable Safety Orders.

C. Contractor's Corporation Yard: Locate where shown or agreed on with Owner and Architect. Enclose with fence and gates as required for security, and as approved.

D. Provide and maintain 6' high temporary fencing around entire work area to keep unauthorized personnel from equipment, structure, utilities, etc. Protect work in place from damage, including fields, roads, landscaping, etc.

2.06 TEMPORARY SIGNS

A. Signs or advertising are not permitted, except Contractor's name may be placed on his field office and equipment, unless otherwise approved by the architect.

2.07 SITE CONTROLS AND PARKING

A. Entrance to Work Site: Contractor and his employees shall use certain access roads or entrance ways as indicated on drawings or as agreed to by Architect and Owner. Access shall not interfere with on-going operations (if any). Maintain these roads in satisfactory condition during the contract time, and repair damages attributable to work of this project at intervals as needed. **At completion of Contract, roads and entrance ways shall be left in condition at least equal to that existing at start of Contract**, except as may be otherwise required by Contract Documents.

B. Temporary access roads are to be provided by and completely removed by the Contractor upon completion of work. Place material such as base rock to provide and maintain safe access to temporary facilities, temporary parking and all areas of work required for continuing operations during winter months so that work may proceed in accordance with project schedule. Contractor is to restore these areas to condition at least equal to that at start of Contract or improve as required in the Contract Documents.

C. Site Storage and Work Areas: Architect will allocate available on-site storage and work areas to Contractor, subject to change as may be necessary by job progress, such as site development or other intervening work. If necessary, Contractor shall obtain off-site facilities for storage at his expense.

D. Regulations: Observe and comply with rules and regulations in effect at occupied campuses or other facilities, including, but not restricted to, parking and traffic regulations, security restrictions, hours of access, and the like.

E. Use of public Sidewalks and Streets (if applicable): Make arrangements with public authorities for temporary use of streets and sidewalks for offices, shops, storage, etc.. Abide by rules, regulations, and ordinances, obtain permits, and pay fees therefor.

F. Debris Control: Keep work and storage areas clean and free of debris. Dispose of debris off premises, as it accumulates. Pay all fees required for use of public dumps. Burning on premises is prohibited.

G. Dust Controls:

1. Indoor Operations: Control dust resulting from indoor construction operations by localizing it to greatest practicable extent using temporary partitions, curtains, or other means which will prevent spread of dust beyond immediate work area. Duct openings and other openings communicating with other parts of building shall have effective temporary closures.

2. Outdoor Operations: Use water wagons or spray from hoses to control dust created by outdoor work operations. Comply with all local and state dust control ordinances.

H. Dewatering Facilities: Provide and maintain dewatering and pumping facilities to keep site reasonably dry, and to protect materials and installed work from water damage until dewatering is no longer required.

I. Security: Contractor is responsible for security of areas of his work during entire time of Contract. Make good all damages to the work and loss of materials due to vandalism or theft, within this responsibility. This includes damages due to construction activities caused to existing facilities.

J. Contractor may wish to provide a security force at his expense. The Owner will not provide any monitoring for security purposes.

K. Parking: On-site parking after occupancy may be limited or may not be permitted during the school year due to limited existing conditions. Check with district office to ascertain parking availability and DO NOT park on-site if not permitted.

2.08 FIRE ALARM AND INTRUSION ALARM

A. **Prior to start of demolition, the contractor shall fully test the fire and intrusion alarms systems in the presence of district personnel to determine the working status of the systems.** The test results shall be coordinated with the Inspector of Record, documented and provided to the District and Architect.

B. During construction, the Contractor shall maintain fire and intrusion protection of the buildings by maintaining, in working condition, the existing systems **or** by some other means

as required for protection. Failure to provide such protection shall result in the Contractor assuming full responsibility for **all** unprotected buildings and property - whether a part of the contract or not.

2.09 EXISTING CONDITIONS

A. Contractor shall record existing site conditions, either by photographs or video, to provide a record of pre-construction site condition.

PART 3 - EXECUTION

3.01 MAINTENANCE AND REMOVAL

A. Maintain all temporary facilities and controls as long as needed for safe and proper completion of Work; remove all such temporary facilities and controls as rapidly as progress of Work will permit.

B. Non-compliance with requirements within this section may result in payment being withheld and/or deductive change orders for lack of proper facilities and controls. If necessary, the Owner will provide such facilities and controls required and back-charge the Contractor.

END OF SECTION

CONTRACT CLOSEOUT

Section 01700
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 FINAL CLEANING

A. Immediately prior to completion and occupancy, **utilizing a professional cleaning service**, remove marks, stains, fingerprints, dust, dirt and paint drippings resulting from work of this project, inside and out including roofs, walls, floors, sidewalks, paving and other finished surfaces. Wash tile, plumbing and other fixtures clean. Clean and polish all windows, hardware and other unpainted metals. Remove temporary labels, tags and paper covering.

1.03 REQUIREMENTS PREPARATORY TO FINAL ACCEPTANCE

A. Temporary facilities shall be removed from site.

B. Plumbing, mechanical and electrical equipment shall operate quietly and free from vibration. Properly adjust, repair, balance, or replace equipment producing objectionable noise or vibration in occupied areas of building. Provide additional brackets, bracing, etc., to prevent objectionable noise or vibration. Systems shall operate without humming, surging, or rapid cycling.

C. Operating instructions for equipment shall be properly mounted and posted.

D. Training: Provide training and orientation of Owner’s operating staff in proper care and operation of equipment, systems and controls including:

1. Kitchen equipment.
2. Fire protection systems.
3. Plumbing equipment.
4. HVAC equipment.
5. Control systems.
6. Signal systems.
7. Telephone communication systems.
8. Data systems.
9. Video systems.
10. Fire alarm systems.
11. Intrusion alarm systems.
13. Sound systems.

14. Other systems as required in the specifications or needed to properly instruct Owner's representatives.

15. Submit three copies of certificate, signed by the Owner's representative, attesting to their having been instructed.

E. Record Drawings shall be completed, signed by Contractor and Inspector and submitted to Architect as specified in Section 01 30 00.

F. Maintenance and Operating instructions and manuals shall be submitted to Architect, as specified in Section 01 30 00.

G. Certifications as described in Section 01 30 00 shall be completed, signed and submitted to Architect per Section 01 30 00

H. Guarantees and warranties shall be submitted to Architect, as specified in General Conditions and Section 01 30 00.

I. Extra Stock shall be delivered and acknowledged by the Owner in quantities specified.

J. Punch List:

1. Prior to Architect's punch list, Contractor shall prepare and address initial deficiencies list for all work. Upon completion, this list, verified as completed by the General Contractor, shall be sent to the Architect.

2. Contractor shall notify Architect when Contractor feels project is complete enough for preparation of Architect's punch list.

3. Architect will then notify appropriate consultants (including civil, mechanical and electrical engineers, landscape architect, food service designer and others as needed) to make their inspections and prepare "punch lists". Consultant "punch lists" must be completed before Architect will make his "punch list".

4. Architect will prepare a "punch list".

5. Punch lists will be published separately for each building within 14 days of Architect's walk through.

6. All work on the punch list, except minor items (as determined by the Architect) shall be completed prior to completion and occupancy.

1.04 FINAL ACCEPTANCE

A. After requirements preparatory to Final Acceptance have been completed as hereinbefore specified, Contractor shall notify Architect to perform acceptance tour. Notice shall be given at least three days in advance of the time the acceptance tour is to be performed.

B. Contractor or his principal superintendents, authorized to act in behalf of Contractor, shall accompany Architect on acceptance tour, as well as any principal subcontractors that Architect may request to be present.

C. If work has been completed in accordance with Contract Documents, and no further

corrective measures are required, Architect will recommend Final Acceptance to the Owner and initiate the filing of the Notice of Completion.

D. If work has been substantially completed in accordance with Contract Documents, and only minor corrective measures are required, Architect will recommend that Owner conditionally accept Project and file Notice of Completion based upon Contractor's assurance that corrective measures will be completed within shortest practicable time period (but absolutely not later than 30 days).

E. If work has not been substantially completed in accordance with Contract Documents, and several or many corrective measures are still required, Architect will recommend one or the other of the following:

1. That Owner accept Project and file Notice of Completion only upon receiving from Contractor a Cashier's Check in amount sufficient to account for corrective measures still required, in the event that Owner had to have others complete the work.

2. That Owner not accept project and not file Notice of Completion. Instead, based on information gathered from acceptance tour, Contractor will be required to complete all corrective measures and then call for another project acceptance tour following procedure outlined above.

F. Should any corrective measures remain incomplete at time final payment is due, Contractor shall provide Owner with Money Order(s) or Cashier's Check in exchange for retention. Money Order(s) or Cashier's Check shall be in an amount one and one-half times the agreed estimated cost as determined by the Architect.

G. Upon Final Acceptance of Project by Owner, Contractor shall submit his request for final payment, less retention. Retention payment will not be made by Owner until 35 days after board acceptance and filing of Notice of Completion with County Recorder, as specified in General Conditions.

I. CLOSE OUT CHECKLIST

The following items are to be fully completed and/or submitted as a condition for final acceptance of the project (as applicable).

The following items are to be fully completed and/or submitted as a condition for final acceptance of the project (as applicable).

1. Specification and Plans Review for Closeout
2. Fire System Test Certificate
3. Certificate of Chlorination and Sterilization
4. Certificate of Compliance for Building Materials
5. Air Balance Report
6. Replace construction cores with keys
7. Operation & Maintenance Manuals - 3 copies
   a. Maintenance Department
   b. School District Office
   c. Facilities Department
8. Training.
9. Guarantees
10. Record Drawings (Electronic)
11. Labels and name plates on all electrical panels
12. Keys (from Contractor - properly labeled):

a. water shut off key
b. gate valve key
c. electrical panel keys
d. communication panel keys
e. all cabinet keys

13. Punch List Items Completed
14. Extra Stock of Specified Items
15. Backcharges Resolved
16. Stop Notices (removal)
17. Notice of Completion accepted and filed with County by Owner
18. Final (Retention) Payment released to Contractor

END OF SECTION

DIVISIONS 02-14

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02 20 00, Earthwork.

B. Section 06 10 00, Rough Carpentry.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the drawings to be salvaged or re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Conflicting requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the provisions of the more stringent shall govern.

1.04 SUBMITTALS

A. Refer to Section 01 30 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Submit certification from cement manufacturer that the cement proposed for use on the project has been manufactured and tested in compliance with the requirements of ASTM C150 for Portland cement and ASTM C595 for blended hydraulic cement, whichever is applicable.

D. Submit concrete mix design for each type of concrete on the project in accordance with CBC Section 1905A.

E. Materials list: Within 35 days after award of Contract, and before any concrete is delivered to the job site, submit to the Architect a complete list of all materials proposed to be used in this portion of the work, showing manufacturer's name and catalog number of all items such as admixture, membrane, concrete mix design and the name and address of supplier of transit-mix concrete.

F. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 30 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on drawings, as adopted by the California Division of the State Architect (DSA)

B. ACI Standards, ACI 318, ACI 301, ACI 304R, ACI 305R, ACI 306R, ACI 308.

C. ASTM C94, Specification for Ready-mixed concrete.

D. CBC, State Chapter 19A, for concrete requirements.

E. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (latest edition).

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

E. Store cement in weather tight building, permitting easy inspection and identification. Protect from dampness. Lumpy or stale cement will be rejected.

1.08 TESTING

A. Cement and Reinforcing shall be tested in accordance with CBC Section 1916A. Testing of reinforcing may be waived in accordance with Section 1916A.4 when approved by the Structural Engineer and DSA.

B. Reinforcing to be welded, except for A706, shall be tested to determine carbon equivalent (C.E.). Cost of testing shall be borne by School District and backcharged to Contractor.

1.09 PROJECT CONDITIONS

A. Notify Architect and DSA at least 48 hours prior to placing concrete.

1.10 ADEQUACY AND INSPECTION

A. Design, erect, support, brace and maintain formwork and shoring to safely support all vertical

and lateral loads that might be applied until such loads can be carried by concrete.

B. Notify Project Inspector, Architect and DSA at least 48 hours prior to placing of concrete.

1.11 PROTECTION

A. Finish surfaces shall be protected at all times from concrete adjacent to them. Inspect forming against such work and establish tight leakproof seal before concrete is poured. Finish work defaced with concrete on surface shall be replaced.

1.12 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Form Material (Concrete Exposed to View): 5/8" (min) APA B-B Ply-form, steel or Sonotubes.

B. Form Material (Concrete concealed from View): Construction grade or better, S4S, minimum 2x.

C. Form Coating: Material which will leave no residue on concrete surface that will interfere with surface coating, as approved by the Architect.

D. Nailing blocks: 2 x 3 DF, beveled and pressure preservative treated, in accord with requirements of Section 06 10 00.

E. Expansion Joint Material: Preformed 1/2" fiber material with bituminous binder manufactured for use as concrete expansion joint material.

F. Reinforcement Bars: ASTM A615, Grade 60, deformed, per ACI 318 Section 3.5.3.

G. Wire fabric: ASTM A185; 6x6 – W1.4xW1.4 in flat sheets (rolls not permitted), unless otherwise specified or shown.

H. Reinforcing supports: Galvanized metal chairs or spacers or metal hangers, accurately placed and securely fastened to steel reinforcement in place. Bottom bars in footings may be supported with concrete blocks.

I. Cement: Portland cement, ASTM C150, Type I or Type II, per ACI 318 Section 3.2.

J. Concrete aggregates: Conform to ASTM C33, and CBC Section 1903A.3.

K. Water: Clean and free from deleterious amounts of acids, alkalis, salts, or organic materials and per ACI 318 Section 3.4.

L. Cement dispersing admixture: Use admixture to improve placing, reduce water cement ratio, and ultimate shrinkage. Admixture shall conform to ASTM C494 and ACI 318 Section 3.6. Such admixture must receive prior approval of Architect, Structural Engineer, and DSA, and

shall be included in original design mix.

M. Sheet Material for Curing Non-Colored Concrete: ASTM C171; Curing Paper, Polyethylene Film, White-Burlap-Polyethylene Sheet, or accepted equal.

N. Bonding agent for patching: "Sikadur 32, Hi-Mod" by Sika Corporation, " Burke Acrylic Bondcrete" by Burke By Edoco, or accepted equal.

O. Non-shrink grout: "Masterflow 713 Plus" by ChemRex Inc., "588 PrecisionGrout" by A.W.R Meadows, Inc., or accepted equal; premixed, non-metallic, no chlorides, non-staining and non-shrinking per CRD-C621 Corps of Engineers Specificiations.

P. Membrane curing compound: "Burke Aqua Resin Cure" by Burke By Edoco, "Sonocrete Kure 1315" by Sonneborn, or accepted equal, for exterior slabs.

Q. Hardener/Sealer: Moxie International, "Moxie 1800 Super-Admix. (For non-colored floors).

R. Non-slip grits: Aluminum oxide or emery graded from particles retained on a No. 50 sieve to particles passing a No. 8 sieve.

1. "Frictex®NS" by Sonneborn
2. "A-H Emery Non-slip" by Anti-Hydro International, Inc.
3. Accepted equal

S. Surface Treatments and Coloring Agents:

1. Hardener: Moxie International "Moxie 1500 Concrete Sealer", W.R. Meadows "Pena-Lith", or accepted equal, for non-colored exposed interior floors.
2. Carbon Black Coloring: Dispersed carbon black in liquid form; "Carblak" by Euclid Chemical Company, "Liquiblack" by Concrete Chemicals, or accepted equal.

T. Stain: L.M. Scofield Company "Lithochrome Chemstain"; color to be selected by Architect.

U. Fibers:

1. Collated Polypropylene Fibrillated Fibers:
   a. "Fibermesh" fibers by Synthetic Industries
   b. "ProConF" fibers by Nycon, Inc.
   c. Accepted equal; Product must have current ICC Report No. to be considered equal.
2. Multifilament Fibers:
   a. "Stealth" fibers by Synthetic Industries
   b. "MultiMesh" fibers by Nycon, Inc.
   c. Accepted equal; Product must have current ICC Report No. to be

considered equal.

W. Waterstops: Greenstreak 789 B-2 rubber waterstop as detailed

X. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials (Class C is not permitted) and per CBC Section 1903A.5. Not more than 15% (by weight) may be substituted for portland cement.

Y. Construction and Control Joint Material

1. 26 ga. (min. thickness) galvanized steel shapes to form tongue-and-groove joint.

2. 24 ga. Galvanized steel splice plates

3. 16 ga. Galvanized steel spikes

4. Acceptable Manufacturers:

   a. “Burke Joint Key” by Meadow Burke

   b. “Pro-Key” by BoMetals, Inc.

   c. Accepted equal

2.02 CONCRETE DESIGN

A. Designed Strength and Classes of Concrete:

1. Class "A" concrete of 1 1/2" max. size aggregate shall have 3500 psi 28 day strength and 0.55 maximum water-cement ratio. Use in footings and other concrete of like nature where minimum thickness equals or exceeds 8". Class B concrete may be used in lieu of Class A at Contractor’s option.

2. Class "B" concrete of 3/4" max. size aggregate shall have 4000 psi 28 day strength and 0.45 maximum water-cement ratio. Use in concrete less than 8" min. thickness including interior floor slabs and curbs. In all interior slabs provide Moxie 1800 Super-Admix and omit air entrainment (ASTM C26) and water-reducing (ASTM C494) admixtures.

3. Class "C" concrete of 1" max. size aggregate shall have 3000 psi 28 day strength with maximum water-cement ratio of 0.55. Use in exterior slabs on grade, including walks (non-structural concrete). Provide polypropylene fibers in all exterior slabs, walks, stairs, ramps and other exposed flatwork at a rate of 1.5 pounds per cubic yard. (Use multifilament fibers in concrete containing coloring).

B. Slump Limits: Provide concrete, at point of final discharge, of proper consistency determined by Test Method ASTM C143. Slumps as follows:

Class "A", 4" plus or minus 1".
Class "B", 4" plus or minus 1".
Class "C", 4" plus or minus 1".

C. Mix Design: All concrete used on this work will be designed for strength in accord with provisions of CBC, Section 1905A.3. All mixtures will be designed by Laboratory selected by School District and all cost of designing mixes will be borne by School District. (Should Contractor desire to pump concrete, a modified Class "B" mix will be designed by Laboratory at School District expense). Fly ash may be used in Concrete to improve workability in amounts up to 15% of cement weight.

D. Fibers: Design mixes applicable shall include fibrillated polypropylene fibers in amounts of not less than 1.5 pounds, nor more than 1.6 pounds, of fiber per cubic yard; 1 pound per cubic yard of multifilament fibers in concrete containing coloring.

E. Carbon Black Coloring: Tone down exterior concrete slabs, walks, ramps, stairs (including bleachers) and other exposed flatwork to eliminate glare, using dispersed carbon black in liquid form at rate of not more than 3 lbs per cubic yard of concrete. Exact amount used will depend on color of cement, and shall be as directed. Add color to mix in accord with manufacturer's printed instructions.

2.03 MIXING OF CONCRETE

A. Conform to requirements of CBC, Chapter 19A.

B. All concrete shall be mixed until there is uniform distribution of material and mass is uniform and homogenous; mixer must be discharged completely before the mixer is recharged.

C. Concrete shall be Ready-mix Concrete: Mix and deliver in accordance with the requirements set forth in ASTM C94. Batch Plant inspection may be waived in accordance with CBC Section 1704A.4.4 when approved by Structural Engineer and DSA.

1. Licensed Weighmaster to positively identify materials as to quantity and to certify to each load by ticket. Approved inspector of the testing laboratory shall check first batching at start of work and furnish mix proportions to Weighmaster.

2. Ticket shall be transmitted to Project Inspector by truck driver with load identified thereon. Inspector will not accept load without load ticket identifying mix and will keep daily record of pours, identifying each truck, its load, time of receipt and approximate location of deposit, and will transmit two copies of record to DSA.

3. A minimum of one set of three cylinders shall be taken and tested for each 50 cubic yards of concrete or fraction thereof. (See also Article 3.15.B.).

4. **At end of project, Weighmaster shall furnish affidavit to DSA on form satisfactory to DSA, certifying that all concrete furnished conforms in every particular and to proportions established by mix designs. Any cost involved in this modified procedure will be paid by School District and backcharged to Contractor.**

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

D. Inspection of reinforcing steel welding shall be per CBC Section 1704.4.2.

E. Project inspector shall maintain placing record per CBC Section 1704A.4.7.

3.02 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Maintain partition in fully open position completely covered with protective materials until final acceptance by the Architect.

D. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

3.03 WORKMANSHIP

A. Form to produce smooth concrete - straight, plumb and true to plane. Concrete out of line, level or plumb will be rejected.

3.04 CONSTRUCTION

A. Form material shall be straight, true, sound and able to withstand deformation due to loading and effects of moist curing. Materials which have warped or delaminated, or require more that minor patching of contact surfaces, shall not be reused.

B. Build forms to shapes, lines, grades and dimensions indicated. Construct formwork to maintain tolerances required by ACI 301. Forms shall be substantial, tight to prevent leakage of concrete, and properly braced and tied together to maintain position and shape. Butt joints tightly and locate on solid backing. Chamfer corners where indicated. Form bevels, grooves and recesses to neat, straight lines. Construct forms for easy removal without hammering, wedging or prying against concrete.

C. Space clamps, ties, hangers and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.

D. Build openings into vertical forms at regular intervals if necessary to facilitate concrete placement, and at bottoms of forms to permit cleaning and inspection.

E. Build in securely braced temporary bulkheads, keyed as required, at planned locations of construction joints.

F. Brace, anchor and support all cast-in items to prevent displacement or distortion.

G. During and immediately after concrete placing, tighten forms, posts and shores. Readjust to maintain grades, levels and camber.

H. Slabs, Walks and Curbs:

1. Expansion Joints: Install at locations indicted, and so that maximum distance between joints is 40' for exterior concrete unless otherwise shown.

2. Slab Control Joints: Install specified keyed-type joint material for all interior slabs and elsewhere as indicated on Drawings. Maximum area between joints is limited to 225 square feet, maximum length between joints is limited to 16 feet, aspect ratio of length to width is limited to 1.25 to 1. Contractor can set joint spacing within above limits to suit placing schedule except that all joints specifically shown on structural drawings must be set as so located.

   a. Where joint spacing is not shown, Contractor will submit proposed locations to suit slab-on-grade detail shown on Structural Drawings.

3. Isolation Joints: Install #30 roofing felt between walls and exterior slabs or walks so that paved areas are isolated from all vertical features, except if expansion joints are specifically indicated.

4. Exterior Slabs, Walks: Install construction joints @ 10’-0” o.c. as minimum, both directions, unless shown otherwise on plans.

3.05 FORM COATING

A. Before placement of reinforcing steel, coat faces of all forms to prevent absorption of moisture from concrete and to facilitate removal of forms. Apply specified material in conformance with manufacturer's written directions.

B. Before re-using form material, inspect, clean thoroughly and recoat.

C. Seal all cut edges.

3.06 CLEANING

A. Remove all wood chips, sawdust, dirt, loose concrete and other debris just before concrete is to be poured. Use compressed air for inaccessible areas. Remove all water from excavations.

3.07 PLACEMENT

A. Reinforcement shall be accurately placed at locations indicated on the drawings within required tolerances and providing required clearances. Reinforcement shall be secured prior to placement of concrete such that tolerances and clearances are maintained. Coverage shall be in accordance with CBC Section 1907A.

B. Clear distance between parallel bars in a layer shall be not less than 1", the maximum bar diameter nor 1½ times the maximum size of the coarse aggregate. Keep man on job to maintain position of reinforcing as concrete is placed. Reinforcement must be in place before concreting is begun. Bar laps may be wired together; lace fabric splices with 16 ga. wire. Splice reinforcing steel (#6 and smaller) with minimum lap of 69 bar diameters in concrete, 75 bar diameter lap in CMU, unless otherwise shown on Structural Drawings and splice wire fabric minimum of two mesh widths and a minimum of 12 inches. Embed fabric in center of

slabs, unless otherwise shown. Install dowels as shown on Drawings. All construction joints in concrete shall have dowels of size and spacing shown, or as approved by Architect.

3.08 CLEANING

A. Reinforcement and all other embedded items at time of placing concrete to be free of rust, dirt oil or any other coatings that would impair bond to concrete.

3.09 WELDING

A. Welding of reinforcing bars shall be performed only where indicated on plans and in compliance with AWS D1.4. and CBC Section 1903A.4 and ACI 318 Section 3.5.2. All welding of reinforcement is to be inspected in accordance with CBC Section 1704A.4.2.

3.10 INSPECTION

A. Approval of reinforcing steel, after installation, must be received from Project Inspector. Architect, Structural Engineer and DSA must be notified 48 hrs. in advance of beginning of concrete placement operations. Inspection of welding will be done by laboratory and all costs in connection with this inspection will be paid as provided for in General Conditions, except that cost of all welding inspection required beyond 3 days total of shop and field welding will be back-charged to Contractor.

3.11 PLACING OF CONCRETE

A. Transportation: Handle from mixer to place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients; deposit as nearly as practicable in final position to avoid re-handling or flowing; partially hardened concrete must not be deposited in work. Concrete shall not be wheeled directly on top of reinforcing steel.

B. Placing: When once started, carry on concrete pouring continuously until section is complete between predetermined construction joints; prevent splashing of forms or reinforcement with concrete, remove such accumulation of hardened or partially hardened concrete on forms or reinforcement above concrete already in place before work proceeds; free fall of concrete not to exceed 6'-0"; if necessary, provide openings in forms to reduce fall.

C. Remove form spreaders as placing of concrete progresses.

D. Place footings as monolith in one continuous pour.

E. Keep excavations free of water. All concrete shall be placed in dry excavations.

F. Compacting: All concrete shall be compacted by mechanical vibrators. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms. Vibrating shall not be applied to concrete which has already taken initial set nor shall it be continued so long as to cause segregation of material.

G. Concrete Slabs (Interior and Exterior): All slabs shall be laid to required line and grades with accurate, firm screeds. Subgrade shall be thoroughly watered the night before laying and sprinkled the following day, immediately in advance of placing.

H. Depress areas of interior floor slabs where required for urinals, floor drains, door frames and tile and as noted on plans. Slope, where indicated on plans, to be in subfloor.

I. Hot Weather Concreting: Comply with ACI 305R-99. Concrete shall not exceed 85 ºF at time of placement. Concrete shall be delivered, placed and finished in a sufficiently short period of time to avoid surface drying. Concrete shall be kept wet continuously after placement until implementation of curing procedure in accordance with this specification.

J. Placing in Cold Weather: Protect from frost or freezing. No antifreeze admixture permitted. When depositing concrete during freezing or near-freezing weather, mix shall have temperature of at least 50 degrees F but not more than 90 degrees F when cement is added. Concrete shall be maintained at temperature of at least 50 degrees F for not less than 72 hours after placing. See ACI 306-02 and CBC 1905A.12 for additional requirements.

K. Horizontal Construction Joint: Comply with CBC Section 1906A.4. Keep exposed concrete face of construction joints continuously moist from time of initial set until placing of concrete; thoroughly clean contact surface by chipping entire surface not earlier than 5 days after initial pour to expose clean hard aggregate solidly embedded, or by approved method that will assure equal bond, such as green cutting. If contact surface becomes coated with earth, sawdust, etc., after being cleaned, rechip entire surface.

3.12 CONCRETE FINISHES

A. Cement Slab Finish: Tamp slab surface with grid tamper and strike off to firm screeds; following stiffening of concrete, float to true surface and finish as follows:

1. Interior Slabs, Smooth Finish (typical finish): Two steel troweling operations; long-handled or Fresno trowel not permitted; first troweling performed when concrete will support operator on kneeboards; second troweling to follow concrete initial set for burnished surface free from trowel marks, depressions, ridges or other blemishes, and shall be acceptable to finish flooring applicators. Tolerance for flatness shall be 1/8" in 10'. Repair slabs which exceed tolerance for flatness by grinding down high spots and filling low spots with a compound approved by finish flooring contractor.

2. Exterior Concrete Walks: Two steel trowelings as called for above; follow second troweling with stiff broom, brooming perpendicular to direction of traffic to form non-slip surface.

B. Joints: Mark off exposed joints, where indicated, with 1/4" radius edging tool. Markings to be clean cut, straight and square with respect to border. Tool edges of exposed expansion and contraction joints, border edges, and wherever concrete adjoins other material or vertical surfaces.

C. Hardener: Harden and dustproof all exposed interior concrete floors except colored concrete, using Moxie 1500 Concrete Sealer. Hardener shall be shipped to job in unopened containers bearing manufacturer's labels. Apply in strict accord with manufacturer's printed instructions.

D. Non-Slip Grits: Apply to all interior concrete floors scheduled to be exposed per manufacturer’s recommendations.

3.13 CURING

A. Concrete in Forms: Keep forms and top on concrete between forms wet continuously until removal of said forms; maintain exposed concrete in wet condition for 14 days after removal of forms.

B. Interior Slabs shall be moist-cured for 7 days after placement

C. Interior Slabs Scheduled to Receive Rubber, Sheet Vinyl, Carpet or Vinyl Composition Tile: Same as item “B” above. Notify Moxie 1800 representative at least 14 days prior to commencement of testing.

D. Interior Slabs Scheduled to Receive Ceramic Tile: No curing compound.

3.14 REMOVAL OF FORMS

A. Remove without damage to concrete surfaces.

B. Sequence and timing of form removal shall insure complete safety of concrete structure.

C. Forms shall remain in place for not less than the following periods of time. These periods represent cumulative number of days during which temperature of air in contact with concrete is 60□ F and above.

1. Vertical forms of foundations, walls and all other forms not covered below: 7 days.

2. Slab edge screens or forms: 5 days.

3. Concrete columns and beam soffits: 14 days.

3.15 CONCRETE TESTING

A. Comply with CBC Section 1903A, 1905A.3, 1916A and as specified in B. below. Costs of tests will be borne by School District.

B. Three identical cylinders shall be taken and tested for each 50 cu. yd. of concrete, or fraction thereof of each mix being placed each day. Cylinders shall represent as nearly as possible the batch of concrete from which they are taken; one shall tested at the age of 7 days and the other at 28 days. Cylinder for 28-day test will not be broken if cylinder for 7-day test meets 28 day strength. Hold third cylinder for test at 56 days if test at 28 days is not at specified strength.

C. Cost of re-tests or coring because of understrength, questionable or defective concrete will be paid by School District, but deducted from Contract price.

3.16 DEFECTIVE CONCRETE

A. As directed by Architect, remove defective concrete from site, or cut out and repair before concrete is thoroughly dry. No patching is to be done until surfaces have been examined by Architect.

B. Permission to patch any area shall not be considered waiver of right to require removal of defective work, if patching does not, in opinion of Architect, satisfactorily restore quality and appearance of surface.

C. Defective concrete is:

1. Concrete not meeting specified 28-day strength.

2. Concrete which contains rock pockets, voids, spalls, cracks, exposed reinforcing, or

other such defects which adversely affect strength, durability or appearance.

3. Concrete which is incorrectly formed, out of alignment or not plumb or level.

4. Concrete containing embedded wood or debris.

5. Concrete having patched voids which were not filled under Architect's direction.

6. Concrete not containing required embedded items.

D. Patching: REPAIRS TO DEFECTIVE CONCRETE INVOLVING STRUCTURAL STRENGTH IS SUBJECT TO APPROVAL OF ARCHITECT AND DSA.

1. Chip away minor defective areas to depth of at least 1" with edges perpendicular to surface. Wet area to be patched and space at least 6" wide entirely surrounding it to prevent absorption of water from patching mortar.

2. Coat with specified bonding agent. Apply patching mortar immediately thereafter. Patching mortar shall consist of 1 part cement to 3 parts fine aggregate mixed with water to consistency as dry as possible consistent with handling and placing.

3. Thoroughly compact mortar by ramming into place and screed off so as to leave patch slightly higher than surrounding surface. Leave undisturbed for 1 to 2 hours to permit initial shrinkage before final finish. Finish to match adjoining surface. Keep wet for at least 7 days. Provide protective covering such as burlap or fiberboard so that patch area is kept continuously damp.

4. In general, minor defective work may be repaired by use of cement mortar, as specified above, but if defects are serious, or affect strength of structure, or, if patching does not satisfactorily restore quality and appearance of surface, complete removal and replacement of concrete may be ordered.

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 30 00, Cast-In-Place Concrete.

B. Section 06 10 00, Rough Carpentry.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Certification: Use only American Welding Society (AWS) certified welders qualified to perform types of welding required. All welding to be inspected in accordance with Section 05 10 00.

1.04 SUBMITTALS

A. Refer to Section 01300.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Samples: The following samples are required. Submit per Section 01 30 00.

1. Submit sample for each type of abrasive safety nosing to Architect for review.

2. Manufacturer's full range of colors for Architect's selection.

D. Shop Drawings: Submit showing all parts, connections and anchorages, adjacent materials, fully dimensioned and noted.

E. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 30 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. American Institute of Steel Construction (AISC) Manual of Steel Construction, 9th edition (ASD).

C. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.

D. AISC Code of Standard Practice for Steel Buildings and Bridges.

E. American Welding Society (AWS) Structural Welding Code - Steel, AWS Standard Code D1.1, current edition.

F. Conflicting Requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, more stringent shall govern.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. Products shall be available at project when required for installation so as not to delay job progress. Installer for these products shall cooperate with installers performing work under other Sections involved to effect proper installation.

1.09 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel shapes, plates and bars: ASTM A-36.

B. Steel sheet: ASTM A446, Grade A.

C. Pipe: ASTM A-53, Type E or S, Grade B, Fy=35 ksi; hot dipped galvanized iron unless

otherwise indicated or specified.

D. Bolts and nuts: ASTM A-307; machine bolts unless otherwise indicated or specified, galvanized when used with galvanized metal.

E. Expansion Anchors: Hilti Kwik Bolt II or approved equal; galvanized unless otherwise indicated. Lead shields or tamp-ins are not acceptable.

F. Steel tubing: ASTM A-500, Grade B, Fy=46 KSI.

G. Unistrut: ASTM A570, Grade 33 or ASTM 446, Grade A.

H. Galvanizing: Hot-dip process, ASTM A-153 or A-385 or A-386, as applicable, performed after fabrication into largest practical section. Weight of coating not less than 2 oz. per sq. ft. of surface. Where damaged, repair surface with one coat of hot process galvanizing repair compound, "Galvalloy", "Galvaweldolloy", or approved equal.

I. Primer: Tnemac Company "69 Special Red Primer"; Rust Oleum Corporation "1069 Heavy Duty Rust Inhibitor Red Primer"; Sherwin-Williams "Kem Kromik Primer"; or approved equal.

J. Fasteners/connectors:

1. Bolts and nuts: ASTM A-307, Grade A and supplemental S1.

2. Machine screws: Cadmium plated steel, Fed. Spec. FF-S-92.

3. Wood screws: Flat-head carbon steel, Fed. Spec. FF-S-111.

4. Plain washers: Round, carbon steel, Fed. Spec. FF-W-92.

5. Toggle bolts: Tumbler-wing type, Fed. Spec. FF-B-588, type, class, and style as required.

6. Lock washers: Helical spring type carbon steel, Fed. Spec. FF-W-84.

7. Masonry anchorage devices: Expansion shields, Fed. Spec. FF-S-325.

8. Lag bolts: Square head type, Fed. Spec. FF-B-561.

9. Tamper resistant fasteners: Snap-off head, or recessed socket for hex wrench with central pin.

10. Security fasteners: Unless otherwise noted, security screws and bolts shall be minimum 3/8"-20 stainless steel security socket pin requiring special tool; 8" o.c. maximum.

K. Safety nosings: For poured-in-place concrete stairs, provide safety nosings constructed of 6063-T5 aluminum nosing base material with a colored epoxy/abrasive filler. The safety nosings shall be 3" wide and shall run the full length of tread. Provide Balco R-305P, ribbed type No. 1 or approved equal.

L. Perforated metal decking for ramps, stairs and landings shall be 14 ga. steel decking with 5/32" dimples at 3/4" on center, staggered, as manufactured by DUUS Perforating Co., San

Jose, CA or approved equal.

M. Stainless Steel: Shall be U.S. Standard revised gauges as specified, Type 302. All sheets shall be free from imperfections. All exposed and working sides shall be No. 4 finish.

1. Tops: All metal tops shall be one-piece welded construction of 14-gauge stainless steel reinforced on the underside with 14-gauge stainless steel hat sections welded in place so tops will support a minimum of 200 pounds per square foot without deflections. Ends shall be returned and closed. Edges shall be hemmed neatly.

2.02 MISCELLANEOUS ITEMS

A. Provide all miscellaneous steel shapes, braces, supports, anchors, bolts, etc., not specified or shown elsewhere, but required for erection and completion of work, including miscellaneous metal items shown under mechanical or electrical work, except as specifically noted otherwise.

1. Metal backing plates, anchor plates, etc. required for anchorage of mechanical and electrical fixtures and equipment to light gauge metal framing shall be furnished and installed by those trades.

2. Miscellaneous metal items embedded in concrete shall be furnished to the respective trades for installation thereunder. Furnish setting templates and/or proper execution of work.

2.03 CONNECTIONS

A. Except where bolted connections are shown, weld all joints and assemblies. Welds not shown on drawings shall be designed to meet intended use of item or assembly.

B. Sizes of bolts, screws or other threaded fasteners or anchorage not shown on drawings shall be of size required to meet intended use of item or assembly.

2.04 GALVANIZING

A. The following items shall be hot dip galvanized after fabrication:

1. All exterior items including those penetrating wall and only with partial exposure to exterior.

2. All items embedded in or anchored to concrete at exterior of building, even if not directly exposed or visible.

3. Only those interior items that are so noted shall be galvanized.

2.05 ASSEMBLIES

A. Fabrication, material and installation shall be as indicated and as specified. Assemblies include, but are not limited to the following. Examine Drawings for additional work required.

B. Angle frames and supports attached to or embedded in concrete construction shall be galvanized after fabrication.

C. Pipe handrails: Fabricate and install as indicated, complete with rails, posts, fittings, brackets and anchorage.

1. Wherever practical, construct bends and sweeps by bending pipe. Use suitable pipe bending jigs to prevent crushing pipe. For short radius bends and sweeps, use formed, flush, welding type fittings.

2. Except where bolted connection are indicated, weld all joints and grind smooth. All bolts, fasteners, and miscellaneous items shall be galvanized.

D. Railings: Fabricate from material indicated, weld all joints and grind smooth. Ease corners. All pipe shall be smooth without rough spots, voids or other such imperfections, ready for paint.

E. Ladders:

1. Fabricate ladders for locations shown with dimensions, spacings, details and anchorages as indicated.

2. Comply with requirements of ASNI A14.3 except as otherwise indicated.

3. Fit rungs in centerline of flat bar type side rails. At flat bar type side rails, plug-weld, and grind smooth as outer rail faces.

4. Support each ladder at top and bottom, and at intermediate points spaced not more than 60" on centers. Use welded or bolted steel brackets designed for adequate support and anchorage, and to hold the ladder clear of wall with minimum 7" clearance from wall to rung centerline.

5. Extend rails 42" above top rung, and return rails to wall or structure unless other secure handholds are provided. If adjacent structure does not extend above top rung, goose-neck the extended rails back to structure for ladder access.

6. Provide nonslip surface on the top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is permeated with aluminum oxide grout.

7. Provide all necessary brackets and fittings for installation.

8. Provide metal landing at top rung where ladder bridges parapet wall.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where fabrication and installation of the work of this Section may properly commence.

B. Make all required measurements in the field to ensure proper fit of miscellaneous metal items.

C. Verify that miscellaneous metal may be fabricated and installed in strict accordance with the original design and the approved Shop Drawings.

D. In the event of discrepancy, immediately notify the Architect. Do not proceed with fabrication or installation in discrepant areas until discrepancies have been fully resolved.

3.02 GENERAL REQUIREMENTS

A. Fabrication and welding shall be in compliance with referenced standards.

B. Welded joints: All welds shall be full length or perimeter of joint or seam. Welded-in butt joints shall be V-groove type. Grind all exposed welds smooth. Welds in butt joints shall be ground flush with surface.

C. Surface finish: All exposed surfaces, corner, edges, etc., of items and assemblies shall be smooth, free of sharp and injurious points and edges.

D. Rough hardware:

1. Provide bent or otherwise custom fabricated bolts, plates, anchors, hanger, dowel, and other miscellaneous steel and iron shapes as required for framing and for anchoring or securing framing to concrete and other structures.

2. Manufacture or fabricate items of sizes, shapes, and dimensions required.

E. Shop clean: After fabrication, thoroughly clean steel of all loose mill scale, rust splatter, slag or flux deposits, oil, dirt, and other foreign matter.

F. Shop priming: After cleaning, except where other finishes are hereinbefore specified, all ferrous metal shall be given one shop coat of specified primer. Parts inaccessible after assembly or erection shall be given two coats of specified primer, second coat darker in color.

3.03 FABRICATION

A. Miscellaneous framing and supports:

1. Provide miscellaneous steel framing and supports which are not part of structural steel framework, as required to complete work.

2. Fabricate miscellaneous units to sizes, shapes and profiles shown; or if not shown, to require dimensions to receive adjacent other work to be retained by framing.

3. Fabricate the miscellaneous units from structural steel shapes, plates, and steel bars of welded construction with mitered joints for field connection, unless shown otherwise.

4. Cut, drill and tap units to receive hardware.

5. Equip units with integrally welded anchors for casting into concrete or building into masonry, and furnish inserts if units must be installed after concrete is placed.

6. Except as otherwise shown, space anchors 24" on center, and provide minimum

anchor units of 1-1/4" x 1-1/4" x 8" steel straps.

7. Galvanized miscellaneous frames and supports where indicated.

3.04 ERECTION

A. Preparation: Furnish setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete construction. Coordinate delivery of such items to project site.

B. Install miscellaneous metals and accessories in accord with reviewed Shop Drawings, referenced standards, manufacturer's installation recommendations or as directed by Architect.

C. Field Welding: Comply with AWS Code for procedures of manual shielded metal arc welding, appearance, and quality of welds made and methods of correcting welded work.

D. Installation:

1. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction including threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

    a. Adhesive anchors shall only be used at concrete block only and only at locations where detailed.

2. Cutting, fitting and placement:

    a. Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications.

    b. Set work accurately in locations, alignment and elevations, and make plumb, level, true and free from rack, measured from established lines and levels.

    c. Provide temporary bracing or anchors in formwork for items which are to be built into concrete or similar constructions.

    d. Fit exposed connections accurately together to form tight hairline joints.

    e. Weld connections which are not to be left as exposed joints, but can not be shop welded because of shipping size limitations.

    f. Grind exposed joints smooth, and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have not been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

3. Railings

    a. Furnish post setting sleeves to concrete trade; direct and supervise proper setting and location of sleeves.
    b. Set railing posts and grout between posts and setting sleeves with non-shrink

grout.

E. Provide isolation of dissimilar metals from contact with one another with two coats of primer or approved equal isolation system.

3.05 TOUCH-UP & REPAIR

A. Immediately after erection, clean connections including field welds and bolted connections and paint exposed areas with same material used for shop priming. Brush or spray apply to provide minimum dry film thickness of 2 mils.

B. After installation of this section is complete, touch-up all damaged and abraded paint on installed assemblies, using paint specified for shop priming.

C. Touch up damaged areas in shop primed surfaces which will be concealed after erection. Leave in condition fit for finish painting by other trades.

D. Repair or replace defective materials as directed.

E. Adjust and lubricate hardware and leave entire installation clean and in good operating condition.

3.06 PROTECTION

A. Protect work and materials of this Section prior to and during installation and protect the installed work and materials of other trades.

B. Protect installed work from damaged from other trades.

C. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

END OF SECTION

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PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 00 00, Miscellaneous Concrete

B. Section 05 50 00, Miscellaneous Metals.

C. Section 06 40 00, Finish Carpentry & Millwork.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

1.04 SUBMITTALS

A. Refer to Section 01 30 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Provide mill certificates for D.F. pressure treated materials.

D. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01300.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on drawings, as adopted by the California Division of the State Architect (DSA).

B. Plywood:

1. Plywood Design Specifications by the American Plywood Association (APA).

2. Voluntary Product Standard DOC PS 1 “Construction and Industrial Plywood.”

C. Lumber: American Softwood Lumber Standard DOC PS 20.

D. AITC 117, MANUFACTURING, Standard Specifications for Structural Glued Laminated Timber of Softwood Species.

E. AITC 117, DESIGN, Standard Specifications for Structural Glued Laminated Timber of Softwood Species.

F. ANSI/AITC A190.1, Structural Glued Laminated Timber.

G. ASTM D 3737 Standard Method for Establishing Stresses for Structural Glued Laminated Timber.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

1.09 PROJECT RECORD DOCUMENTS

A. Provide per Section 01 70 00, Project Close-out Procedures.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber: Douglas Fir-Larch unless otherwise noted. Lumber designated as Douglas Fir

South by WWPA is not acceptable. All lumber shall be graded under one of the following:

1. Rules No. 17, Standard Grading Rules for West Coast Lumber, current edition - WCLIB or Standard Grading Rules for Western Lumber, current edition - WWPA.

2. Standard Specifications for Grades of California Redwood Lumber, current edition - RIS.

A. Lumber:

1. Poles: All poles Douglas Fir and/or Ponderosa Pine conforming to ANSI 05.1 Specifications and Dimensions for wood pole except as follows:

   a. Straightness: Poles may deviate from straightness in one plane and one direction only. A straight line joining surface of wood at ground line and surface of wood at top shall not be more than 1-1/2" from surface of pole at any joint.
   b. Minimum sapwood thickness of 3/4".

   c. Spiral grain or twists limited to one complete turn in any 30' of length.

   d. Select poles for uniformity and appearance.

   e. Seasoning checks shall not be considered defect except width of checks shall not exceed 1/2" at time of shipment. No restriction on length or depth of checks.

   f. Butts and tips cut square before pressure treatment.

   g. No undersize permitted but up to 2" oversize allowed.

   h. Poles are specified by tip diameter as based on average natural taper of 1" in 10'.

   i. Pressure treatment: Poles are to be pressure treated by McCormick & Baxter's process with Cellon (Pentachlorophenol in L.P.G.).

   j. Treatment procedures in accord with AWPA Standard C23, "Pole Build-Construction-Preservative Treatment by Pressure Processes". **Incising is not permitted.**

B. All lumber shall be new with no re-use except as permitted by Architect. **No boxed heart** will be permitted in **3x or thicker**. Maximum moisture content 19%.

1. All framing, except as otherwise noted - No. 1.

2. 6x and thicker members - Select Structural.

3. Blocking, bridging, furring, stripping and nailers - No. 2.

4. Redwood, Unless Otherwise Noted: Foundation Grade.

5. Plywood Sheathing: C-D with exterior glue (PS 1-07), T & G Edges where shown.

6. Sills, Stripping at Roof and Hip and Ridge Nailers for Steel Tile: DF pressure treated with approved preservative to obtain minimum penetration of 1/4" into all surfaces of wood (Mill certificate for this treatment must be furnished with shipment). Redwood sill may be used only for non-bearing stud walls or where shown explicitly on Structural Drawings.

7. T & G Decking: DF or Hemlock, 6 inch nominal width, thickness as shown on Drawings. All material kiln dried, maximum moisture content 15% in decking. Random lengths not permitted; all joints over supports. For roof decking, use "Select Dex", Pattern WC-200.

8. Plywood Siding: 4' x 10' x 5/8" rough sawn Redwood 303 Siding Exterior (PS 1-07).

9. Exterior Decking: California Redwood, select decking, 2 x 6. Beams, ledgers and other framing members to be redwood, select structural, open grain.

10. Fascia: Tight Knot Cedar, S4S.

F. Preservative: Pentachlorophenol in oil colored with pigment to produce strong, contrasting color on wood which has been treated per AWPA C1-91 and C15-91.

G. Fastenings:

1. Nails: ASTM F1667 common wire nails or spike; box nails not permitted. All nails exposed to weather shall be hot dipped galvanized. Wire gauges and lengths for common nails are to be as follows: 16d nails are .162 inches round x 3-1/2 inches; 10d nails are .148 inches round x 3 inches; and, 8d nails are .131 inches round x 2-1/2 inches.

2. Bolts: Machine bolts, unless noted otherwise (ASTM A-307, Grade A).

3. Washers: Use for all bolts or lag screws bearing on wood. Malleable iron or steel washer at head and nut as shown on Drawings. Washers not required under heads of carriage bolt, but nut shall have cut washers.

4. Adhesive for Plywood Floor Sheathing: Conform to APA-AFG-01.

5. Miscellaneous Fasteners: Steel Hardware, Joist Hangers, Post bases, Tie downs, etc: ASTM A36, galvanized at exterior locations; Simpson, Silver or approved equal.

6. Machine Nailing: The use of nailing guns is subject to a satisfactory jobsite demonstration and the approval of the Structural Engineer and DSA. This approval is subject to continued satisfactory performance. If the nailheads penetrate the outer ply or if the minimum allowable edge distances are not maintained, the performance will

be deemed unsatisfactory.

H. Building Paper: Pabco, J.M., or approved equal, #15 asphalt saturated felt.

I. Non-shrink Grout: Embeco, Non-metalic, or approved equal.

J. Caulking: Furnished and installed under this Section. (Materials and workmanship shall conform to Section 07 90 00.)

2.02 QUALITY CONTROL

A. Grade mark each piece of lumber by agency approved by DSA. Lumber Manufacturer's Association Certificates may be accepted in lieu of such grade and trade marks for complete, unbroken original bundles readily identifiable to certificate, only. Certificates will be required for items used structurally but furnished under Millwork Section.

B. Plywood Sheathing: Each panel shall be legibly identified as to type, grade and species glue per American Plywood Association specification.

2.03 EQUIPMENT

A. Powder Actuated Fasteners: Powder-actuated fastening system may be used where shown, or specified, in structural connections (connections carrying computed stresses). All connector and powder charges shall be used strictly in accord with manufacturer's instructions. Operators shall be certified by manufacturer of tool, and application methods shall be in accord with Article 28, Powder-Actuated Tool, Paragraph 1685, of Title 8, California.

B. Tools and fastenings shall be equal to Hilti Systems. Demonstration of satisfactory and secure fastening made it side under actual job conditions will be required before proceeding with work. Evidence of inadequate holding power will be cause for rejection of such fastenings.

PART 3 - EXECUTION

3.01 ERECTION AND BRACING

A. Furnish and erect rough structural wood framework, including posts, beams, rafters, studs, plates, nailers, blocking, bridging, sheathing, stripping, purlins, grounds and furring.

B. Furnish all plant, labor, material, tackle, guys, braces, scaffolds, staying and equipment necessary to erect rough carpentry components and to hold them safely in position until permanent connections are completed. Permanent connections as used herein refer to all hardware and include all structural work of any description and attachment thereof to the surrounding walls.

C. Wherever stacks of material, erection equipment or other loads are carried by work during construction, make provisions to take care of stresses and strains resulting. Keep temporary bracing in place until permanent walls and roofs are completed; provide temporary bracing sufficient to keep structure stable, plumb and in line until completed. Place temporary bracing to allow freedom of workmen in building and erecting other work.

3.02 FRAMING

A. Partition and Wall Furring Framing: Wood studding of size called or spaced as shown. Use top and bottom plates - double top plate and lap at each intersection with walls or partitions. Stagger joints 4' in upper and lower member of top plate, unless shown otherwise. Frame openings with double studs at each side, with headers and lintels as shown.

1. Stud partitions or walls, more than 10' but not more than 20' in height, to have blocking of same width and thickness as stud; fit snugly and nail into studs so as to provide maximum 8' space.

2. Studs that are to receive direct application of finish shall be square cut and in true plane. Provide solid blocking for all plywood joints.

3. Top plate splices for all walls shown on roof framing plans are essential for continuity.

4. Wherever stud walls meet masonry and at other locations shown, install against continuous pad of 1" thick rigid fiberglass insulation.

B. Framing for Piping: Frame partitions containing any piping to give proper clearance; place pipe 1-1/2 outside diameter or less in center of plate using neat round holes; no notching allowed; pipes not to pass through sills or plate less than 5-1/2" in width. Furr partitions where required to conceal piping.

C. Fire Blocking: Comply with CBC, Section 708. Provide 2" nominal thickness lumber for blocking by width of enclosed spaces within partition; provide fire blocks at intersection of interior and exterior walls with ceilings and roof to effectively cut all communication by fire through hollow concealed space, and prevent vertical and horizontal draft. Use continuous row of fire furring; place in such manner that no concealed air spaces greater than 10' in any direction occur. Fire blocking and draft stops shall be provided in conformance with CBC 708.

D. Blocking, Backing, Stripping and Nailing Members: In addition to normal wall blocking, install necessary nailing member for plywood panels, so that all edges fall on solid framing. Provide solid blocking for gypsum wall board only at cut or square edges. (Tapered edges do not require blocking.) Provide blocking for anchorage or nailing of all finish; wood and metal door frames (including wall and ceiling access doors); metal coverings; plasterwork; nailing members used in connection with roof decking; blocking and backing required by all wall or ceiling hung equipment and accessories (including suspended acoustic ceiling), and by Mechanical and Electrical Contractors for heating, plumbing and electrical fixtures.

E. Glue Laminated Members: Do not erect any for which Inspectors Certificate has not been

furnished. Cutting is not permitted, except as shown on Drawings, or with written approval of Structural Engineer.

F. Recessed Fixtures: Frame openings for panel boxes and other equipment, according to requirements of fixtures provided.

G. Roof Strips, Roof Curbs and Nailers: Install at openings through roof, except where prefabricated curbs are shown or specified.

H. Plywood Sheathing: See Drawings for thickness. All joints of wall sheathing must bear on studs or blocking. All plywood nailing shall be as shown on Structural Drawings. Closer nail spacing applies not only at all edges of all sheets, but also over all walls or beams, and farthest nail spacing applies only at interior bearings other than as specified above.

Use of nailing gun to apply nails is subject to written approval of Architect and such approval will be qualified to insure results being equal to that obtained with hand nailing; use of abut on framing member less than 2-1/2" wide will not be approved nor will such use be permitted on wall. Where electrical or mechanical requirements require interruption of plywood pattern, same must be submitted to and approved by Structural Engineer through Architect.

I. Nailing: Penetration of nails or spikes not shown otherwise half length of nails into piece of receiving points; however, to connect pieces 2" net in thickness, 16d nails may be used unless shown otherwise. Do not drive nails closer together than half their length nor closer to edge of piece of lumber or timber than 1/4 of their length; opening and size of nails to be such that splitting will not occur; bore holes for nails wherever necessary to prevent splitting; bore diameter of hole smaller than diameter of nail spike; see Nailing Notes on Drawings. Wherever nails of normal length may penetrate and show in exposed work, use nail of specified diameter and shorter length.

J. Screws: Driving into place not permitted. Soap may be used to lubricate screws. In placing lag screws, first bore holes of same diameter and depth as shank; bore holes for threaded portion of screws with bit 70% shank diameter. For wood screws, #14 and larger, drill lead holes for shank and threaded portions of 7/8 times shank and thread root diameter respectively.

K. Steel Plates and Shapes Bolted to Wood: Bore holes in timber same diameter as bolt; use steel piece as templates for locations of holes; tighten nut or rods and bolt at time of installation and re-tighten before covering up just before final acceptance of the work; examine accessible nut, re-tighten any to be found loose for exposed work, cut protruding bolt ends off within 1/8 inch of bolt head and file all burrs off.

L. Gypsum Sheathing: Apply horizontally and fasten by nailing in accordance with CBC Table No.
25A-G.

M. Rough and Framing Hardware: Furnish and install all rough hardware such as, nails, spikes, bolts, screws, drift pins and dowels. Furnish and install all framing clips, hangers, splice plates and other framing hardware. Furnish anchor bolts for installation in forms under

Section 03 10 00.

N. Decking: Where roof decking will be exposed as ceiling of rooms below it is both rough framing and finish carpentry. Handling and installation shall preserve intended architectural effect of soffit finish. Install decking with face pattern down (exposed). Each piece is to be toe-nailed at each support with one nail and face nailed with one nail, as shown on Drawings. Use ring shanks nails. End joints shall be butted tight and joints between courses drawn up tight by supplementary nailing as required; such supplementary nailing shall not affect appearance of underside. Broken, chipped, marred face, or other unnatural defects will be justification for rejection where installed in exposed locations. Do not mar surface of decking and adjacent materials.

O. Poles: Set base at designated elevation on concrete, center poles on grid lines and have annular space filled with Class Concrete as specified in Section 03300. Cut daps for framing neatly and accurately, limiting saw overcut to 1/8" and holding face to face of dap dimension to 8-1/2" dimensions given plus or minus 1/8". Paint required daps with pentachlorophenol.

P. Preparation for steel shingles: After application of felts install redwood or cedar lath strips 24" o.c. over rafters from eaves to ridge. Nail 12" o.c. with 4d common wire nails. After lath has been glazed install 1x2 stripping (pressure treated as specified hereunder) 10" o.c. parallel to eaves and nail at each rafter position with 5d common wire nails. Coordinate layout of stripping with steel shingle installer for proper spacing. 1x2 stripping to be installed in 48" lengths leaving 1/2" gaps between for drainage.

3.03 MISCELLANEOUS INSTALLATION

A. After installation of metal items specified in Section 05100 and 05500 (or Section 05110) touch up abrasions or voids in shop prime coat, using same material specified for priming.

B. Provide curbs and bolting for mechanical equipment as shown on Mechanical Drawings.

C. Provide vent holes as shown on Drawings.

D. At sound-deadened partitions install plates on double bead of non-skinning type, butyl-based caulking compound.

E. For items involving more than one section of these Specifications, coordinate work of all trades and be responsible for installation of item.

F. Install railing, using specified non-shrink grout in accord with manufacturer's printed instructions.

G. Caulking: (See Section 07 90 00 for locations where joint sealants will be applied.) At other locations, and wherever required, apply specified material neatly and in accord with manufacturer's written instructions. Apply with sufficient pressure to completely fill joints. Clean surrounding material of excess caulking.

H. Building Paper: Install on wall surfaces where finish will be metal siding or veneer. Apply 2

layers weatherboard fashion with 2" laps to horizontal joints and 6" laps at vertical joints and corners. Use 3/8" head galvanized nails, nailing sufficiently to hold without buckling. Repair all damaged places before installation of finish materials. Installation of paper finish for cement plaster is included in Section 09 20 00.

END OF SECTION

FINISH CARPENTRY

Section 06 20 00
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00, Rough Carpentry.

C. Section 06 41 16, Plastic Laminate Casework.

D. Section 07 92 00, Joint Sealants.

E. Section 08 11 13, Hollow Metal Doors & Frames.

G. Section 08 71 00, Door Hardware.

H. Section 08 80 00, Glazing.

I. Section 09 72 00, FRP Wall Coverings

I. Section 09 91 10, Painting.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Work shall be done under direction of a capable foreman experienced in installation of finish carpentry work.

E. Carefully plan and lay out all finish work; cooperate with other trades.

F. Workmanship shall be of highest quality. Materials that are marred or otherwise damaged during installation shall be immediately replaced at no additional cost to the Owner.

G. All millwork shall be manufactured in accordance with the standards in the latest edition of the Manual of Millwork of the Woodwork Institute of California in the grade or grades hereinafter specified or shown on the drawings. Grade mark and mill identification shall appear distinctly legible on back of each piece of lumber. No marks shall appear in exposed faces of work to receive transparent or semi-transparent finishes.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Samples: The following samples are required. Submit per Section 01 33 00.

1. Submit sample for each type of shapes, assemblies, etc., as necessary and hardware to Architect for review.

2. Manufacturer's full range of colors for Architect's selection.

D. Shop Drawings: Submit showing all parts, connections and anchorages, adjacent materials, fully dimensioned and noted.

E. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

F. Before delivery to the job site, the millwork supplier shall issue a WIC CERTIFIED COMPLIANCE CERTIFICATE indicating the millwork products he will furnish for this job, and certifying that they will fully meet all the requirements of the grade or grades specified.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. Manual of Millwork as adopted by the Woodwork Institute of California (WIC).

C. Plywood: Guide to Plywood Grades as published by the American Plywood Association, latest edition. U.S. Product Standard PS 1-83.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. Products shall be available at project when required for installation so as not to delay job progress. Installer for these products shall cooperate with installers performing work under other Sections involved to effect proper installation.

B. Materials shall be protected continuously after grading, during storage, transportation and handling, in such a manner as to avoid exposure to moisture conditions that could increase their moisture content.

C. Protect exterior work from rain and other moisture until it can be finished.

1.09 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Exterior Trim (including Fascia):

1. Redwood, B-grade or better, dry, rough sawn face, for opaque finish.

2. Custom Grade Western Cedar, for transparent finish.

B. Interior Trim:

1. W.I.C. Custom Grade V.G. Douglas Fir, for opaque finish.
   Finish for all trim where hardwood is not indicated.

2. W.I.C. Custom Grade Birch, for transparent finish.
   Finish where hardwood is indicated.

C. Moisture content shall be a minimum of 6% and shall not exceed 12% up to 2 inches nominal thickness and shall not exceed 19% for pieces thicker than 2 inches up to 4 inches nominal thickness.

D. Plastic Laminate Panels: Panel Specialists, Inc. Wall Panel System 310 (Fire Rated), high pressure laminate on particle board or approved equal. Provide with concealed vertical divider, ceiling/base molding, outside corner trim and other trim. Laminate selection from complete range of colors and finishes. Systems, including laminate, substrate and adhesive to be certified to be rated as Class I maximum smoke density not to exceed 450.

E. Wood Preservative: Dip or brush treat all exterior wood except Redwood or Cedar unless otherwise noted; per Manual of Millwork, WIC.

F. Adhesives: As recommended by the manufacturer for the intended use and materials required.

G. Fasteners: Provide all fasteners as indicated on drawings or shop drawings or as necessary for proper installation of products installed herein, in sizes, quantities sufficient to draw and hold products rigidly and permanently in place. Fasteners shall be selected for concealed appearances.

1. Nails: Hot-dipped galvanized for all exterior work. Bright finish finishing nails for all interior work. Ring shank nails for all exterior decks.

2. Bolts: Machine bolts, unless noted otherwise.

3. Washers: Use for all bolts or lag screws bearing on wood. Malleable iron washers shall be used for all exposed work at head and nut. Malleable iron or steel washers to be sized at 16 time area of bolt and not less than 1/2 bolt diameter in thickness. Cut washers may be used only where specified. Washers not required under heads of carriage bolts, but nuts shall have cut washers.

H. Miscellaneous Items: Provide all miscellaneous fasteners, brackets, supports, connectors and accessory items as indicated on the Drawings or as required by the product manufacturer for a complete and proper installation of the materials, products or systems specified in this Section.

PART 3 - EXECUTION

3.01 MILLING WORK

A. Mill to dimensions and profiles shown, and match existing where indicated. Except where exact length can be determined, material shall be provided long for cutting and fitting in field.

B. "Back out" reverse side of trim when 5/8 inch or more thick or 1-5/8 inches or more wide.

C. Kerf unexposed side of exterior millwork where "cupping" may occur.

3.02 PRELIMINARY PAINT/FINISH OF MILLWORK

A. All surfaces, edges and ends of millwork to be painted shall be primed before shipping. Unexposed surfaces to be in contact with concrete and masonry shall receive two coats of primer. Primer shall be an alkyd enamel undercoat applied in accordance with manufacturer's specifications.

B. All surfaces, edges and ends of millwork to receive stain or transparent finish shall be sealed at the shop before shipping. Primer shall be an approved clear wood preservative such as "Woodlife", Pentaseal" or approved equal. Preservative materials shall not prevent later field application of stain or clear finish from penetrating the wood. Millwork shall be tied, shipped and stored in such a manner as to avoid warping, twisting and curling. Any such warped millwork may be rejected by the Architect.

C. All unexposed edges cut on the job shall be primed with the same primer used in the shop.

D. Redwood shall not be shop primed.

3.03 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. In the event of discrepancy, immediately notify the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.04 PROTECTION

A. Protect work and materials of this Section and other sections prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Exposed finish shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

3.05 INSTALLATION

A. General: Do no millwork until wet operations are completed and concrete, masonry and plaster work has thoroughly dried and millwork has been primed or sealed in approved manner.

B. Installation of finish carpentry and millwork shall conform to the applicable requirements of the W.I.C. "Manual of Millwork".

C. Interior Frames: Install plumb, square and true, securely wedged and anchored to structure. Countersink face nails.

D. Trim Members: Install level, plumb and true, with member neatly and accurately scribed in place. Install trim in single lengths, running trim in as long a length as practical for species specified. Butt joints to be back-beveled, exterior and interior angles mitered.

E. Nailing: All nails to have required penetration into holding member per Title 24, Table 23A-1-G.

1. Exterior Trim: 10d nails or less, use finish nails set 1/16 inch below face, without putty. 10d to 20d nails, use common nails driven flush without hammer marks and putty. 20d or over, use common nails driven flush without hammer marks and putty.

2. Interior Trim: Set nails 1/16 inch below face, with putty. No putty where finish will be clear.

3. Exterior Plywood: Nails long enough to penetrate structural backing 1 inch. Use galvanized box nails, driven flush without hammer marks.

4. Interior Plywood: Install with grain texture vertical, with edges and ends occurring only over bearings. Use aluminum or stainless steel finish nails in 8d size for 5/8 inch thick

plywood and 6d for 3/8 inch thick plywood. Nail 6 inches o.c. along all sheet perimeter edges and 12 inches o.c. along all intermediate bearings.

F. Wainscot: Install wainscot system per manufacturer's installation recommendations, using trim, fasteners and attachments required.

G. Panels and moldings are to be mechanically fastened through gypsum board backing and into wood or metal studs with expansion anchors per manufacturers recommendation. Provide in addition to anchors, construction adhesive per manufacturers recommendation. Provide continuous sealant to all panel molding connections to make waterproof. Moldings shall be detailed so as not to cause damage to adjacent moldings or panels if vandalized or removed.

H. FRP: Install FRP panels per manufacturer’s installation recommendations using trim, adhesive, fasteners and other means required. Install such that no fasteners are visible in panel field.

3.06 WORKMANSHIP

A. Exposed surfaces shall be free from tool marks, torn grain, cross sanding, or workmanship defects that cannot be concealed by specified painter's finish.

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00, Rough Carpentry.

B. Section 09 51 13, Acoustical Ceilings.

C. Division 22: Duct and Pipe Insulation.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Installer's/Applicator's Qualifications: Company with a minimum of two years in performing work of this section and certified by manufacturer as an approved Installer/Applicator.

E. Volatile Organic Compound (VOC) Emissions: Provide products complying with GREENGUARD Product Emission Standard for Children and Schools.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Executed Guarantee of Contractor/Subcontractor per Article 1.05.

C. Product Data: Submit data on product characteristics, performance criteria, and limitations, including the following:
1. General installation/application instruction.
2. Environmental conditions required for installation and installation techniques.
3. Safety requirements for application of products.

D. Installer's/Applicator's Qualifications: Submit copy of Installer's/Applicator's certification from manufacturer.

E. Sustainable Design: Provide manufacturer's certificates prepared by an independent, third party certifying to the following:
1. Recycled material content for products with recycled content.
2. Volatile organic compound content for each interior adhesive and sealant and related primer.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. California Quality Standards for Insulating Materials.

C. ASTM Standard C-665.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's original sealed packaging and/or original bundles with tags and labels intact.

B. Storage: Store and protect products in accordance with manufacturer's instructions. Store with seals and labels intact and legible. Store inside and in a dry location. Protect insulation materials from moisture and soiling. Provide ventilation to prevent condensation and degradation of products.

D. Inspection: Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

PART 2 - PRODUCTS

2.01 PRODUCT STANDARDS

A. References to manufacturer's names and products are to facilitate establishing level of quality, function and method of application.

B. Thermal Resistance Value (R): Thermal resistance calculated on value of material itself, without regard to location or method of installation.

1. Batt Insulation. (Unless specifically noted otherwise.)

a. For ceilings and ceiling/roof:
- Minimum R-value shall equal 38

.

b. For framed walls,
- Minimum R-Value, Thickness 3-1/2 Inches: R-13.
- Minimum R-Value, Thickness 5-1/2 Inches: R-21.5.

2. Board Insulation. (Unless specifically noted otherwise.)

a. On top of roof, R shall equal 14.3.

2.02 MATERIALS

A. Owens Corning, or approved equal, Batt Thermal Insulation (walls and ceiling/roof assemblies):
   1. Batt Insulation, Unfaced: ASTM C 665, Type I, preformed glass fiber batt type, unfaced.
   2. Batt Insulation, Kraft Faced: ASTM C 665, Type II, Class C preformed glass fiber batt type, Kraft paper faced one side.
   3. Batt Insulation, Foil Faced: ASTM C 665, Type II, Class B preformed glass fiber batt type, foil faced one side with maximum flame/smoke properties of 75/450 in accordance with ASTM E84.

B. Batt Sound Insulation: Owens-Corning unfaced glass fiber acoustical insulation or approved equal, complying with ASTM C-665, Type 1. Batts to be full depth of studs. Flame spread and smoke density shall conform to CBC 707 and ASTM E-84, FHC 25/50 or less.

F. Vapor Barrier: All insulation shall have an integral vapor barrier on inside face unless otherwise noted. Vapor barrier shall have vapor permeance of not more than one perm when tested in accord with ASTM E-96. All insulation materials including facings installed within floor-ceiling assemblies, roof-ceiling assemblies, walls, crawl spaces or attics shall have a flame-speed rating not to exceed 25 and a smoke density not to exceed 450 as per CBC 707.

G. Drain Pipe Insulation Wrap: Exposed drain and supply plumbing lines under sink and vanities shall be wrapped with an approved insulation wrap to a neat and uniform appearance with tapered ends. Insulation wrap shall be wrapped with a white washable vinyl tape as approved by the Architect.

2.03 ACCESSORIES

A. All other materials, such as additional insulation materials, fasteners, line wire, tape and retainers, not specifically described but required for a complete and proper installation of building insulation, shall be as selected by the Contractor subject to submittal approvals. Accessories: Provide accessories per insulating system manufacturer's recommendations, including the following:

   1. Tape: Polyethylene self-adhering type for Kraft faced insulation and bright aluminum self-adhering type for foil faced insulation.
   2. Insulation Fasteners: Impale clip of galvanized steel; type recommended by insulation manufacturer for particular use intended.
   3. Mechanical Insulation Fasteners: FM approved, corrosion resistant, size required to suit application.
   4. Wire Mesh: Galvanized steel, hexagonal wire mesh.
   5. Spindle Fasteners: Corrosion-resistant wire spindles.
   6. Ventilation Baffles: Formed plastic, metal, or cardboard sized to fit full width of rafter spaces..

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, flashing conditions, penetrations, adjoining construction and the conditions under which work is to be installed. Verify that surfaces are dry and free of oil, grease, dust, rust, or other contaminant.

B. Report unacceptable conditions in writing. Do not proceed with the Work until unsatisfactory conditions have been corrected and surfaces are acceptable.

C. Verify that fire stopping is in place before beginning to apply the air infiltration barrier with flexible seal technology.

D. Verify the following conditions have been sealed with the air infiltration barrier before installing insulation and before closing in framing cavities:

1. Gaps between window units and framing.

2. Gaps between door heads, jambs, and sills and wall framing.

3. Interface of foundation or slab and sill plate.

4. Interface of band joists or rim joists and plates and subfloor.

5. Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space.

E. Verify the following work is complete before installing insulation and before closing in framing cavities:

1. Vapor retarder or air barrier is installed at fireplace walls.

2. Air sealing is provided between the garage and conditioned spaces.

3. Vapor retarder or air barrier is installed in common walls between dwelling units.

4. Recessed light fixtures are air tight, IC rated, and sealed to gypsum board.

    a. Exception: Light fixtures in locations with conditioned spaces on both sides do not need to be air tight and do not need to be sealed unless required by another Section in the Project Manual.

3.02 PREPARATION

A. Provide thermal insulation at all exterior walls, interior partitions noted on Drawings to be insulated, and masonry walls as indicated, at all wood ceiling joists below roof areas, at all acoustical suspended ceilings and other locations indicated, including metal decks. Insulation in walls shall extend the full length of all exterior walls and vertically to the highest adjacent roof/ceiling. Install wall and ceiling insulation to create complete thermal enclosure around habitated space.

B. Provide sound insulation at toilet walls adjoining other rooms, toilet chase wall and as indicated on drawings. Extend vertically to highest adjacent roof/ceiling.

C. Before beginning work, protect windows, plumbing fixtures, finish materials, and finish surfaces within work area from overspray by covering them with a plastic film. Secure edges of film to assure air infiltration barrier with flexible seal technology does not get behind the film.

D. Sweep area to receive air infiltration barrier application to remove dust and other contaminants that will interfere with providing a thorough seal.

E. Fill medium-sized gaps (gaps between 3/8 inch and 3 inches) between surfaces to be sprayed with fiberglass insulation. Cover gaps greater than 3 inches with rigid, nonporous material such as gypsum board, , extruded polystyrene insulation, sheathing, OSB, particle board, agrifiber particle board, or plywood secured to framing and apply sealant at the perimeter.

F. Comply fully with OSHA regulations regarding protective clothing, breathing apparatus, ventilation, and restricting access to areas of application.

3.03 INSTALLATION OF BATT OR BLANKET INSULATION

A. Wood joist ceilings: Install thermal insulation batts or blankets between joists with snug fit at sides and firmly butted ends with no open space at perimeter or in between. Staple insulation to sides of joists at 4" spacing through bent down flanges of vapor barrier in such manner that air leaks between insulation and joists are minimized.

B. Exterior stud walls: Install thermal insulation in same manner as specified for wood joist ceilings, by stapling flanges of vapor barrier to sides of wood studs.

C. Suspended ceilings: Place on top of suspended ceiling materials, including light fixtures. Suspend on wire supports such that 6 inches minimum clearance is maintained between light fixture and insulation. Fit snugly between ceiling supports and at edges and ends so air leaks are minimized. Extend 12 inches beyond wall lines of rooms to be insulated. Where walls or plenum barriers extend above ceiling, place 12 inch width of batt on opposite side, adjacent to wall or plenum barrier.

E. Sound insulated walls: Fill between studs where shown; Pack completely, free from gaps and voids; Cut and pack around pipes, etc.

3.05 PROTECTION

A. Protect installed insulation from damage until covered.

END OF SECTION

SINGLE PLY MEMBRANE ROOFING

Section 07 54 20
Project #23-34-026

1. GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

A. Section includes a fully adhered Solar Bright 80 mil Evaloy KEE single ply roofing system over one layer 1/2" Dens Dek prime and all associated details required by the manufacturer for a complete warrantable roofing assembly.

B. Sections includes patching and repair of all new HVAC equipment and related accessories to keep the manufacturer warranty intact.

C. Related Work Specified Elsewhere:

1. Section 06: Rough Carpentry
2. Section 07: Insulation
3. Section 07: Sheet Metal Flashing and Trim
4. Section 07: Sealants

1.3. SUBMITTALS

A. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data substantiating that materials comply with specified requirements.

B. Samples: Submit two (2) samples of the following:

1. Membrane
2. Fasteners / Plates
3. Insulation Board

C. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.

D. Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7, In no case shall the design loads be taken to be less than those detailed in Design and Performance Criteria article of this specification.

E. Certificates: Cool Roofing certified by Cool Roof Rating Council.

F. Shop Drawings: For roofing system. Include plans, elevations, sections, details and attachments to other Work.

G. Samples: If specifically requested for specified products; required for alternate products.

H. Installer Qualifications: Provide evidence that installers meet the requirements of Article 1.4.

I. Closeout Submittals:

1. O & M Manuals: Maintenance instructions.

2. Guarantee: Provide completed form per Article 1.5.

3. Manufacturer's weekly inspection reports noting issues, corrections, and final inspection photos.

1.4. QUALITY ASSURANCE

A. Installer Qualifications:

1. Minimum of 5 years of experience on similar work; knowledge and understanding of standards referenced herein; skill necessary to perform in compliance with this specification. Installers failing to demonstrate the required experience, knowledge, or skill shall be removed from the project.

2. Factory trained and approved applicator, certificate must be current.

3. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress. Maintain proper supervision of workmen.

4. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer.

B. Testing Characteristics: UL Class A roof; I-90 wind uplift.

C. Applicator-Manufacturer Review: Provide Drawings and Specifications reviewed by Applicator with agent of roofing manufacturer; obtain manufacturer's agreement that specified system is proper for application shown.

D. Manufacturers Participation:

1. Pre-Application Job-Site Conference: Arranged by Applicator, with a minimum of 1 week advance notice; for review of storage, handling, protection, surface preparation, materials and application specifications; attended by applicator, his foreman, Architect, inspector, and manufacturer's agent.

2. Source Quality Control: Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001.

3. When the project is in progress, the roofing system manufacturer will provide the following:

a. Report progress and quality of the work as observed.

b. Provide job site inspections a minimum of two (2) days a week throughout the course of construction.

c. Provide electronic inspection reports submitted weekly to the Owner and/or Architect.

d. Report to the Architect and/or Owner in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.

e. Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.5. WARRANTY

A. Manufacturer: Provide a letter on manufacturers form that all repairs have been made sufficiently to keep the existing manufacturers warranty intact.

B. Manufacturer will provide the following services at years 2, 5, 10 &15 at no cost to the owner.

1. Inspection by a technical service representative and delivery of a written inspection report documenting roof conditions.

2. General rooftop housekeeping, subject to limits but generally including removal of incidental debris.

C. Provide one warranty by a single approved manufacturer for membrane roof areas, coping metal systems and transitions between the material types.

D. Installer: Provide in required form for a period of two (2) year from date of acceptance by Owner.

2.PRODUCTS

2.1. KEE SINGLE-PLY ROOFING

A. Acceptable Products:

1. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this section.

2. The design is based upon roofing systems by The Garland Company Inc./VPG, Local representative Richard Jones (559) 647-1196

a. Solar Bright 80 Membrane (ASTM D 751)

b. Membrane Thickness: (ASTM D 751) 80 mil nominal

c. Breaking Strength (ASTM D 751): 298X278 lbf/in

d. Tearing Strength (ASTM D 751): 89X109 lbf/in

e. Factory Seam Strength (ASTM D 751) 286 lbf

f. Solar Reflectivity (ASTM C 1549) 82% (White)

g. Emissivity (ASTM C 1371) 91% (White)

h. SRI (ASTM E1980) 109 (White)

B. Alternate Products: Substitutions will not be accepted, must meet the existing manufacturers warranty requirements.

C. Parapet Wall Covering: 0.080 inch thick.

2.2. UNDERLAYMENT

A. Slip Sheet: VPG Rosin Sheet; Install one layer of VPG rosin sheet shingled uniformly to achieve one ply over the entire roof substrate. Shingle in direction of the slope of the roof to shed water.

1. VPG Rosin Board by Viking Products Group

2.3. NAILERS

A. Douglas Fir; No. 2 or better, pressure treated; no creosote or asphalt preservatives allowed.

2.4. ROOF BOARD INSULATION

A. Roof Insulation Base Layer 4’ x 8’ max dimension: N/A

1. Thickness: N/A

2. R-Factor Average: N/A

3. Attachment Method: N/A

B. Roof Insulation top layer: Georgia Pacific Dens Dek Prime Roof Board.

1. Max Dimension: 4’ x 8’

2. Thickness: 1/2” at all horizontal surfaces and 1/2” inch at all vertical surfaces.

3. Attachment Method: Mechanically attached with manufacturers #15 screws and 3” insulation plates, 16 per 4’x8’ sheet.

C. Tapered Insulation: Tapered roof board insulation to be used as required for tapered insulation system or tapered crickets. Hunter or equal, ASTM C 1289, Type II, Class 1, Grade 2, (20psi) polyisocyanurate insulation board.

1. Field Slope: __N/A__ inch per foot.

2. Sump Slope: _1/2”_ inch per foot.

3. Cricket Slope:_1/2”_ inch per foot as needed for crickets and proper slope.

4. Attachment Method: Mechanically Attached

2.5. FASTENERS

A. Heavy duty #15 threaded fastener with a #3 Phillips drive used with barbed fastening plate to secure the insulation board to the structural decking. It is used on minimum 22 gauge steel decks or minimum 15/32" CDX plywood decks. It is also designed to offer an optimum combination of driving performance, back-out and corrosion resistance with excellent pullout performance.

1. TruFast #15 EHD Roofing Fasteners

B. Fastening Plate: A 2-3/8" diameter metal barbed fastening plate used with HP-X, CD-10 or HD 14-10 Fasteners for membrane or insulation securement. This plate can be used for membrane or insulation securement.

1. TruFast Metal Seam Plates, 2.4” barbed.

C. Insulation Fastening Plate: A nominal 3-inch metal plate used for insulation attachment in conjunction with the appropriate fastener.

1. TruFast Metal Insulation Plates, 3” round.

2.6. ACCESSORIES

A. Solar Bright 80 membrane shall be used for all flashing requirements to match the field membrane and warranty expectations selected for the roofing system.

B. Solar Bright Inside Corners: Pre-molded corner flashing for inside corners. 80 mil thickness. Color - White.

C. Solar Bright Outside Corners: Pre-molded corner flashing for outside corners. 80 mil thickness. Color - White.

D. Solar Bright T-Joint Covers: 40 mil thick non-reinforced PVC flashing cut into a 4.5 inch (114mm) diameter circle used to seal step-offs at splice intersections.

E. Solar Bright Pipe Flashings: A pre-molded flashing and clamping ring used for pipe penetrations. Available for 1 inch to 6 inch (25 - 152mm) diameter pipes.

F. Solar Bright Split Pipe Seals: Pre-fabricated flashing consisting of 80 mil reinforced Membrane for pipes 1 inch to 6 inch (25 - 152mm) in diameter. A split (cut) and overlap tab are incorporated to allow the pipe seal to be opened and wrapped around the pipe when it is not possible to pull a standard pipe flashing over a round penetration.

G. Solar Bright Non-Reinforced Flashing: 80 mil thick rolls 12 inches and 24 inches wide. Used for inside/outside corners and field fabricated pipe flashings when use of pre-molded accessories is not feasible.

H. Solar Bright Heat Weldable Walkway Rolls: offering superior tear, puncture and weather resistance and designed to protect membrane in those areas exposed to repetitive foot traffic or other hazards. Walkway material may be heat welded to membrane using an automated heat welder or

hand held heat welder. Walkway Rolls are 36 inches (914mm) wide by 60 feet (18.3 M) long and are nominal 80 mils thick.

I. Single ply Coated Sheet Metal: Provide where flashing, gravel stops and sheet metal are in contact with single ply roofing membrane. Install 22 gauge cleat all all edge metal conditions.

2.7. SOLVENT, SEALANT, AND ADHESIVES

A. As recommended by manufacturer.

B. SolarBright Low VOC Bonding Adhesive: Low VOC solvent-based contact adhesive that allows bonding of membrane to various porous and non-porous substrates.

1. Weight: 7.4lbs
2. VOC: 199
3. Color: Amber
4. Solids: 20%

3. EXECUTION

3.1. EXAMINATION

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

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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

D. Do not commence Work until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment.

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

3.2. PREPARATION

A. Do not apply wet roofing, on wet application surface, or when temperature of deck less than 50 degrees F.

B. Provide entire roof system including treated wood nailers, Single-ply coated sheet metal, and coordination of items such as roof drains, sumps, jacks, etc.

C. Protect adjoining materials from stains particularly around perimeter of building; prevent debris from clogging roof drains.

D. Deck surface swept clean and dry; keep free of loose and foreign materials.

3.3. INSTALLATION

A. Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

1. Install insulation or membrane underlayment over the substrate with boards butted tightly together with no joints or gaps greater than 1/4 inch (6 mm). Stagger joints both horizontally and vertically if multiple layers are provided.

2. Secure insulation to the substrate with the required mechanical fasteners or insulation adhesive in accordance with the manufacturer's current application guidelines and as specified in section 07 54 20, 2.4, A, B, & C above.

3. Securely attach insulation to the roof deck. Attachment must have been successfully tested to meet or exceed the calculated uplift pressure required by Factory Mutual (FM I-90) & the International Building Code (ASCE-7) or ANSI/SPRI WD-1.

B. Application; Adhered system over roof deck

1. Position SolarBright membrane over the acceptable substrate. Fold membrane sheet back lengthwise so half the underside of the membrane is exposed.

2. Apply SolarBright Bonding Adhesive in accordance with the manufacturer's published instructions, to the exposed underside of the membrane and the corresponding substrate area. Do not apply Bonding Adhesive along the splice edge of the membrane to be hot air welded over the adjoining sheet. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.

3. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a soft bristle push broom to achieve maximum contact.

4. Fold back the un-bonded half of the sheet lengthwise and repeat the bonding procedures.

5. Position adjoining sheets to allow a minimum overlap of 2 inches (51mm).

6. Hot-air weld the SolarBright membrane sheets using the Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's hot air welding procedures.

7. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches (51mm) and complete the bonding procedures as stated previously.

8. Parapet Wall Covering: Install as shown, extend to full height of parapet; lap under parapet cap flashing and over wall substrate 2 inches minimum on the back side of the wall. Secure in adhesive and attach at 9” on center on the outside face to assure a completely watertight installation.

9. Walkway: Per manufacturer's instructions and as shown on drawings. If drawings do not show walkways a minimum required will be;

a. A path from the main roof access point to and around all HVAC units, to and around all serviceable roof top equipment, to and around all roof hatches, to and around all access points as designated by the owner, and as needed for protection of the roofing system will have walkway installed.

b. All support blocking will have walkway pad installed as a protection mat.

C. Fasteners:

1. General: Per manufacturer's recommendation; fastening length and pattern based on performance values supplied by the fastener/disc manufacturer and conforming to Factory Mutual I-90 fastening pattern.

2. Walkway Fastening: Provide 2 inch continuous heat weld strip around perimeter of membrane. A 3” opening is to be left non-welded at the lower side of the walkway pad to allow drainage and venting.

D. Hot Air Welding

1. All field seams exceeding 10 feet in length shall be welded with an approved automatic welder.

2. All field seams must be clean and dry prior to initiating any field welding.

3. Remove foreign materials from the seams (dirt, oils, etc.) with Acetone or authorized alternative. Use CLEAN WHITE COTTON cloths and allow approximately five minutes for solvents to dissipate before initiating the automatic welder. **Do not use denim or synthetic rags for cleaning**.

4. All welding shall be performed only by qualified personnel to ensure the quality and continuity of the weld.

5. Contaminated areas within a seam will inhibit proper welding and will require a membrane patch or replacement of the membrane.

E. Hand Welding

1. The lap or seam area of the membrane should be intermittently tack welded to hold the membrane in place.

2. The back "interior" edge of the membrane shall be welded first, with a thin, continuous weld to concentrate heat along the exterior edge of the lap during the final welding pass.

3. The nozzle of the hand held hot air welder shall be inserted into the lap at a 45° angle to the lap. Once the polymer on the material begins to flow, a hand roller shall be use to apply pressure at a right angle to the tip of the hand welder. Properly welded seams shall utilize a 1-1/2 inch wide nozzle, to create a homogeneous weld, a minimum of 1-1/2 inches in width.

4. Smaller nozzles may be used for corners, and other field detailing, maintaining a minimum 1 inch weld.

F. Automatic Machine Welding

1. Follow all manufacturers’ instructions for the safe operation of the automatic welder.

2. Follow local code requirements for electric supply, grounding and surge protection.

3. The use of a dedicated, portable generator is highly recommended to ensure a consistent electrical supply, without fluctuations that can interfere with weld consistency.

4. Properly welded seams shall utilize a 1-1/2 inch wide nozzle, to create a homogeneous weld, a minimum of 1-1/2 inches in width.

G. Inspection

1. The job foreman and/or supervisor shall initiate daily inspections of all completed work which shall include, but is not limited to the probing of all field welding with a dull pointed instrument to assure the quality of the application and ensure that any equipment or operator deficiencies are immediately resolved.

2. Ensure that all aspects of the installation (sheet layout, attachment, welding, flashing details, etc.) are in strict accordance with the most current Solar Bright Roofing Systems Specifications and Details.

3. Excessive patching of field seams because of inexperienced or poor workmanship will not be accepted at time of final inspection for warranty acceptance.

H. Metal Flashings:

1. General: Fabricate and install per Section 07601 - FLASHING AND SHEET METAL, as shown and per manufacturer's recommendations. Install PVC coated metal flashing at intersections of roofs with sloped or vertical surfaces, roof interruptions and penetrations.

2. Base Flashing: Extend up vertical surfaces 6 inches, minimum, and onto the horizontal roof surfaces not less than 3 inches, unless otherwise noted. Provide PVC coated metal flashing with 2 inches minimum overlap of roofing membrane; heat weld in the horizontal plane, with subsequent sealing of seams with sealant.

3. All perimeter edge details are to be fabricated from Garland/VPG SolarBright Clad Metal and required to have 22 gauge cleat.

4. Ensure all fascia extend a minimum of 2 inch lower than the bottom of the wood nailers.

5. Fasten all metal flashing to wood nailers or approved substrate with approved fasteners eight (8”) inches on center.

6. Manufacture and install Solar Bright Clad metal in accordance with approved details, ensuring proper attachment, maintaining 1/2 inch expansion joints and the installation of a minimum 2 inch bond breaker tape prior to sealing the joint.

7. Solidly weld Solar Bright Clad expansion joints with a 6 inch strip of Solar Bright membrane welded to the Solar Bright Clad, covering the bond breaker tape (cover plates are optional).

I. Roof Drains

1. Flash all roof drains in accordance with Solar Bright roof drain details.

2. Replace all worn or broken parts that may cut the Solar Bright membrane or prevent a watertight seal. This includes the clamping ring and strainer basket.

3. Replace all drain bolts or clamps used to hold the drain compression ring to the drain bowl.

4. Solar Bright non-reinforced 60 mil membrane shall be used for flashing the drain assembly. Drain assemblies and basins or "sumps" must be free of any asphalt or coal tar pitch residue prior to installation.

5. The drain target sheet should be sized and installed to provide for a minimum of 12 inch of exposed 60 mil on all sides of the drain.

3.4. FIELD QUALITY CONTROL

A. Perform field inspection and testing as required under provisions of Division 01 Section Quality Requirements & manufacturers recommendations.

B. Heat weld test cuts will be required. One (1) test cut per 5,000 square feet will be required.

C. Correct defects or irregularities discovered during field inspection.

D. Require attendance of roofing materials manufacturers' representatives at site during installation of the roofing system a minimum of two (2) days per week. A copy of the specification should also be on site at all times.

3.5. CLEANING

A. Keep premises free from accumulation of waste and debris. At completion of installation remove surplus materials and debris.

B. At completion clean exposed surfaces in a manner that will not damage finish.

3.6. FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with Contractor, Architect, installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.

B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.

C. The roofing system manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Roofing Contractor.

D. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.

E. Repair or replace deteriorated or defective work found at time above inspection as required to a produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements

F. Notify the Contractor, Architect, & Owner upon completion of corrections.

G. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

END SECTION 07 54 20

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00, Rough Carpentry.

B. Section 07 41 00, Manufactured Metal Roofing.

D. Section 07 54 00, Single Ply Membrane Roofing.

F. Section 07 92 00, Joint Sealants.

G. Section 08 11 13, Hollow Metal Doors and Frames.

H. Section 09 91 13, Exterior Painting.

I. Divisions 23 and 26, Mechanical and Electrical Sections.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturer's regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Shop Drawings: Submit showing all parts, connections and anchorages, adjacent materials, fully dimensioned and noted. Submit shop drawings of fabricated items showing profiles and relationship to adjacent materials.

C. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

C. Provide 2 year guarantee for watertightness from date of filing of Notice of Completion. Guarantee shall cover damage from leaks due to defective materials or workmanship.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. Except as herein modified, fabricate and install Work in accordance with printed standards of Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Architectural Sheet Metal Manual and Specifications, latest edition.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

1.09 PROJECT RECORD DOCUMENTS

A. Provide per Section 01 77 00, Project Close-out Procedures.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Galvanized iron sheet metal: Hot-dip galvanized copper-bearing steel. ASTM A525, 1.00 lb./sf Commercial Class; 24 gauge. except where otherwise shown.

B. Metal Siding/Soffits: Galvanized iron sheet metal: Hot-dip galvanized copper-bearing steel. ASTM A525, 1.25 lb./sf Commercial Class, 22 gauge.

C. Fasteners: For metal siding/soffits: Hex washer head, 410 stainless steel with neoprene washer, self-drilling: #10 X 1 ½”

D. size.

D. Lead: Fed. Spec. QQ-L-201, grade B. 4 lb/sf min.

E. Nails: Hot-dip galvanized annular thread, "stronghold" type.

F. Solder: ASTM B32, Class A1.

G. Flux: Muriatic acid.

H. Asphaltic primer: ASTM D41. Type as recommended by membrane roofing manufacturer where sheet metal work is in contact with membrane roofing materials.

I. Plastic cement: Asphaltic, FS SS-C-153, Type I.

J. Flashing Reglets: Galvanized steel, 2-piece flashings, types as indicated on drawings.

K. Sealants: Non-hardening, non-sagging one part sealant per FS TT-S-230, Geocel 2000 or approved equal.

L. Reglet: Terminator WaterTite Reglet as manufactured by O'Keeffe's Inc. Reglet shall be extruded high impact noryl, furnished with splice sleeves, U.V. stabilized EPDM wedge gaskets and Terminator Tape. WaterTite flashings shall be furnished in 22 gauge gsm.

1. Provide Type SS at plaster.

2. Provide Type CW at cast-in-place concrete.

3. Provide Type MI at masonry.

M. Underlayment: One ply of Aqua Block, 60 mil self-adhering membrane. Seams shall be lapped in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 WORKMANSHIP, FABRICATION AND INSTALLATION

A. Specifications herein are minimum; provide such extra materials and workmanship as necessary to obtain required results. Install work in accord with recognized standards and best trade practices.

B. Where work is not otherwise shown or specified, conform to details and requirements set forth in the referenced SMACNA Manual.

C. Where materials or construction systems are specified with reference to a particular manufacturer (such as, reglets and caulking and sealants), make installations in strict accord with the approved manufacturer's installation instruction.

D. Except where otherwise noted or specified, sheet metal work shall be galvanized sheet metal. Make cleats and edge strips of the same metal as items with which they are used.

E. Accurately reproduce profiles and bends; make intersections sharp, even and true. Make plain surfaces free from buckles and waves with as few joints as possible. Reinforce work as required for strength and appearance.

F. Bend metals to minimum radius as recommended by manufacturer for thickness used (in general, the radius shall be not less than the thickness of metal) and in accordance with the referenced SMACNA Manual.

G. Provide for proper expansion and contraction caused by thermal or building movement. Make joints tight. Conceal nails and other fastenings where possible. **Face nailing through exposed surfaces is not permitted unless specifically shown.** Secure exposed edges to underlying materials with clips, cleats or tabs (edge strips). Provide neoprene washers at exposed fasteners.

H. Make seams in direction of flow.

I. Hem exposed edges of sheet metal work 1/2 inch.

J. Do cutting, fitting, punching, etc., in sheet metal to accommodate work specified elsewhere and provide necessary accessory items.

K. Properly apply caulking and sealants to sheet metal items to permit movement between surfaces and to make entire installation watertight. Conform to requirement of Caulking and Sealants Section.

L. Soldering: Roughen smooth surfaces with clean emery cloth or sandpaper; do not use steel wool. Use torch or well heated irons. Solder slowly, thoroughly heating seams and completely sweating solder through full width with a least 1" of solder evenly flowed along seams. Wherever possible, solder in a flat position. Solder seams on slopes greater than 45 degrees a second time. Solder immediately after application of flux; after soldering, immediately neutralize any corrosive flux with 5% soda solution and flush with clean water. Soldering of exposed surfaces shall be neatly done. Exposed solder shall be dressed and finished. Soldering shall be employed only to seal or fill seams. Where structural strength is required, do not rely on solder alone but use supplementary mechanical fasteners.

M. Cut edges or joints and abrasions which expose base metal of galvanized sheet metal shall

be coated with solder to equivalent thickness of zinc coating before assembling or installing sheet metal items.

N. Priming Surfaces:

1. Coat all metal surfaces in contact with single ply roofing with primer or sealant as recommended by the roofing membrane manufacturer.

2. Coat all metal surfaces in contact with built-up roofing and Sealing Tape with asphalt primer, and allow to dry before setting in place.

O. Provide isolation of dissimilar metals from contact with each other by coating with asphalt primer.

P. Finish all sheet metal work straight and true, with miters and joints accurately fitted. Exposed work shall be free of dents. All corners shall be reinforced, and seams soldered or otherwise made waterproof. Exposed edges shall be hemmed or finished smooth.

Q. All work shall be made watertight and leak proof. Except where provision is required for expansion and contraction, all joints and seams shall be locked, or otherwise made mechanically strong. Solder may be used, where appropriate, to make joints and seams watertight, but shall be considered as providing mechanical strength.

R. Fabricate sheet metal work from materials and of gauges indicated or specified. Where material is not indicated, fabricate from zinc coated steel sheet not less than 24 gauge.
1. Cleats supporting bottom edges of sheet metal work shall be continuous; secure on not more than 24 inch centers. Provide cleats at free edges of flashing as indicated on Drawings.

S. Flashings:

1. Install flashings required to provide watertight protection.

2. Assemble and install flashings at roofing and waterproofing conditions to conform to approved manufacturer's recommendations and the requirements of the Built-up Roofing and Single Ply Roofing Sections.

3. Carry flashings around corners 4 inch minimum; metal soldered or otherwise joined at the angle is not permitted. Three-way angles shall have the corners soldered watertight.

4. Flashings installed to be fully restrained shall be nailed at 3" centers (max.); otherwise use clips or cleats.

5. Roof flashings and related metal shall be installed with flanges on top ply of roofing and reinforced as per requirements of Roofing Sections.

6. Unless metal manufacturer has more stringent requirements, make up continuous straight runs of flashings in 24 ft. maximum lengths. Unless otherwise shown or specified, connect continuous runs together with 3-inch loose lock expansion joints sealed watertight with sealants. Provide expansion joints at 10 ft. maximum from any external or internal corners, and in straight runs less than 24 ft. but more than 10 ft.,

make expansion joints at center of run. Running joints between expansion joints shall be locked and soldered or lapped and riveted/soldered. At joints, lap to be minimum 8".

7. Flashings shall conform to the appropriate plates and recommendations of the referenced SMACNA Manual.

T. Metal Copings/Caps:

1. Construct metal copings as shown on the Drawings and in conformance with referenced SMACNA Manual.

2. Form to Details in 8'-0" lengths with bends formed so drip crimp on exposed (exterior) side will lock over bottom edge of continuous 18 gauge galvanized cleat for concealed support. The back (roof) side shall be secure with a screw fastener with a neoprene washer through an oversized or slotted hole spaced at 24" o.c. maximum.

3. Except for expansion joints, solder joints in coping.

4. Provide expansion joints every 16'-0" using a 1-1/2" loose locked joint filled with sealant. Provide expansion joints at 8'-0" maximum from any internal or external corner per the referenced SMACNA Manual. Joints to be 8" minimum lap.

U. Metal Siding/Soffits:

1. Galvanized iron sheet metal: Cut sheets in approximate 4’-6” x 8’-6” sizes. Lay up in shingle style with running bond pattern with 3” overlap at joints minimum. Bend pieces and wrap corners with 3” overlap minimum. As shown in drawings.

2. Install sheet metal siding over a single layer underlayment of 60 mil self-adhered membrane.

3. Fasteners: Install fasteners lined up in square orderly pattern with 16” on center spacing.

V. Apply single ply membrane at all horizontal plaster surfaces, under all horizontal sheet metal flashing at curbs, parapet caps, etc. and as shown on drawings.

3.03 TOUCH-UP

A. Where galvanizing is damaged by fabrication or installation, repair surfaces with hot process galvanizing repair compound, "Galvalloy", "Galvweldalloy", or approved equal, applying in accord with manufacturer's printed directions. Float full, grind, and buff smooth.

3.04 CLEANING

A. Upon completion of installation, remove manufacturer's temporary labels, and marks of identification. Thoroughly wash surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition. Replace damage parts and surfaces which are not free from imperfections.

3.05 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09 91 13, Exterior Painting.

B. Section 09 91 23, Interior Painting.

1.03 REFERENCE

A. ASTM C790 - Use of Latex Sealing Compounds.

B. ASTM C804 - Use of Solvent Release Type Sealants.

C. ASTM C834 - Latex Sealing Compounds.

D. ASTM C919 - Use of Sealants in Acoustical Applications.

E. ASTM C920 - Elastomeric Joint Sealants
.

F. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

G. ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).

H. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.03 QUALITY ASSURANCE

A. Use only new materials and products.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging, as indicated for each application. Failure of installed sealers to comply with this requirements will be recognized as failures of materials and workmanship.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Samples: The following samples are required. Submit per Section 01 33 00.

1. Submit sample for each type of sealant to Architect for review.

2. Manufacturer's full range of colors for Architect's selection.

D. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

C. Guarantee shall cover all materials and workmanship for a period of two (2) years from filing date of Notice of Completion.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.07 PROJECT CONDITIONS

A. Verify that job site conditions are within limits specified in product manufacturer's printed recommendations.

PART 2 - PRODUCTS

2.01 SEALANT AND MATERIAL MANUFACTURERS

A. Following is a list of acceptable manufacturers of sealants and sealant materials. Inclusion in this list is not intended to imply that all manufacturers make all products. Products made by listed manufacturers must comply with all specified requirements.
1. Bostik Construction Products.

2. Dow Corning Corporation.
3. General Electric Company.
4. W.R. Meadows, Inc.
5. Pecora Corporation.
6. Mameco International.
7. Tremco.

B. Substitutions: Under provisions of Section 01 33 00.

2.02 SEALANT TYPES

A. Single-Component Polysulfide (Non-Sag): ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, A, M.

B. Multi-Component Polysulfide (Non-Sag): ASTM C 920, Type M, Grade NS, Class 25, Use NT, A, M.

C. Multi-Component Polysulfide (Self-Leveling): ASTM C 920, Type M, Grade P, Class 12.5 Use T, A, M.

D. Multi-Component Polysulfide (Water-Immersible): ASTM C 920, Type M, Grade NS, Class 12.5, Use NT, A, M.

E. Single-Component Urethane: ASTM C 920, Type S, Grade NS, Class 25, Use NT, A, M; USDA and FDA status.

F. Single-Component Urethane (Self-Leveling): ASTM C 920, Type S, Grade P, Class 25, Use T, A, M.

G. Multi-Component Urethane (Gun-Grade): ASTM C 920, Type M, Grade NS, Class 25, Use NT, A, M.

H. Multi-Component Urethane (Self-Leveling): ASTM C 920, Type M, Grade NS, Class 25, Use T, A, M.

I. Single-Component Silicone (Non-Acid Cure): ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, A, M; USDA and FDA status.

J. Single-Component Silicone (Acid Cure): ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, A, M; USDA and FDA status.

K. Acrylic-Latex Caulk: ASTM C 834.

L. Butyl Rubber: Federal Specification TT-S-001657.

M. Bedding Compound: For installation of thresholds and similar items indicated to be bedded in sealant, use a preformed butyl-polyisobutylene sealant tape. Size of tape as

required for the specific application.

2.03 JOINT AND SURFACE TYPES

A. Pedestrian and Vehicle Traffic Joints - Provide one of the following for each joint type:
   1. Multi-component polysulfide (self-leveling)
   2. Multi-component urethane (self-leveling)
   3. Single-component urethane (self-leveling)

B. Non-Traffic Deck Joints - Provide one of the following for each joint type:
   1. Multi-component urethane (gun-grade)
   2. Single-component urethane

C. Vertical Joints - Provide one of the following for each joint type:
   1. Single-component polysulfide (non-sag)
   2. Multi-component polysulfide (non-sag)
   3. Multi-component urethane (gun-grade)

D. Expansion, Control, and Perimeter Joints - Provide one of the following for each joint type:
   1. Multi-component urethane (self-leveling)
   2. Single-component urethane; use only where dynamic movement will not exceed 50 percent of joint width - above or below grade
   3. Single-component urethane (self-leveling)

E. Curtainwalls and Related Assemblies - Provide one of the following for each joint type:
   1. Single-component silicone (neutral cure)
   2. Single-component silicone (acid cure)

F. Non-Moving Joints, Interior and Exterior: Butyl rubber.

G. Water-Immersion Areas - Provide one of the following for each joint type:
   1. Multi-component polysulfide (self-leveling)
   2. Multi-component polysulfide (non-sag)

H. Glazing - Provide one of the following for each joint type:
   1. Single-component silicone (neutral cure)
   2. Single-component silicone (acid cure)

I. Wood Window Glazing - Acrylic-latex calk.

J. Acoustical Sealant - Provide one of the following for each joint type:
   1. Acrylic-latex caulk
   2. Butyl rubber

K. Kitchen Areas: Sealant complying with FDA requirements for use in food areas - Provide one of the following for each joint type:
   1. Single-component urethane

2. Single-component silicone (neutral cure cure)
3. Single-component silicone (acid cure)

L. Toilet and Bath Areas: Sealant containing a fungicide for mildew resistance - Provide one of the following for each joint type:
1. Single-component silicone (neutral cure)
2. Single-component silicone (acid cure)

M. Exterior Doors and Windows: Sealant used for exterior joints or butyl rubber.

N. Interior Doors and Windows - Provide one of the following for each joint type:
1. Acrylic-latex caulk
2. Butyl rubber

O. Built-In Cabinet Work: In kitchen, toilet, and bath areas, as specified for those areas. In other areas, single-component silicone (acid or non-acid cure) or acrylic-latex caulk.

P. Rated Walls: Fire-rated Sealant, UL Systems in accordance with Section 07840.

2.04 SEALANT COLORS

A. Provide materials matching colors indicated or if no color as indicated, matching the color samples selected from those submitted to the Architect.

2.05 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round, closed cell polyethylene or butyl rubber backer rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive Work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions.

D. Protect elements surrounding the Work of this Section from damage or disfiguration.

3.03 INSTALLATION

A. Do not proceed with sealant Work until the sample joints specified in Part 1 of this Section have been prepared and accepted by the Architect.

B. Install sealant in accordance with manufacturer's instructions.

C. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.

D. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

E. Install bond breaker where joint backing is not used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

H. Tool joints concave unless detailed otherwise.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01 50 00.

B. Protect sealants until cured.

END OF SECTION

HOLLOW METAL
DOORS & FRAMES

Section 08 11 13
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 20 00, Finish Carpentry

B. Section 07 92 00, Joint Sealants

C. Section 08 71 00, Door Hardware

D. Section 09 29 00, Gypsum Board.

E. Section 09 91 13, Exterior Painting.

F. Section 09 91 23, Interior Painting.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Manufacture all labeled doors and frames in strict conformance with the specifications and procedures of Underwriters Laboratories Inc. (UL).

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Shop Drawings: Show all parts, connections and anchorages, adjacent materials, fully dimensioned and noted.

D. Executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

C. Guarantee doors and frames from defects in materials and workmanship including twisting, buckling or warping for a period of 2 years from filing of Notice of Completion.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. ANSI - American National Standards Institute

C. ANSI/NFPA 80 - Standard for Fire Doors and Windows.

D. ANSI/DHI A 115.IG - Installation Guide for Doors and Hardware.

E. ANSI/BHMA A 156 - Specifications for Hardware Preparations in Standard Steel Doors and Frames.

F. ANSI/SDI A 250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.

G. SDI - Steel Door Institute

H. SDI-111 - Recommended Standard Details for Steel Doors & Frames.

1.07 FIRE RESISTIVE LABELS

A. Labeled Doors: Conform with UL requirements; doors shall bear label for fire resistive rating indicated.

B. Labeled Frames: Construct frames for labeled openings per UL requirements and their listings. Provide UL label for fire resistive rating indicated.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off the ground and in areas so as to not interfere with the progress of the work. Doors with dents or other defects not repairable will be rejected.

C. Transport, store and handle in strict conformance with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

E. Store frames in upright position.

1.09 PROJECT CONDITIONS

A. Verify that conditions are correct and proper for installation of products. Obtain accurate job dimensions of openings including floor elevations. Ascertain correct locations and arrangements of anchorage required to accommodate work.

PART 2 - PRODUCTS

2.01 HOLLOW METAL DOORS

A. General: Shop fabricate to required sizes and shapes. Form and weld with straight arises, edges and corners; surfaces free from warp, wave, buckle, dents or other defects. Use of excessive metallic filler to conceal manufacturing defects is not acceptable. Construct per Steel Door Institute (SDI) "Recommended Specifications, Standard Steel Doors and Frames", (latest edition), plus additional specified requirements.

B. Fabrication: Flush Doors; Type II, heavy duty, 1-3/4 inches thick, 18 ga. steel face sheets over stiffeners; faces free of seams or joints. Close top and bottom edges by welding flush or with recessed 18 ga. spot welded channels. Weatherproof top edge of exterior doors. Turn face sheets over vertical edges of doors and mechanically interlock, spot weld at approximately 2" on center.

C. Reinforcement: Stiffen as recommended by SDI or using any method conforming with ANSI A 151.1 criteria for determining twist test strength.

D. Insulation: Door manufacturer's standard sound deadening material on door interior. Sound deadening material in labeled doors shall conform to UL requirements.

E. Cutout: Make cutouts for required louvers and glazing; provide steel non-removable stops on outside face and removable stops on interior face.

F. Preparation for Hardware: Factory prepare and reinforce doors for indicated finish hardware. Make cutouts and mortises for mortise hardware.

1. Provide 10 ga. flat steel reinforcement for hinges; 12 ga. for locksets and surface applied hardware. All gages minimum.

2. Internal reinforcing shall prevent collapse of face sheets by stress of lockset installation. Provide reinforcement on both faces of all doors for surface mounted closers, whether or not closers are indicated.

3. Perform drilling and tapping for mortise hardware at factory to templates furnished by hardware vendor. Drilling and tapping for surface applied hardware by hardware installer.

G. Louvers (Fixed): Manufacturer's standard fixed slat, 20 ga. cold-rolled steel. Factory cleaned, bonderized and prime coated.

H. Metal Insulated Panels: .062" smooth aluminum faces on both sides of plywood core, prefinished with corrosion resistant primer and custom color paint finish, 1" total thickness.

I. Glass Stop: Unit frame, model FGS 75, manufactured by Anemostat Products Division, Carson, CA, or an approved equal, for fire rated and non-fire rated doors.

1. Frame: 18 gauge.
2. Finish: Factory primed; field painted under Section 09 91 10.
3. Unit shall shall have UL or WH label and State Fire Marshal approval number.
4. Glazing: As specified in Section 08 80 00.
5. Mounting: Countersink, one-way vandal-resistant head, through-bolts.
6. Exterior Doors: Unit shall be hot-dip galvanized after fabrication.

2.02 PRESSED METAL FRAMES

A. General: Welded type per CS242 as minimum requirements, plus additional requirements specified herein. Shop fabricate with straight arises, edges and corners; surface free from warp, wave, buckle, dents or other defects. Use of excessive metallic filler to conceal manufacturing defects is not acceptable.

B. Fabrication: Manufacturer's standard, modified where shown, 16 ga. steel, cross section profile as shown, depth to suit wall thickness. Header and jambs secured at corners by internal welding of faces or by welded splice plates, and further secured at webs by welding or mechanical interlock; exposed joints neat and tight. Provide temporary metal spreaders at bottom of frames to maintain rigidity. Welding per applicable standards of AWS for high grade hollow metal work.

C. Anchors: Provide at 2' -0" max. spacing, min. 16 ga. x 2" wide to securely fasten frames to wall construction involved (wire anchors not acceptable); anchor bottom of frame within 2 inches of floor to wood framing or concrete curb (where occurs) with expansion anchors, both sides. Provide minimum 2 anchors at head of frames over 2' - 6" wide, and minimum 4 anchors per door jamb. Anchors shall provide stiffness and rigidity to keep frames square, in accurate position without twisting, buckling or warping. Position one jamb anchor above top butt reinforcement and one jamb anchor below bottom butt reinforcement. Anchors for labeled frames shall conform to UL requirements.

1. Anchor types:

a. New wall (wood framing): Wood stud anchors; 16 ga., 2" wide steel anchor straps, securely welded inside each jamb at interior side(s). **Continuous steel nailing flange at exterior side.**

b. New wall (masonry/concrete): Strap & Stirrup anchors, 16 ga., 2" x 10", corrugated and perforated, spot welded to back of jamb soffit.

c. Existing wall (wood framing): Existing opening anchor; pipe spacer with 16 ga., 2" wide steel reinforcing strap, welded inside each jamb, at outside edge. Use FHMS with minimum 2" penetration into solid framing.

d. Existing wall (masonry/concrete framing): Existing opening anchor, same as for wood framing noted above, into expansion anchors set securely in existing walls.

e. Other areas: As required for secure, installation as recommended by the HMMA - Hollow Metal Manual and the Manufacturer.

2. All anchors to be UL approved for use on labeled frames.

D. Preparation for Hardware: Factory prepare and reinforce door frames for approved finish hardware. Make cutouts and mortises for mortise hardware. Provide 10 ga. steel reinforcement for hinges, 12 ga. for lock strikes and closers, and 14 ga. for surface applied hardware.

1. Provide reinforcement at head of frames for surface mounted closers at all doors whether or not closers are indicated.

2. Punch lock jamb of frames; install 4 rubber door silencers. For pairs of doors, locate door silencers at head, two for each door.

3. Provide steel housing closures for hardware mortise to prevent intrusion of plaster, mortar or concrete.

4. Perform drilling and tapping for mortise hardware at factory to templates furnished by hardware vendor. Drilling and tapping for surface applied hardware will be done by hardware installer.

E. Sound deadening for door frames in hollow wall (wood frame) construction: Coat all inside (concealed) faces with fibered asphalt emulsion similar to autobody undercoating. Apply over shop primer 1/8 inch thick and thoroughly dry before handling.

F. Special Frames: 16 ga. with integral stop formed to cross section profile indicated. Provide muntins, mullions, and impose sections required, removable glazing stops or molding secured with tamper-proof oval head self-tapping screws set in countersunk holes at 12 inches o.c. Weld corners of frame, grind smooth on exposed frames. Structure shall be adequate to withstand 25 lbs/sf wind load normal to glass surface.

2.03 PRIMING

A. Bonderize and factory paint doors and frames with one coat of baked-on rust inhibitive primer. Back coat frames with asphaltic emulsion wherever frames will be in contact with masonry. **Verify and coordinate primer compatibility with finish painting**. Prior to and after primer is applied, store and protect doors properly to prevent the possibility of rusting or moisture damage. Doors and frames shall be re-primed on-site prior to finish painting.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. Prior to fabrication, verify every opening size, including wall thickness, and coordinate with

door sizes as shown on drawings.

D. In the event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 INSTALLATION

A. General: Install metal doors and frames and accessories in conformance with reviewed Shop Drawings and manufacturer's data, and as specified herein.

B. Placing frames:

1. Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.

2. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

    a. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels. Coordinate building-in of anchors and grouting of frames with other trades.

3. Anchor to floor slab with power type actuated fasteners through floor anchors attached to frames.

4. Anchor securely to metal studs with four (4) No. 12 sheet metal screws per anchor.

5. Anchor continuous nailing flange securely to wood studs with four (4) No. 12 x 2" flat head wood screws per anchor. Attach anchor straps at interior side and all interior straps with four (4) 10d ring shank nails per anchor.

6. Seal perimeter of frames where shown or required to fill space between frame and adjoining material. Sealant materials and application shall conform to applicable requirements of Section 07 92 00. Where sealant is entirely concealed and wall components forming door openings are not designed for differential movement, oil based caulking compound may be used; otherwise, use one part synthetic rubber sealant.

7. When installing new frames in existing openings, remove existing finishes sufficiently to properly install and adequately fasten new frame. Prepare openings as required to receive new frame. Cut back existing finishes as necessary. Provide misc. blocking, backing, straps, etc. to fully prepare opening for new frame. Patch and repair surfaces when completed to match adjacent finishes.

C. Doors: Hang with clearances noted in Section 08 71 00, Finish Hardware, unless otherwise indicated or required for rated assemblies. Apply hardware in conformance with SDI-100 and the manufacturer's written instructions.

D. Except for frames installed in metal or wood stud walls, grout all other frames solid. When temperature conditions necessitate an additive be used in grout to prevent freezing as frames are installed, installer of frames shall coat inside of frames with corrosion inhibiting

bituminous material.

E. Coordinate installation of hardware including installation of intrusion detection system components and wiring.

3.03 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Immediately prior to punch list walk-through, check and re-adjust operating finish hardware items, leaving metal doors and frames undamaged and in complete operating condition.

3.04 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00, Rough Carpentry.

B. Section 08 71 00, Finish Hardware, for Cylinders.

C. Section 09 24 00, Cement Plaster.

D. Section 09 20 00, Gypsum Wallboard.

E. Section 09 51 13, Acoustical Ceilings.

F. Section 09 91 10, Painting.

G. Division 23, Mechanical Work, for mechanical equipment requiring access.

H. Division 26, Electrical Work, for electrical equipment requiring access.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. For installation of special doors use only personnel thoroughly trained and experienced in installation of the selected projects, and familiar with the requirements of this project.

E. All special door assemblies requiring fire resistance ratings shall bear UL labels for class required. Labels shall be attached to door and frames.

1.04 SUBMITTALS

A. Refer to Section 01 30 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Shop Drawings: Show all parts, connections and anchorages, adjacent materials, fully dimensioned and noted. Show locations of all doors and panels on plan.

D. Executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 30 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

C. Guarantee doors shall operate properly and will be free of defects in material and workmanship for a period of two years from date of filing of Notice of Completion.

1.06 REFERENCES AND STANDARDS

A. Tilte 24, Part 2, CCR, California Building Code.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

PART 2 - PRODUCTS

2.01 ACCESS DOORS

A. Wall Doors (fire rated): Milcor Fire Rated Doors for Walls:

1. Material: Prime painted steel: 16 gauge frame with 20 gauge door panel.

2. Finish: Chemically bonded with prime coat of baked-on electro-static powder.

3. Hinge: Continuous type; steel with stainless steel pin.

4. Automatic panel closer: Typical.

5. Lock: Self-latching with flush, key-operated cylinder lock with two keys with interior latch release.

6. Anchors: Furnish with anchors as required.

B. Masonry and Tile Wall Doors: Milcor Style M Standard Flush Door (non-rated):

1. Material: 14-gauge steel frame and door panel.

2. Finishes: Chemically bonded with a prime coat of baked-on electro-static powder.

3. Hinge: Concealed spring hinges open to 175 degrees. Extracting pin from hinge leaf attached to panel permits panel removal. Number of hinges varies with size of door.

4. Lock: Cylinder lock with two keys.

5. Anchors: Furnish with anchors as required.

C. Ceiling Doors: Milcor Fire-Rated Doors for Drywall Ceilings (one-hour):

1. Material: Cold-rolled steel: 16-gauge frame with 18-gauge door panel; 20-gauge panel sides and 26-gauge panel hat channel.

2. Finishes: Chemically bonded with a prime coat of baked-on electro-static powder. The exposed edges have a prime coat of white, rust-inhibitive paint. Ceramic fiberboard facing on covers.

3. Hinge: Continuous "piano-type"; one per door.

4. Lock: Self-latching spring bolt lock, with key-operated cylinder lock mounted flush with the ceiling finish.

D. Aluminum Ceiling Access Doors: Style CT (suspended acoustical ceilings)

1. Material: 1/4" extruded aluminum and 1/8" aluminum plate.

2. Finish: Aluminum.

3. Hinge: Stainless steel.

4. Construction: Frames are 1/4" aluminum extrusions assembled with mitered and welded corners. Hanger brackets with pre-drilled 7/16" holes are welded near each corner on the hinge side and opposite side. Covers are 1/8" aluminum plate mounted to the frame with a continuous hinge. Aluminum edging on tile covers provides a 3/4" recess for tile.

E. Ceiling Doors: Milcor style DW (drywall ceilings.

1. Material: 16 gauge steel frame with 16 gauge door panel.

2. Finish: Chemically bonded with a prime coat of baked-on electro-static powder. The exposed edges have a prime coat of white, rust-inhibitive paint. Ceramic fiberboard facing on covers.

3. Hinge: Concealed spring hinges open to 175 degrees. Extracting pin from hinge leaf attached to panel permits panel removal. Number of hinges varies with size of door.

4. Lock: Cylinder lock with two keys.

5. Anchors: Furnish with anchors as requires.

F. Plaster Walls, Ceilings and Soffits (non-rated) Milcor Style K, flush frame access door, typical all non-rated locations:

1. Material: 16 gauge steel frame with 14 gauge door panel and 22 gauge galvanized casing beads.

2. Finish: Chemically bonded with a prime coat of baked-on electrostatic powder.

3. Hinge: Concealed spring hinges to open 175 degrees.

4. Lock: Cylinder lock with two keys.

G. Drywall Walls and Ceilings (non-rated) Milcor Style DW, flush frame access door, typical all non-rated locations.

1. Material: 16 gauge steel frame with 14 gauge door panel. Galvanized steel drywall bead.

2. Finish: Chemically bonded with a prime coat of baked-on electrostatic powder.

3. Hinge: Special, double-acting concealed spring hinges opening to 175 degrees.

4. Lock: Cylinder lock with two keys.

H. Keying: All doors shall be keyed alike. Provide minimum 2 keys for each door at end of project to District.

I. Size: Provide minimum 22" x 30" doors or larger if a larger opening is required for maintaining or replacing an item.

2.02 KEYPAD ACCESS PANELS

A. Keypad Access Panel: I/U Series Fire Rated Flush Access Door as manufactured by Nystrom Products Company of Reno, NV, 12" x 12".

1. Material: Cold-rolled steel; 14-gauge door, 16-gauge frame.

2. Finish: Phosphate dipped and primed, field painted.

3. Hinge: Flush continuous piano hinge.

4. Latch: Prepared for mortise cylinder by Schlage.

5. Provide 2" x 4" area with 1/16" holes at 1/2" o.c. centered in door.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install access doors in accord with door manufacturer's printed instructions. Completed installation shall operate smoothly.

B. Provide access doors at locations shown on drawings, as noted **and as required to access all equipment requiring maintenance, replacement or inspection including but not limited to smoke/heat detectors, fire dampers, clean-outs, valves, etc.** See Mechanical and Electrical plans for equipment locations.

C. Coordinate location with structure, fixtures and equipment. Provide layout for approval prior to framing openings.

D. Provide doors in walls/ceiling appropriate to type of assembly.

E. Field paint doors per section 09900.

F. Coordinate keypad access panel with intrusion alarm installer for installation of conduit and equipment.

3.02 PROTECTION

A. Protect work and materials of this Section prior to and during installation and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

3.03 CLEANING AND REPAIRING

A. Touch up damaged areas in shop primed surfaces which will be concealed after erection. Leave in condition fit for finish painting by other trades. Repair or replace defective materials as directed. Lubricate hardware and leave entire installation clean and in good operating condition.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:
   1. Door Hardware, including electric hardware.
   2. Thresholds, gasketing and weather-stripping.
   3. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
   1. Division 8: Section - Steel Doors and Frames.
   2. Division 8: Section - Wood Doors.

1.3 REFERENCES (Use date of standard in effect as of Bid date.)

A. 2022 California Building Code, CCR, Title 24.

B. BHMA – Builders' Hardware Manufacturers Association

C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

D. DHI – Door and Hardware Institute

E. NFPA - National Fire Protection Association.
   1. NFPA 80 - Fire Doors and Other Opening Protectives
   2. NFPA 105 - Smoke and Draft Control Door Assemblies

F. UL - Underwriters Laboratories.
   1. UL 10C - Fire Tests of Door Assemblies
   2. UL 305 - Panic Hardware

G. WHI - Warnock Hersey Incorporated

H. SDI - Steel Door Institute

1.4 SUBMITTALS & SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit six (6) copies of schedule organized vertically 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. Include a Cover Sheet with;
    a. Job Name, location, telephone number.
    b. Architects name, location and telephone number.
    c. Contractors name, location, telephone number and job number.
    d. Suppliers name, location, telephone number and job number.
    e. Hardware consultant's name, location and telephone number.
2. Job Index information included;
    a. Numerical door number index including; door number, hardware heading number and page number.
    b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
    c. Manufacturers' names and abbreviations for all materials.
    d. Explanation of abbreviations, symbols, and codes used in the schedule.
    e. Mounting locations for hardware.
    f. Clarification statements or questions.
    g. Catalog cuts and manufacturer’s technical data and instructions.
3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6A A	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent

information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.

F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.

I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

J. LEED Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification; coordinate and cooperate with Owner and Architect in providing information necessary for required LEED rating.

1.5 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
   1. Responsible for detailing, scheduling and ordering of finish hardware.
   2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing. To maintain the integrity of patented key systems provide a letter of authorization from the specified manufacturer indicating that supplier has authorization to purchase the key system directly from the manufacturer.
   3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
   1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

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

F. Product packaging to be labelled in compliance with CA Prop 65, Safe Drinking Water and Toxic Enforcement Act of 1986.

1.6 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.7 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
   1. Locksets: "ND" Ten (10) years.
   2. Electronic: One (1) year.
   3. Closers: Thirty (30) years
   4. Exit devices: Three (3) years.
   5. All other hardware: Two (2) years.

1.8 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.9 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key Owner Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review Owner's keying standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	None – Owner Standard
Exit Devices	Von Duprin	None – Owner Standard
Closers	LCN	Or Approved Equal
Push, Pulls	& Protection Plates	Ives Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops		Ives Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.2 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
   1. Hinges shall be sized in accordance with the following:
      a. Height:
         1) Doors up to 42" wide: 4-1/2" inches.
         2) Doors 43" to 48" wide: 5 inches.
      b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
      c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
   2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.
   1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:

a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
b. Offset lever pull – minimum 1,600 foot pounds without gaining access
c. Vertical lever impact – minimum 100 impacts without gaining access

2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
4. Cylinders: Refer to "KEYING" article, herein.
5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
11. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

C. Exit devices: Von Duprin as scheduled.
1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
3. Mechanism case shall have an average thickness of .140".
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
12. Furnish glass bead kits for vision lites where required.
13. All Exit Devices to be sex-bolted to the doors.
14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
a. The unlatching force shall not exceed 15 lbs. applied in the direction of travel.

D. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.

2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
5. Closers shall be installed to permit doors to swing 180 degrees.
6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

E. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

F. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

G. Thresholds: As Scheduled and per details.
1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
3. Use ¼" fasteners, red-head flat-head sleeve anchors (SS/FHSL).
4. Thresholds shall comply with CBC Section 11B-404.2.5.

H. Seals: Provide silicone gasket at all rated and exterior doors.

1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.

I. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

J. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.3 KEYING

A. Furnish a Proprietary Schlage masterkey system as directed by the owner or architect. Key system to be designated and combinated by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.

B. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.

C. Extend the original Schlage masterkey system established for the project.

D. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangeable Core (FSIC). Pack

E. Furnish construction keying for doors requiring locking during construction.

F. Furnish all keys with visual key control.
1. Stamp key "Do Not Duplicate".
2. Stamp (BHMA) key symbol on key.

G. Furnish all cylinders with visual key control
1. Stamp (BHMA) key symbol on side of cylinder (CKC).

H. Furnish mechanical keys as follows:
1. Furnish 2 cut change keys for each different change key code.
2. Furnish 1 uncut key blank for each change key code.
3. Furnish 6 cut masterkeys for each different masterkey set.
4. Furnish 3 uncut key blanks for each masterkey set.
5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
6. Furnish 1 cut control key cut to each SKD combination.

7. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.
8. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
9. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

I. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.
1. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.
2. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
3. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

J. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.
1. Furnish CL100PB for use with non-I/C Schlage cylinders.
2. Furnish CL771R for use with FSIC Schlage cylinders.
3. Furnish CL721G for use with SFIC Schlage cylinders.

2.4 FINISHES

A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.5 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

3.3 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper

function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.4 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.5 Field quality control

A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.6 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.

C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

GLY	=	Glynn Johnson	Overhead stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
LCN	=	LCN	Door Closers

DOOR HARDWARE

Section 08 71 00
18-44-002

SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

103719 OPT0352930 VERSION 1

GROUP NO. 01

2	EA	CONT. HINGE	700	630	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-9849-L-DT-06-LBL	626	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-9849-L-NL-06-LBL	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
2	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	GASKETING	188SBK PSA	BK	ZER
2	SET	MEETING STILE	328AA-S	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL	A	ZER

GROUP NO. 02

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50P6D RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 03

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70P6D RHO	626	SCH
1	EA	OH STOP	90S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 04

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80P6D RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 05

6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	DBL CYL DEADBOLT	B662P6 12-631	626	SCH
2	EA	PUSH PLATE	8200 4" X 16"	630	IVE
2	EA	PULL PLATE	8302 10" 6" X 16"	630	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP/HOLDER	WS45	626	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
2	SET	MEETING STILE	328AA-S	AA	ZER

END OF SECTION 087100

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00, Rough Carpentry

B. Section 07 21 00, Thermal Insulation

C. Section 07 92 00, Joint Sealants

D. Section 08 11 13, Hollow Metal Doors and Frames.

E. Section 08 30 50, Access Doors.

F. Section 09 51 13, Acoustical Ceilings

G. Section 09 72 00, FRP Wall Panels.

H. Section 09 91 23, Interior Painting.

I. Division 22 and 26, Related Mechanical and Electrical Work.

1.03 QUALITY ASSURANCE

A. Use only new materials and products.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Samples: Submit sample for each type of finish texture to Architect for review per Section 01 33 00.

D. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

C. Guarantee Period shall be two (2) years.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. Gypsum Association publication GA-210-85.

C. Gypsum Association publication GA-600-12, Fire Resistance Design Manual.

D. Gypsum Association publication GA-216-89, "Recommended Specifications for the Application and Finishing of Gypsum Board".

E. Underwriters' Laboratories, Fire Resistance Directory, latest edition.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations. Materials are to be neatly stacked flat, avoiding undue sag or damaged to board surfaces or edges.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. Do not install wallboard or joint compounds when building temperature is below 55 degrees F or if proper ventilation is not provided to eliminate excessive moisture from building.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Gypsum Wallboard:

1. Fire resistant Type "X" Gypsum Wallboard: ASTM C-36 and ANSI A69.1; USG Sheetrock Firecode "C" Core with SW edge, Domtar Gyproc Fireguard Type X, Gold Bond Fire-Shield Sta-Smooth, or approved equal; round tapered edge, 5/8 inch thick fire-rated with U.L. label unless otherwise indicated.

a. Use on all walls except as otherwise noted.

2. Water Resistant Type "X" Gypsum Wallboard: ASTM C-630 and ANSI A69.1; USG Sheetrock Firecode "C" Core, Domtar Gyproc Moisture-Guard Type X, Gold Bond MR Fireshield, or approved equal; moisture resistant board, round tapered edge, 5/8 inch thick fire-rated with U.L. label unless otherwise indicated.

   a. Use on all walls at restrooms, toilet rooms, shower rooms, locker rooms, janitor closets, kitchens and other locations as noted for water resistive conditions.

B. Metal Accessories: Fabricated from galvanized steel; suitable for intended use.

1. Corner Beads: USG Dur-A-Bead #103, or approved equal, size 1-1/4" x 1-1/4".

2. Casing Bead: USG Series No. 200-B, or approved equal.

3. Exposed Edge Trim: USG Series No. 200-A with back flange or approved equal.

4. Metal Furring Channels: USG Metal Furring Channels, Dale FC-7/8, Gold Bond Furring Channel or approved equal 7/8 inch deep x 1-1/4 inch face width resilient metal furring channel.

5. Expansion Joint: USG No. 093 Control Joint, Gold Bond E-Z Expansion Joint, equivalents by Beadex or Domtar or approved equal.

6. Others as indicated on the Drawings and as recommended by reference standards.

C. Fasteners:

1. Screws: Gypsum Wallboard to metal furring channels, use 1" length hilo type S, bugle head. Gypsum wallboard to gypsum wallboard, use 1-1/2" length type G, bugle head. Gypsum wallboard to wood, use 1-1/4" length, bugle head. Gypsum wallboard to metal studs, use 1" length hilo type S, bugle head for 20 gauge or less and 1-1/8" length type S, bugle head for studs greater than 20 gauge. Others as required and recommended by gypsum wallboard manufacturer and in accordance with the specified standards.

2. Nails: Phosphate etched, concave head, steel wire nails, especially made for attachment of gypsum boards; for 1/2" board, use 1-3/8 inches long x 14 ga.; for 5/8 inch board, use 1-7/8 inches long x 13 ga.; for sheathing, use 1-5/8 inch galvanized roofing nails.

3. Spacing shall be in accordance with CBC Table 25A-G and 25A-H.

D. Joint System Materials: Conform to ASTM C475.

1. Tape: USG Sheetrock Brand Joint Tape or approved equal.

2. Joint compound: USG Sheetrock Brand Joint Compound - Taping, or approved equal.

3. Joint finishing compound: USG Sheetrock Brand Joint Compound - Topping, or approved equal.

E. Prime Coat: USG Sheetrock First Coat or approved equal.

F. Interior wall sealant: Highly elastic, water-based compound, specifically formulated for acoustical sealing. Non-bleeding, non-staining, pumpable and easily applied in beads; Tremco Acoustical Sealant, Presstite 579.64; or approved equal.

H. Adhesives shall be per gypsum wallboard manufacturer's recommendations.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Report unacceptable sub-surfaces to Contractor for corrective action before proceeding with installation. Starting of work will indicate acceptance of such sub-surfaces.

B. Surface acceptance: After application of sealer, surfaces shall be checked for surface damage, defects or uneven walls. Uneven walls shall mean those that are not straight, plumb or of even true plane. Such discrepancies shall be corrected prior to application of further wall decoration.

3.02 COORDINATION

A. Coordinate work to avoid delays and interference with work of mechanical, electrical and other trades.

3.03 WORKMANSHIP

A. Workmanship shall be of highest quality. Joints, corners, screws and nail heads shall be finished with long tapered finish, smooth and even in texture. Surfaces shall be prepared to receive paint finish.

3.04 INSTALLATION

A. Fire-resistive ratings: Where fire rated construction is indicated, install wallboard assembly to provide fire-resistive rating required.

B. Sheet arrangement layout: Conform to layouts and requirements indicated; use long sheets to restrict joints to minimum. Conditions met and not covered by plans and specifications shall be resolved in conformity with best practice of trade.

C. Joints: Butt sheets loosely together with tapered edges always placed together (butt edges placed next to tapered edges are not permitted). Sand or kerf cut edges and mill ends to provide smooth jointing on exposed face. Stagger end joints. Shim wallboard on wood framing to get even joints without offsets.

D. Fasteners: Place fasteners no less than 3/8 inch from edges of boards. Install fasteners with heads dimpled slightly below surface; do not cut through paper. Use crown face hammers for driving nails and approved power tools for self drilling screws. Fasten gypsum wallboard to all bearings as follows:

1. Ceilings, Non-rated: Nails, 7 inches o.c., screws 12 inches o.c.

2. Walls, Non-rated: Nails, 8 inches o.c.; screws 12 inches o.c.

3. Ceilings, One-hour Rated: Nails, 6 inches o.c.; screws 8 inches.

4. Walls, One-hour Rated: Nails 7 inches o.c. all bearings; screws 8 inches o.c. at edge bearings, 12 inches o.c. at field bearings.

E. Ceilings: Place boards with long dimension at right angles to supports and end joint occurring over supports. On fire rated ceilings butted end joints may be placed between supports and reinforced on upper side with 8 inch wide wallboard back up strips set in approved adhesive. Place perimeters of ceilings and edges of openings over solid bearing members.

F. Partitions: Place boards with long dimensions either vertical or horizontal (but not combination of both) on studs. Stagger vertical joints on opposite sides of partitions. Locate joints at least 12 inches from jambs of openings. Keep end joints to minimum.

G. Cutting and scribing: Cut neatly to fit around outlets, switch boxes and other protrusions, using keyhole saw or specially designed cutting tool for opening of exact shape and size needed.

H. Trim: Edge exterior corners with specified bead set to true plumb line. Where wallboard joins or abuts any material other than wall board, cover end of board with specified metal casing, leaving joint sufficient for installation of sealant. Attach per manufacturer's recommendations. No clenching allowed.

I. Interior Wall Sealant: At all interior partitions, use double bead of specified material. Install at floors, wall intersections, where walls abut other materials and at all electrical boxes. Apply in accord with manufacturer's printed directions.

J. Fixture Enclosures: Provide 1 hour enclosures of 5/8 inch thick UL labeled wallboard around all fixtures in ceilings with one hour fire rating.

M. Resilient Metal Clips: Fasten to wall at 24 inches o.c. maximum. Position clips within 4 inches of floor and ceiling. Metal clip spacing not to exceed 24 inches o.c. Apply gypsum board to channels using 1 inch long U.S.G. Type S screws spaced 12 inches o.c. with horizontal abutting edges centered over clip screw flange.

N. Gypsum Sheathing: Apply horizontally and fasten by nailing with 1-5/8 inch galvanized roofing nails at 8 inches o.c. each bearing.

3.05 FINISHING

A. Finish all joints, screw and nailhead depressions, applied metal trim and surface blemishes, applying tape and compounds in strict accord with manufacturer's printed directions.

B. All exposed wallboard shall be finished and sanded as necessary to provide flat, smooth surface ready for decoration.

C. Wallboard which will be covered by panels or wall-fastened casework and wallboard which is

above level of finished ceiling, shall be taped, but need not be finished and sanded smooth.

D. Smooth Finish: At exposed gypsum wall board and plaster surfaces in Toilet Rooms, Kitchens and other areas as scheduled.

1. Apply full coat of prime coat over entire surface, paint as specified in Section 09900.

E. Spray Texture Coat: At all exposed gypsum wall board and plaster surfaces, not scheduled for smooth finish.

1. Unless otherwise specified or scheduled, apply the single-coat spray texture to all surfaces in a degree of texture approved by the Architect to match approved sample. No texture shall be applied until approved in writing by the Architect.

2. Finish Texture: Spray texture shall be as follows:

a. Walls: Light orange peel.

b. Ceilings: Light orange peel.

F. Gypsum wallboard to receive FRP, vinyl wall covering, or similar thin flexible coverings shall receive finish topping and sanding and shall be left in a smooth condition, free of surface imperfections, ready to receive the specified wall covering.

3.06 ADDITIONAL REQUIREMENTS

A. Accessories and Light Fixture Protection: Wherever accessories, panels and recessed light fixtures penetrate fire-rated gypsum wallboard, provide protection box assembly in accordance with UL specifications and as detailed to maintain integrity of rated wall/ceiling system.

B. Access Panels: Fabricate, install to detail. Refer to Section 08305 and Mechanical and Electrical work under Divisions 15 and 16.

C. At wall/floor joints greater than 3/16", fill void completely to provide solid backing for floor base.

3.07 PROTECTION

A. Protect work and materials of this Section prior to and during installation and protect the installed work and materials of other trades.

B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

3.08 CLEAN-UP

A. Remove all empty containers, scraps of material and all other debris, and leave premises broom clean. Clean all adjoining work spotted or otherwise defaced by this operation.

END OF SECTION

ART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00, Rough Carpentry.

B. Section 09 29 00, Gypsum Wallboard.

C. Division 21, Fire Sprinkler Systems

D. Division 23, Mechanical Work, for duct systems and ceiling penetration products.

E. Division 26, Electrical Work, for lighting fixtures.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Certification: Where required, provide certification that system is currently listed with Underwriters Laboratories, Inc., including copy of such listing and testing.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Samples: The following samples are required. Submit per Section 01 33 00.

1. Submit sample for each type of grid member and ceiling panel to Architect for review.

2. Manufacturer's full range of colors for Architect's selection.

D. Shop Drawings: Show all parts, connections and anchorages, adjacent materials, fully dimensioned and noted. Show suspension system details and reflected ceiling plans indicating location of electric lighting fixtures, mechanical air supply and return outlets and other items which affect ceiling layout construction. Indicate locations of various types of suspension systems and types of panels or tile. Show access panels where required. Submitted system shall comply with general design requirements per Article 1.12 below.

E. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

F. Test Report on load capacities.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code and IR 25-2.13.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. Protect adjacent surfaces from damage during work of this Section. Installer shall be responsible for checking Drawings and job conditions, conforming to code requirements, and for providing additional channels and hangers as required for support of electrical and mechanical work for type and extent of work. Coordinate layout with other work which penetrates or is supported by ceiling suspension system.

B. Do no installing when building is excessively cold and damp, or hot and dry. Plastering, drywall and concrete must be complete and dry. Windows must be in place and glazed. Maintain temperature of approximately 70 degrees F before, during and after installation. Heating system must be installed and operating when necessary to maintain temperature. Roof and exterior doors must be completed and made watertight.

1.09 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

1.10 APPROVAL OF SUBSTITUTE PRODUCTS

A. Products may be proposed for substitution provided they meet all requirements of this specification and that prior to erection of the suspended ceiling system a copy of an acceptable substantiating test report shall be submitted to the Architect and DSA. The tests shall show how that the axial tension and compression ultimate load capacity of the runners and their splices, intersection connections and expansion devices complies with the requirements of Section 2506.2.1 of CBC. The Contractor shall receive specific authorization

from the Architect to proceed prior to erection. Evaluation of test results shall be made on the mean values resulting from tests of not fewer than three identical specimens, provided the deviation of any individual test result from the mean value does not exceed plus or minus ten percent. The tests shall be made by an approved testing agency.

1.11 FIRE RATED ASSEMBLIES

A. Provide Underwriters' Laboratories, Inc. tested, labeled and listed steel grid members and acoustical panels to meet time-design fire endurance rating of one hour, or more as indicated on drawings, for combined suspended acoustical ceiling and floor or roof assemblies shown. Assembly shall have been approved by State Fire Marshal by date of bid opening.

1.12 GENERAL DESIGN REQUIREMENTS

A. Provide completely designed system complying with requirements of CBC Section 2506.2.1, , IR 25-2.13.

PART 2 - PRODUCTS

2.01 CEILING SUSPENSION SYSTEM DESIGN REQUIREMENTS

A. **Ceiling System Components**

1. Shall comply with ASTM C635 and Section 5.1 of ASTM E580.
2. The ceiling grid system must be rated heavy duty as defined by ASTM C635.
3. Main runners, cross runners, splices, expansion devices and intersection connectors shall be designed to carry a mean ultimate test load of not less than 180 lbs. in compression and tension per ASTM E580 Section 5.1.2.
4. Ceiling wire shall be Class 1 zinc coated (galvanized) carbon steel conforming to ASTM A641. Wire shall be #12 gauge (0.106" diameter) with soft temper and minimum tensile strength = 70 ksi. The maximum allowable (ASD) tension load for wire meeting this specification is 350 lbs.
   i. Four (4) turns of the wire within 1.5" will develop the wire allowable load.
   ii. Three (3) turns of the wire within 3" is assumed to develop no more than 50 percent of wire allowable load.

2.02 CEILING SUSPENSION SYSTEM

A. Manufacturer: CertainTeed Ceilings Seismic Suspension Systems
B. Product
   1. Name: 15/16” Classic Stab System
C. Physical Characteristics
   1. Structural Classification: Heavy Duty (per ASTM C635 and Section 5.1 of ASTM E580)
   2. Double web design manufactured of hot-dipped galvanized steel
   3. Flange Size:
      i. 15/16”
   4. Color: White
D. Components
   1. Main Runners
      i. Size: 12’
   2. Cross Tees
      i. Sizes: 2’ & 4’

E. Edge Molding
    1. Type 15/16" x 2" wall angle
    2. Profile: "L" shape

F. Attachment Devices: Anchors sufficient for five-times design load indicated in ASTM C635 (Table 1). Wire for hangers of size and type to suit intended application, complying with ASTM C641, Class 1 zinc coating, not less than 12 gauge.
    1. Seismic Restraints: Pursuant to CISCA recommendations, ASTM E580 and local code requirements
    2. ICC-ES Evaluation Service Report (ESR-3336)
        i. Suspended Ceilings Framing Systems and Seismic Perimeter Clip (CTSPC-2)

2.03 ACOUSTICAL PANELS

A. MANUFACTURER: CertainTeed Ceilings

B. ACOUSTIC CEILING UNITS

1. Acoustical Ceiling Panel (ACP) – Type A1
    i. Name: Fine Fissured Customline
    ii. Physical Characteristics
        1. Type: III (per ASTM E1264)
        2. Form: 2 (per ASTM E1264)
        3. Pattern: C, D, K (per ASTM E1264)
        4. Sizes: 2'x2', 2'x4'
        5. Thickness: 3/4"
        6. Edges: Square 15/16" grid
        7. Finished Surface: Painted
            a. Mold / Mildew inhibitor included: BioShield
        8. Finished Surface Color: White
        9. Core Composition: Wet-felted mineral fiber
        10. Recycled Content:
            a. Fine Fissured Customline: 33%
                i. 33% (pre-consumer), 0% (post-consumer)
        11. Rapidly Renewable Content:
            a. Fine Fissured Customline: 7%
    iii. Performance Criteria
        1. Noise Reduction Coefficient (NRC) per ASTM C423 (E-400 mounting)
            a. 0.60 [Fine Fissured Customline 224]
        2. Light Reflectance (LR) per ASTM E1477
            a. 0.84
        3. Ceiling Attenuation Class (CAC) per ASTM E1414
            a. 38 [Fine Fissured Customline 224]
        4. Humidity Resistance
            a. Warranted to withstand relative humidity of up to 90% at 104ºF without sagging, warping or delaminating for 10-years
        5. Flame Spread Classification per ASTM E84: Class A
    iv. Independent Environmental Certifications
        1. VOC content
            a. Third-party certification of compliance

i. Per *California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010*

2. Recycled content
    a. Third-party verified Type I Environmental Label
        i. Per ISO 14024 *Environmental Labels and Declarations - Type I Environmental Labeling - Principles and Procedures*
3. Rapidly Renewable content
    a. Third-party verified Type I Environmental Label
        i. Per ISO 14024 *Environmental Labels and Declarations - Type I Environmental Labeling - Principles and Procedures*
4. Environmental Product Declaration
    a. Third-party verified Type III Environmental Product Declaration Per ISO 14025 - *Environmental Labels and Declarations - Type III Environmental Declarations -- Principles and Procedures*

2. Acoustical Ceiling Panel (ACP) – Type A2
    i. Name: Vinyl Rock
    ii. Physical Characteristics
        1. Type: XX (per ASTM E1264)
        2. Form: NA (per ASTM E1264)
        3. Pattern: G (per ASTM E1264)
        4. Size: 2’x4’
        5. Thickness:1/2”
        6. Edges: Square 15/16” grid
        7. Finished Surface: CRF Vinyl
        8. Finished Surface Color: White
        9. Core Composition: Gypsum
        10. Recycled Content: 0%
    iii. Performance Criteria
        1. Noise Reduction Coefficient (NRC) per ASTM C423 (E-mounting)
            a. NA
        2. Light Reflectance (LR) per ASTM E1477S
            a. 0.78
        3. Ceiling Attenuation Class (CAC) per ASTM E1414
            a. 40 (Vinylrock 2’x4’)
        4. Clean Room Classification
            a. Class 5 per IOS 14644-1
        5. Humidity Resistance
            a. Warranted to withstand relative humidity of up to 90% at 104ºF without sagging, warping or delaminating for 10-years
    iv. Independent Environmental Certifications
        1. VOC content
            a. Third party certification of compliance
                i. Per California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010
            b. Accepted Construction Product for use in food establishments operating under the authority of the CFIA

2.04 MISCELLANEOUS MATERIALS

A. Adhesive: As recommended by tile manufacturer for surface conditions applicable.

B. All other materials, not specifically described but required for a complete and proper installation of ceiling systems, including all necessary clips, wires and accessories to complete the suspension system.

C. Suspension system members to be galvanized coated. Exposed material to be factory finished in low sheen satin white.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that suspended acoustical ceiling may be installed in accordance with the original design, all codes and regulations, and the reviewed Shop Drawings.

C. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

D. Installer shall examine all substrates and verify that ceiling surfaces are acceptable. Notify Contractor of conditions detrimental to proper installation of ceiling tile. Beginning work indicates acceptance of existing conditions.

3.02 PREPARATION

A. Lay out suspension system and acoustical units as indicated. Install all acoustical units with grain in same direction.

B. Coordinate with mechanical and electrical trades in correct locations of lighting fixtures, grilles, registers and other items to be installed in suspension system.

C. Measure each ceiling area and establish layout of adhesive applied acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half-width units at borders and comply with reflecting ceiling plans.

D. Prior to erection of the suspended ceiling, a copy of an acceptable substantiating test report shall be submitted to the Architect and DSA. The test shall show that the axial tension and compression ultimate load capacity of the runners and cross runners and their splices, intersection connections and expansion devices complies with the requirements of 2016 CBC – 1616A.1.21. Evaluation of test results shall be made on the basis of the mean values resulting from tests of not fewer than three identical specimens, provided the deviation of any individual test result from the mean value does not exceed plus or minus 10 percent. Tests shall be made by an approved testing agency.

3.03 INSTALLATION OF SUSPENDED CEILING

A. Suspension System Installation:
   1. Shall comply with ASTM C636 and Section 5.2 of ASTM E580.
   2. #12 gauge hanger wires may be used for up to and including a 4 foot by 4 foot grid

spacing and shall be attached to main runners. Splices in hanger wires shall develop 50 percent of the wire allowable load.

3. Provide #12 gauge hanger wires at the ends of all main and cross runners within eight (8) inches of the support or within one-fourth (1/4) of the length of the end tee, whichever is least, for the perimeter of the ceiling area. Perimeter wires are not required when the length of the end tee is eight (8) inches or less.
4. Ceiling grid members shall be attached to two (2) adjacent walls per ASTM E580, Section 5.2.3. Ceiling grid members shall be at least 3/4 inch clear of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners should be free, and a minimum of 3/4 inch clear of wall.
5. The width of the perimeter supporting closure angle shall be not less than two (2) inches. Use of angles with smaller widths in conjunction with proprietary perimeter clips may be acceptable in accordance with Section 5 of IR 25-2.13.
6. At the perimeter of the ceiling area, where main or cross runners are not connected to the adjacent wall, provide interconnection between the runners at the free end to prevent lateral spreading. A metal stabilizer or a #16 gauge wire with a positive mechanical connection to the runner may be used and placed within eight (8) inches of the wall. Where the perpendicular distance from the wall to the first parallel runner is eight (8) inches or less, the stabilizer or #16 gauge wire is not required.

B. Lateral Force Bracing Assembly Installation:

1. Lateral force bracing assemblies consisting of a compression strut and four (4) #12 gauge splayed bracing wires oriented 90 degrees from each other are required for all ceiling areas.
    i. Exception: Lateral force bracing may be omitted for suspended acoustical ceiling systems with a ceiling area not to exceed 144 square feet, for all values of SDS, when perimeter support is provided in accordance with Section 2.2 of IR 25-2.13 and perimeter walls are designed to carry the ceiling lateral forces
2. Lateral force bracing assemblies shall be spaced per Table 1 for all values of the component importance factor (Ip) of the ceiling
3. There shall be a brace assembly a distance of not more than one-half (1/2) of the above spacing from each surrounding wall, expansion joint and at the edges of any ceiling vertical offset. For example, where the brace spacing is 8' x 12', the edge distance shall be 4 feet in the direction of the 8 foot spacing and 6 feet in the direction of the 12 foot spacing.
4. The slope of bracing wires shall not exceed 45 degrees from the horizontal plane and wires shall be taut. Splices in bracing wires shall develop the wire allowable load.
5. Compression struts shall meet the following requirements:
    i. The strut shall be sized to adequately resist the vertical component force induced by the ceiling bracing wires and have a maximum kl/r not to exceed 300. The struts listed in Appendix A meet this requirement for ceilings complying with the general requirements of this IR.
    ii. The strut shall not be more than one (horizontal) in six (vertical) out of plumb.

TABLE 1
LATERAL FORCE BRACE ASSEMBLY SPACING

Design Spectral Acceleration Parameter, S_{DS}	**Brace Assembly Spacing (ft.)**	
	$z/h \le 0.5$[a]	$z/h > 0.5$[a,b]
$S_{DS} \le 1.15$	12 x 12	12 x 12
$1.15 < S_{DS} \le 1.73$	12 x 12	8 x 12
$S_{DS} > 1.73$	8 x 12	8 x 8

Footnotes:

a. Where, as defined in ASCE 7, Section 13.3.1:

z = height in structure of point of attachment of ceiling with respect to the base.
h = average roof height of the structure with respect to the base.

b. It shall be permitted to use the brace assembly spacing for "z/h > 0.5" for the full building height.

C. Attachment of Hanger and Bracing Wires:

1. Fasten hanger wires with not less than three (3) tight turns in three (3) inches. Hanger wire loops shall be tightly wrapped and sharply bent to prevent any vertical movement or rotation of the member within the loops (see ASTM E580, Section 5.2.7.2).
2. Fasten bracing wires with not less than four (4) tight turns in one and one-half (1-1/2) inches.
3. Hanger and bracing wire anchorage to the structure shall be installed in such a manner that the direction of the anchorage aligns closely with the direction of the wire (e.g. bracing wire ceiling clips must be bent as shown in the details and rotated as required to align closely with the direction of the wire, screw eyes in wood must be installed so they align closely with the direction of the wire, etc.)
4. Separate all ceiling hanger and bracing wires at least six (6) inches from all unbraced ducts, pipes, conduit, etc.
5. Hanger and bracing wires shall not attach to or bend around obstructions including but not limited to: piping, ductwork, conduit and equipment. Provide trapeze or other supplementary support members at obstructions to allow typical hanger spacing. Brace assemblies must be configured and/or located in order to avoid obstructions in addition to maintaining the required brace assembly spacing.D
6. Provide additional hangers, struts and brace assemblies as required at all ceiling breaks, soffits or discontinuous areas D
7. Hanger wires that are more than one (horizontal) in six (vertical) out of plumb shall have counter-sloping wires.
   Note: See ASTM C636, Figure 1, for counter-sloping methods.
8. Attachment of the bracing wires to the structure above and to the main runners shall be adequate for the load imposed. The weight (W_p) shall be taken as not less than four (4) psf for calculating seismic forces (F_p)
9. Post-installed anchors (e.g. expansion anchors, screw anchors and power actuated fasteners) shall have a current Evaluation Report acceptable to DSA in accordance with DSA IR A-5.
10. Power actuated fasteners in concrete are not permitted for bracing wires
11. DSA approval of a construction plan is required prior to installing post-installed anchors in prestressed concrete. The construction plan shall demonstrate how the location of existing prestressing tendons and strands will be located and denoted as necessary to avoid interference.D

D. Expansion Joints, Seismic Separation Joints:

1. Expansion joints shall be provided in the ceiling at intersections of corridors and at junctions of corridors and lobbies or other similar areas.
2. For ceiling areas exceeding 2,500 square feet, a seismic separation joint shall be provided to divide the ceiling into areas not exceeding 2,500 square feet in accordance with ASTM E580, Section 5.2.9. D

E. Ceiling Fixtures, Terminals and Devices:

1. All fixtures, terminals and other devices shall be mounted in a manner that will not compromise ceiling performance in accordance with Section 13.5.6.2.2 Item 5 of ASCE 7 as amended by CBC Section 2016 CBC – 1616A.1.21 and ASTM E580 Sections 5.3 and 5.4.
2. Ceiling panels shall not support any light fixtures, air terminals or devices.
3. Penetrations through the ceiling for sprinkler heads and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall have a two (2) inch

oversized ring, sleeve or adapter through the ceiling tile to allow free movement of one (1) inch in all horizontal directions. Alternatively, per ASTM E580, Section 5.2.8.5, a flexible sprinkler hose fitting that can accommodate one (1) inch of ceiling movement shall be permitted to be used in lieu of the oversized ring, sleeve or adapter.

4. Slack safety wires shall be considered hanger wires for installation and testing requirements.

F. Light Fixtures:

1. All light fixtures** shall be positively attached to the ceiling suspension systems by mechanical means per California Electrical Code (CEC) Article 410.36 to resist a horizontal force equal to the weight of the fixture. A minimum of two screws or approved fasteners are required at each light fixture, per ASTM E580, Section 5.3.1. See Section I for pendant-mounted light fixture support and bracing requirements.
2. Surface-mounted light fixtures shall be attached to the main runner with at least two positive clamping devices on each fixture. The clamping device shall completely surround the supporting ceiling runner and be made of steel with a minimum thickness of #14 gauge. Rotational spring catches do not comply. A #12 gauge slack safety wire shall be connected from each clamping device to the structure above. Provide additional supports when light fixtures are eight (8) feet or longer or exceed 56 lbs. Maximum spacing between supports shall not exceed eight (8) feet.
3. Light fixtures weighing less than or equal to 10 lbs. shall have a minimum of one (1) #12 gauge slack safety wire connected from the fixture housing to the structure above.
4. Light fixtures weighing greater than 10 lbs. but less than or equal to 56 lbs. may be supported directly on the ceiling runners, but they shall have a minimum of two (2) #12 gauge slack safety wires connected from the fixture housing at diagonal corners to the structure above.

   Exception. All light fixtures greater than two by four feet weighing less than 56 lbs. shall have a #12 gauge slack safety wire at each corner.
5. All light fixtures weighing greater than 56 lbs. shall be independently supported by not less than four (4) taut #12 gauge hanger wires (one at each corner) attached from the fixture housing to the structure above or other approved hangers. The four (4) taut #12 gauge wires or other approved hangers, including their attachment to the structure above, shall be capable of supporting four (4) times the weight of the fixture.

G. Services within the Ceiling:

1. All flexible sprinkler hose fitting mounting brackets, ceiling-mounted air terminals or other services shall be positively attached to the ceiling suspension systems by mechanical means to resist a horizontal force equal to the weight of the component. Screws or approved fasteners are required. A minimum of two attachments are required at each component.
2. Ceiling-mounted air terminals or other services weighing less than or equal to 20 lbs. shall have one (1) #12 gauge slack safety wire attached from the terminal or service to the structure above.
3. Flexible sprinkler hose fittings, ceiling-mounted air terminals or other services weighing more than 20 lbs. but less than or equal to 56 lbs. shall have two (2) #12 gauge slack safety wires (at diagonal corners) connected from the terminal or service to the structure above.
4. Flexible sprinkler hose fittings, ceiling-mounted air terminals or other services weighing more than 56 lbs. shall be supported directly from the structure above by not less than four (4) taut #12 gauge hanger wires attached from the terminal or service to the structure above or other approved hangers. The four (4) taut #12 gauge wires or other approved hangers, including their attachment to the structure above, must be capable of supporting four (4) times the weight of the unit.

H. Other Devices within the Ceiling:

1. All lightweight miscellaneous devices, such as strobe lights, occupancy sensors, speakers, exit signs, etc., shall be attached to the ceiling grid per article E.1 of this section. In addition, devices weighing more than 10 lbs. shall have a #12 gauge slack

safety wire anchored to the structure above per article E.2 of this section. Devices weighing more than 20 lbs. shall be supported from the structure above using details provided by the registered design professional.

I. Pendant-Mounted Light Fixtures:
   1. Where pendant-mounted light fixtures are to be installed in areas with a suspended ceiling, the construction documents shall include complete support details complying with this section and DSA *IR 16-9: Pendant Mounted Light Fixtures*.
   2. Support pendant-mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting two(2) times the weight of the fixture. c) If a pendant-mounted light fixture is directly and independently braced below the ceiling (i.e., aircraft cables to walls), then a brace assembly is not required above the ceiling.
   3. If a pendant-mounted light fixture is free to swing 45 degrees from vertical in all directions, and is not directly and independently braced below the ceiling, then a bracing assembly is only required where the pendant hanger penetrates the ceiling. Special details are required to attach the pendant hanger to the bracing assembly to transmit the horizontal and vertical forces.
      i. **Exception.** Where the weight of the fixture is less than 20 lbs., the vertical component of the brace force need not be considered so no compression strut/post is required.
   4. Rigid conduit shall not be used for attachment of the fixtures

J. Fire Rated Ceilings:
   1. Provide a detail and tested assembly number for rated ceiling assemblies from an authorized testing agency. The components and installation details must conform in every respect with the listed detail and number. Details shall clearly depict all components, including insulation materials, framing and attachment of the design so that the assembly can be constructed and inspected accordingly.
   2. Pop rivets, screws or other attachments are not acceptable unless specifically detailed in the listed construction detail(s), or an approved listing by a State Fire Marshal (SFM) recognized laboratory.

K. Acoustical Ceiling Tile Panel Installation:
   1. For ceiling installations utilizing acoustical tile panels of mineral or glass fiber, it is not mandatory to provide 3/4 inch clearance between the acoustical tile panels and the wall on the sides of the ceiling which are free to slip

L. Other Panel Types:
   1. Panels weighing more than one-half (1/2) psf, other than mineral fiber and glass fiber acoustical tile, and all metal and wood panels shall be positively attached to the ceiling suspension runners by mechanical means, such as bolts, screws or rivets, and each attachment shall have the allowable design strength to support 100 percent of the weight of the panel acting in any direction. A minimum of two attachments are required for each panel. For ceiling installations utilizing panels other than mineral or glass fiber, 3/4 inch clearance shall be provided between the ceiling panel and the wall on the sides of the ceiling area which are free to slip, unless otherwise justified by seismic qualification indicated below.
   2. The use of other types of attachment, such as clips, snap-in devices, perforated lips, clamping devices or spring loaded devices or hooks, shall be listed per DSA IR A-5 and identified for use with the type of ceiling framing members and panels. The listing shall be seismically qualified in accordance with ASCE 7 Section 13.2.5 or 13.2.6.
   3. An alternate means of compliance per California Administrative Code (CAC), Section 4-304 may be proposed and reviewed on a project-by-project basis when using unlisted means of attachment. The alternate means of attachment shall have the allowable design strength to support 100 percent of the weight of the panel acting in any direction

and shall be capable of maintaining that strength if the ceiling grid is distorted or out of level. Where an alternate means is proposed, requests must be submitted to DSA for review through the Construction Change Document (CCD) process, using form DSA 140: Application for Approval of Construction Change Document – CCD Category A/B. Requests approved and authorized by DSA shall be incorporated into the original project plans or CCD, and a note specifying the alternate materials or methods shall be denoted on the plans and/or specifications.

4. It is also alternately permitted to provide a secondary means of connecting the panel to the grid or structure to retain the panel in case of panel dropout, ceiling grid distortion and ceiling grid becoming out-of-level. The secondary attachment shall have the allowable design strength to support two (2) times the weight of the panel acting in any direction, such as a slack wire or cable.
5. Special attachment details complying with one of the methods outlined above, such as screws or cables, shall be provided at the perimeter of the ceiling, where panels are cut or altered, or where non-standard panel sizes or edge conditions occur.

M. Exitways
1. Exitways of essential services buildings shall be installed in accordance with Section 13.5.6.2.2 Item 1 of ASCE 7 as amended by CBC Section 1616A.1.21. A main or cross runner shall be installed on all sides of each piece of tile, board or panel and each light fixture or grill. Splices or intersection of such runners shall be attached with through connectors such as pop rivets, screws, pins, plates with end tabs or other approved connectors

N. Free Floating Ceilings:
1. Free floating ceilings (ceilings not attached to any walls) supported by wires in accordance with this section shall be braced in accordance with this section, regardless of the ceiling area, unless it can be demonstrated the anticipated ceiling movement will not cause failure of the ceiling components or failure of mechanical, electrical, plumbing and fire and life safety components/systems within the ceiling area and within the area of anticipated movement.
2. The perimeter of free floating ceilings shall be supported by a continuous runner which is spliced in accordance with ASTM E580 Section 5.1.2.

3.04 INSTALLATION OF ADHERED TILE

A. Tile: Place tile units as shown on drawings; with exposed tile joints true and straight and junctures neat, tight and properly trimmed, as required. Complete tile work shall present smooth, level or plumb surface free from unevenness, edge or corner offsets, cupping, scratches, broken tile or other imperfections. Coordinate work with other trades in providing openings, such as for lighting fixtures, ventilating fixtures, access doors and other.

B. Adhesive: Spots of adhesive, 1-1/4 inch minimum diameter, shall be placed at all corners; the tile pressed and slid into place and face surface aligned and leveled. Use sufficient adhesive to permit adjusting tile to uniform true plane without irregularities.

C. Spline: Install splines at all four corners.

D. Tile in Access Doors: Set tile in recessed access door panel using adhesive of sufficient depth to permit tile on panel to finish flush with surrounding tile. Drill hole in tile before application, for access to cam lock control, and install plastic protector supplied with access door.

3.05 GYPSUM BOARD INSERTS

A. Install gypsum board inserts provided under Section 09 29 00 after they have been painted under Section 09 91 23. Install each panel on perimeter bead of Tremco, or approved equal, acoustical sealant and attach hold-down clips.

3.06 ADJUSTING AND CLEANING

A. Upon completion, clean soiled and discolored surfaces, leave free from defects. Remove and replace damaged or improperly applied material, as directed.

B. Acoustical panel units, adhesive applied acoustical tile, suspension members and trim shall be free of scratches, stains, smudges, fingerprints, discolorations, breaks, chips or other damage. Finished ceilings shall be uniform in appearance, including uniform color and texture.

C. Clean exposed surfaces of acoustical ceilings. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.07 PROTECTION

A. Protect work and suspended acoustical ceiling materials prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

3.08 EXTRA STOCK

A. Deliver all open partially used boxes of acoustical panels and tile to Owner for replacement stock.

B. Provide a minimum of 100 sq. ft. of each type, size and texture of panel and tile used in this work to the Owner for replacement stock.

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 30 0, Cast-In-Place Concrete, for concrete finishing.

B. Section 08 71 00, Door Hardware

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Samples: The following samples are required. Submit per Section 01 33 00.

1. Submit sample for each type of resilient flooring (min. 2" x 2" for tile and 2" x 5" for sheet) and base (min. 2" x height) to Architect for review.

2. Manufacturer's full range of colors for Architect's selection. Architect may select more than one color.

3. Submit full size samples of materials in selected color(s); tile, 12" x 12"; sheet, 12" x 12"; base, 48" length.

D. Shop Drawings: Submit layout of each area to be covered with sheet materials with locations of seams, fully dimensioned, indicating adjacent materials where applicable.

E. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

F. Maintenance and Operating Manual: Include manufacturer's written recommendations for care, cleaning and maintenance of each type of material installed.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

C. Guarantee period shall be 2 years from date of filing Notice of Completion. Include unconditional guarantee against loss of bond between rubber base and wall.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.07 PROJECT CONDITIONS

A. Do not install materials unless ambient temperature of 70 degrees F is maintained 72 hours prior to and during laying and until all materials have been stored at site for 72 hours at that temperature.

B. Do not apply materials on wet or damp surfaces.

C. Defer laying until other work that might cause damage to flooring has been completed.

1.08 QUALIFICATIONS

A. For installation of flooring products, use installers approved by the manufacturer properly skilled and completely familiar with the products and the manufacturer's recommended methods of manufacturer and installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Vinyl composition tile: ASTM F 1066 Class 2 – through pattern, 1/8" ga., 12" x 12" size; Armstrong Standard Excelon Vinyl Composition Tile, "Imperial Texture", "Multi-Color" or “Rave” series; or approved equal. ASTM E 662 Smoke Developed 450 or less. Any proposed substitute must have similar texture/pattern selection as well as physical properties. Architect will select from full range of colors in any series and will choose 2 different colors (or more where indicated by pattern on plans) to be installed in pattern as indicated on plans. Resilient flooring shall have a coefficient of friction of at least 0.5 per ASTM D2047.

B. Rubber Base: As manufactured by Johnsonite, Flexco Company, or approved equal. Provide cove base for resilient flooring; carpet base where carpet occurs. Cope inside corners and wrap outside corners. Preformed exterior corners are not acceptable. Provide base in continuous 120 foot rolls; straight 4 foot lengths will not be allowed. Architect may choose from complete range of manufacturer's colors.

C. Reducer Strips: Manufacturer and color to match manufacturer and color of wall base. Rubber; thickness to match adjacent tile; tapered or bullnose edge.

D. Adhesives: Moisture and alkali resistant, as recommended by flooring material manufacturer for particular material and installation condition; proceed with primer where recommended by flooring material manufacturer. Verify that all adhesives intended for use will be compatible with any chemical residues remaining on the floor surface following asbestos abatement operations.

E. Other materials: All other materials, including adhesives and cored base metal edge, not specifically described but required for a complete and proper installation of resilient flooring, shall be only as recommended by the manufacturer of the material to which it is applied.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to all work of this Section, carefully inspect the installed work of other trades and verify that all work is complete to the point where this installation may properly commence. Work of all other trades, including painting, shall be substantially completed before start of laying flooring and permanent heating system must be in operation.

B. Verify that resilient flooring and base may be installed in accord with the design, die lots are the same and floors and walls will accept the adhesive and covering.

C. Examine substrate and conditions under which work is to be performed. Surfaces must be broom-clean, free of coatings that would impair adhesion, smooth and level with no more than 1/8 inch in 10 feet variation from level.

D. Subfloor Testing: Perform the following tests prior to start of installation to confirm the substrate is ready to receive the finish materials:

1. Adhesive Bond Test: In several locations throughout the area to receive the flooring, glue down 3' x 3' pieces of the flooring with the recommended adhesive. Allow to set for 72 hours and try to remove. A sufficient amount of force should be required to remove the flooring.

2. Moisture Test: Moisture tests to be taken on all concrete floor regardless of the age or grade level. The test should be a calcium chloride test as manufactured by Roofing Products. One test should be conducted for every 1000 sq. ft. of flooring. The test should be conducted around the perimeter of the room, at columns and where moisture may be evident. The moisture emission from the concrete shall not exceed manufacturers acceptable limits.

3. pH Test: pH tests, should be conducted in several locations throughout the area. If the pH is 10 or higher, it must be neutralized prior to beginning the installation. This shall be achieved by sanding the concrete with a heavy grit sand paper and vacuuming up the residue. If that is not effective, a solution of 1 part Muriatic acid to 4 parts water must be applied to the floor. This must then be neutralized with clean water and vacuumed up. Retest to assure the pH has been neutralized.

3.02 FLOOR PREPARATION

A. Subfloors shall be smooth, dry, repaired as necessary, and clean of debris. Due to the nature of concrete, the slab will not be completely smooth, flat or free of blemishes. Filling, patching and leveling will be required. A latex emulsion filler compatible with the adhesive is to be used for necessary patching and leveling.

B. Concrete floors with steel troweled (slick) finish shall be properly roughened up (sanded) to ensure suitable adhesion.

C. Concrete floors with curing, hardening and breaking compounds shall be abraded with mechanical methods only to remove compounds. Use blastrac or similar equipment.

D. Vacuum subfloors immediately prior to installation to remove loose particles.

E. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation of flooring or base in areas of discrepancy until all such discrepancies have been resolved.

F. Beginning of installation will imply acceptance of sub-floor by installer.

3.03 CONDITION OF EXISTING SURFACES

A. Inspection of subsurfaces: Before starting installation of any resilient flooring or base, thoroughly examine all surfaces prior to bid on which finish flooring and base are to be applied. Examination includes bond, moisture and alkali testing of concrete sub-floors. No extra payment for work additional to that shown and/or specified in plans and specifications as may be necessary for complete application of the resilient flooring will be allowed if such additional work is apparent from inspection of existing premises and conditions.

B. Cleaning and preparation of existing sub-floors: Prepare existing sub-floors as required to receive new resilient flooring. Include removal of existing flooring and adhesive, cleaning of sub-floors, patching of cracks and other imperfections, and leveling of depressions and holes. Cracks, holes and depressions shall be patched and level with proper patching and leveling compounds hereinbefore specified. Prime subfloors before installing resilient flooring.

C. Beginning of installation will imply acceptance of sub-floor by installer.

3.04 ADHESIVE APPLICATION

A. Installation shall be with manufacturer approved adhesives and approved installation methodologies must be followed.

B. Follow adhesive manufacturer's directions for mixing and applying. Cover surface evenly.

Do not exceed working area or time limits recommended by manufacturer.

3.05 INSTALLATION

A. Extend installation under open-bottomed obstructions, and under removable flanges, or obstructions. Extend into closets and alcoves of rooms, unless another floor finish is indicated for such spaces. Extend floor products under all moveable furniture, disabled accessible cabinets and equipment unless otherwise indicated. Scribe, cut and fit or flash flooring and cove to permanent fixtures, built-in furniture and cabinets, pipes and outlets, and permanent columns, walls and partitions as shown on the plans.

B. Tile: Install wall to wall and to fixed cabinets and casework. Install under freestanding equipment. Cut neatly to and around permanent fixtures.

1. Lay from centerline mark so that cut tiles at opposite sides of room are of equal width and cuts are as wide as possible. Layout shall be square and parallel with straight unbroken joint lines.

2. Alternate direction of tile pattern for each abutting tile in line. Fit tightly and accurately to vertical surface, floor plates, thresholds and edging strips with clean cuts.

3. Lay in color patterns, as shown on Drawings.

4. Cut in game stripping where indicated on plans. Verify exact layout and colors prior to start of work.

5. Roll immediately with 100 lb. roller.

C. Base: In rooms where rubber base is designated, install on all base surfaces including around cabinets and other standing equipment, unless shown otherwise.

1. Apply base in accord with base manufacturer's printed directions. Tightly adhere to substrate.

2. Set straight and level, joints closely fitted flush, top and bottom edges in firm, full contact with floor and wall, and entire backside bonded to wall. Scribe neatly to door trim or other edges. Verify wall extends to floor for full backing. Do not install base where voids or space exists at wall/floor joint. Fill voids due to seams in substrate materials with manufacturer's recommended filler material.

3. Minimum piece length 24 inches.

4. Exercise care to prevent staining of adjacent surfaces.

5. On masonry surfaces, at v-joints in concrete, or similar irregular surfaces, fill voids along top edge of base with adhesive filler material recommended by base manufacturer.

6. At gypsum board and fiberboard walls, **fill voids at wall/floor intersection** fully before installing base to provide complete backing of base. Do not install base with gap; this will result in deformation by furniture and will require removal and replacement of base.

7. Cope inside corners: Cut first piece square to the corner. Undercut and scribe the adjacent piece to the corner, attach per manufacturer.

8. Wrap outside corners: With top set gauge, remove portion of back side of base to the bend. Make two relief cuts, one on each side of the bend at the bottom of the base. Remove a tapered piece from the bottom of the toe. Attach per manufacturer.

D. Edging and Transition strips: Provide at all unprotected edges of floor covering or where floor covering transitions.

3.06 PROTECTION

A. Protect work and materials of this Section before and during installation and protect the installed work and materials of other trades. Do not allow any traffic on VCT tile until floors are sealed.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Provide a temporary non-staining paper pathway in all traffic areas.

3.07 CLEAN-UP AND FINISH

A. Remove excess adhesive from walls and floors.

B. Clean up debris and remove from site.

C. VCT and sheet vinyl floor finish: Thoroughly clean floor with neutral cleaner and wax and seal all products per manufacturer's written instructions (3 – 5 coats of finish, as recommended). Clean and reseal immediately prior to occupancy if floors are not acceptable to Owner or Architect.

3.08 EXTRA STOCK

A. Furnish ONE unopened boxes of each floor tile from same lot as used in work. Mark boxes with manufacturer's name and color pattern.

C. Furnish one percent additional rolled base from same lot of each color utilized, 25 LF minimum. Mark boxes with manufacturer’s name and color pattern.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: Provide and install multi-part resinous floor system, complete, as shown on Drawings and as specified, including:

1. Locations: Areas as indicated by the Plan finish schedule.

2. Provide preparation of substrate as recommended by the resinous flooring manufacturer.

3. Provide and install cove base with trims and accessories as specified in this Section.

4. Provide and install multi-part resinous floor system as specified in this Section.

5. Provide and install sealant joint material for the Work of this Section as specified in this Section.

6. Provide treatment of substrate cracks and control/construction joints as needed and specified in this Section.

B. Related Work Specified Elsewhere:

1. Division 03 30 00 – Cast-In-Place Concrete

2. Division 07 90 00 – Joint Protection

1.02 SUBMITTALS

A. Comply with provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required.

1. Include certification that indicates compliance of materials with requirements.

C. Samples: Submit, for verification purposes, 5-inch square samples of each type of resinous flooring required, applied to a rigid backing, in color and finish indicated.

1. For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and finishes available.

D. Certificates: By manufacturer of resinous flooring; upon completion of Work, written statement that technical support to applicator and field supervision was sufficient to assure proper application of materials and that installation is acceptable.

E. Project References: Provide list of five projects in California where the applicator has installed the Manufacturer's product system in a commercial kitchen of similar size to this project's. Projects shall have been in service at least 12 months and include the project's name, location and point of contact to verify the quality of resinous flooring installation.

F. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

1.03 QUALITY ASSURANCE

A. Qualifications of the Applicator: Licensed or approved by the manufacturer of the coating system and has successfully completed 5 projects of similar size and complexity.

B. Single Source Responsibility: Obtain primary resinous flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this Section.

C. Special Requirements: Regulatory Agencies: Use materials for Work of this Section which comply with volatile organic compound limitations and other regulations of local Air Quality Management District and other local, state, and federal agencies having jurisdiction.

D. ISO 9001: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9001 registered quality system.

1.04 PRE-INSTALLATION CONFERENCE

A. Comply with requirements of Section 01 04 00, Meetings.

B. Arrange a conference at the job site to coordinate resinous flooring and critical finish systems, to be attended by the General Contractor, Architect/Owner’s Representative and personnel involved in the actual manufacture as well as the installation of the Work in this Section and of the following Sections:

1. Section 03 30 00 – Cast-In-Place Concrete

2. Section 06 41 16 – Plastic Laminate Casework.
3. Section 09 72 00 – FRP Wall Panels

1.05 PROJECT CONDITIONS

A. Concrete shall be properly cured for a minimum of 30 days. Type III concrete shall be properly cured for a minimum of 7 days. Concrete shall be tested for moisture-vapor-emission as detailed in Part 3 to determine if a moisture-vapor control membrane is needed.

B. Utilities, including electric, water, heat (air temperature between 60 and 85°F/16 and 30°C) and finished lighting to be supplied by General Contractor.

C. Job area to be free of other trades during, and for a period of 24 hours, after floor installation.

D. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

1.06 DELIVERY, STORAGE AND HANDLING

A. Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.

B. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors.

1. No on site weighing or volumetric measurements allowed.

C. Material shall be stored in a dry, enclosed area protected from exposure to moisture.

1. Temperature of storage area shall be maintained between 60 and 85-degrees F.

1.07 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) one full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) one full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

1. Resinous manufacturer representative shall return to project within 6 months to conduct inspection of resinous floor area.

PART 2 - PRODUCTS

2.01 RESINOUS WALL & FLOOR COATING

A. Colors:

1. As selected by Architect from manufacturer’s standard colors.

B. Resinous Wall & Floor Coating:

1. Basis of Design: Urethane Resin Flooring with Decorative Quartz Finish applied at a minimum total thickness of 1/4”. Substitutions to approved manufacturer's listed below must be submitted and approved 7 days prior to bid date, no exceptions.

   a. Approved Manufacturer's:
   Stonhard - (www.stonhard.com) ph: (800) 854-0310 Contact: John Wagner

C. System Components and Installation Steps: Manufacturer's standard components that are compatible with each other shall be installed as follows:

1. Urethane Mortar with Colored Quartz Broadcast:

   a. Formulation: Liquid-rich, self priming, textured, four component, polyurethane mortar system consisting of a urethane-urea binder, pigments and graded quartz aggregates with a broadcast application of brightly colored silica quartz aggregates.
   b. Application Method: Notched trowel and Spraycaster
   c. Minimum Application Thickness: 3/16”

2. Polyurethane Undercoat with Second Application of Colored Quartz Broadcast:

   a. Formulation: Two-component, clear, free flowing aliphatic polyurethane consisting of polyaspartic resin and an aliphatic isocyanate with a broadcast application of brightly colored silica quartz aggregates.
   b. Application Method: Silica quartz broadcast into a squeegee and medium nap roller applied undercoat.
   c. Minimum Application Thickness: 1/16”

3. Clear Polyurethane Finish Sealer:

   a. Formulation: Two-component, clear, UV light resistant, aliphatic polyurethane coating.
   b. Application Method: Squeegee and medium nap roller
   c. Minimum Application Thickness: 5-10 mils to achieve finish texture of

approved sample submittals.

D. Physical Characteristics: Provide resinous coating system in which the minimum physical properties of resinous coating including aggregate, when tested with standards or procedures referenced below, are as follows:

1. Compressive Strength: 7,700 psi (ASTM C579)

2. Tensile Strength: 1,000 psi (ASTM C307)

3. Flexural Strength: 2,400 psi (ASTM C580)

4. Hardness: 80-84 (ASTM D2240/Shore D)

5. Thermal Coefficient of Linear Expansion: 13 x 10^{-6} in./in.°F (ASTM C531)

6. Heat Resistance: 200°F (Continuous), 250°F (Intermittent)

E. Expansion/Isolation Joint Sealant Materials:

1. Polyurethane Joint Sealant: Two-component, pourable polyurethane sealant with a minimum 400% percent elongation per ASTM D-638.

2. Backer Rod: Polyurethane foam rod or polyethylene backer rod one grade larger than the joint width.

F. Dynamic Cracks, Control and Construction Joints (if needed):

1. Two-component, flexilbilized epoxy membrane in conjunction with 10 ounce fiberglass engineering fabric.

G. Integral Coved Base:

1. Colored Quartz Mortar: Four-component, colored quartz epoxy mortar to match flooring with two-component finish sealer applied to the height indicated on Drawings and Finish Schedule.

2. Radius at floor/wall interface shall be at a ¾" minimum.

3. Metal Cove Termination Strip (optional): 1/8" x ½", "T" shaped, aluminum, cove strip fastened to wall substrate at cove height indicated on Drawings. Metal cove strip to be compatible with FRP wall panels. Termination strip not required where resinous floor coating transitions continuously up wall.

PART 3 - EXECUTION

3.01 EXAMINATION

A. General: Examine substrate to receive resinous coating and give written notification of any deficiencies. Do not proceed until unsatisfactory conditions are corrected.

1. Substrate must be dry and free of all wax, grease, oils, fats, soil, loose or foreign materials and laitance.

   a. Laitance and unbonded cement particles must be removed by abrasive blasting, scarifying.
   b. Other contaminants may be removed by scrubbing with a heavy-duty industrial detergent, “Stonkleen DG9”, or equal; and rinsing with clean water.
   c. The surface must show open pores throughout and have a sandpaper texture.

B. Moisture Testing: Test horizontal and vertical substrates to determine acceptable dryness. Test method as recommended by resinous coating manufacturer.

1. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.

2. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 6 lbs. per 1,000 sq. ft. per 24 hours.

3. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

   Test above provides a more accurate indication as to whether or not a concrete slab has dried sufficiently to allow finish flooring application than the tests below.

   For applying impermeable resinous flooring systems, 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab in 24 hours is generally considered a safe moisture-vapor-emission rate. Consult manufacturers for appropriate rates for permeable systems that will allow moisture vapor to continue through them once cured.

3.02 PREPARATION

A. Surface Preparation: Concrete preparation shall be by mechanical means and include use of a scabbler, scarifier or shot blast machine for removal of bond

inhibiting materials such as curing compounds or laitance.

3.03 MIXING

A. General: Mix components only in amounts that can be applied within recommended application life.

1. Discard materials not used within application life.

3.04 SYSTEM APPLICATION

A. General: Apply each component of resinous coating system in compliance with manufacturer's written directions to produce a uniform monolithic surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.

B. Resinous Flooring:

1. Mortar Base: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed applicator. Notched finishing trowels and spiked rollers are used to smooth the material to the required thickness. Brightly colored quartz aggregate is then broadcast into the wet mortar.

2. Undercoat with Second Broadcast: Remove excess unbonded granules by lightly brushing and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and immediately broadcast colored quartz aggregate into undercoat.

3. Clear Polyurethane Finish Sealer: Remove excess unbonded granules by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures to both floor and coved base surfaces.

C. Integral Coved Base:

1. Mix and apply cove base mortar in conjunction with mortar base of resinous flooring at the height indicated on Drawings and/or Finish Schedule.

D. Expansion/Isolation Joints:

1. Stonflex MP7 Sealant: Mix and apply sealant to properly prepared cut joints (if any). The use of a polyethylene backer rod should be used in expansion and/or isolation joints. Sealant shall be applied at a depth of

half the width of the joint.

E. Dynamic Cracks, Control and/or Construction Joints:

1. Stonproof CT5: Prior to installation of Resinous Flooring, mechanically rout cracks and joints to a depth of 3/8” minimum and at a 45 degree angle to create a “V” into the concrete substrate following the crack and/or joint. Apply Stonproof CT5 at a 30 mil thickness six inches on each side of crack or joint and filling the “V”. Immediately place 10 ounce woven fiberglass engineering fabric into uncured Stonproof CT5 and saturate with additional Stonproof CT5 applied with a medium nap roller.

3.05 FIELD QUALITY CONTROL

A. The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of flooring application.

1. The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.

2. Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.

3. If test results show materials being used do not comply with specified requirements, Contractor may be directed by the Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

3.06 PROTECTION OF ADJACENT WORK

A. General: Resinous floor system will be installed in locations where other adjacent finish materials, including ornamental metal, lath and plaster, and other finish assemblies may already be in place. Protect all adjacent surfaces during installation and finishing.

1. Installed adjacent finishes shall be completely isolated from epoxy coating system installation. Provide Plastic ("Visqueen") wrap and mask all edges.

2. Provide constant supervision and immediate clean up throughout resinous floor system installation.

3. After resinous floor system has fully cured, remove protection from adjacent surfaces and wipe down surfaces using clean, cotton towels.

3.07 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.

1. Close area of application for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation.

1. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application.

2. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning:

1. Remove temporary covering and clean resinous flooring just prior to final inspection.

2. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 SUMMARY

A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished gypsum wallboard.

1. Aluminum trim.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09 29 00, Gypsum Board

B. Section 09 67 23, Resinous Flooring

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Certification: Where required, provide certification that system is currently listed with Underwriters Laboratories, Inc., including copy of such listing and testing.

1.04 SUBMITTALS

A. Refer to Section 01 30 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

D. Selection Samples: Submit manufacturer’s standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

E. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
1. Submit complete with specified applied finish.
2. For selected patterns show complete pattern repeat.
3. Exposed Molding and Trim: Provide samples of each type, finish, and color.

F. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site

G. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 30 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. American Society for Testing and Materials: Standard Specifications (ASTM)
1. ASTM D 256 - Izod Impact Strengths (ft #/in)
2. ASTM D 570 - Water Absorption (%)
3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
5. ASTM D 2583- Barcol Hardness
6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Marlite; 202 Harger Street, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com.

B. Products:
   1. Standard FRP

2.02 PANELS

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
   1. Coating: Multi-layer print, primer and finish coats or applied over-layer.
   2. Dimensions:
      a. Thickness – 0.090 “ (2.29mm) nominal
      b. Width - 4'-0” (1.22m) nominal
      c. Length: As indicated on the drawings
   3. Tolerance:
      a. Length and Width: +/-1/8 “ (3.175mm)
      b. Square - Not to exceed 1/8 “ for 8 foot (2.4m) panels or 5/32 “ (3.96mm) for 10 foot (2.4m) panels

B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
   1. Flexural Strength - 1.0 x 10^4 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
   2. Flexural Modulus - 3.1 x 10^5 psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
   3. Tensile Strength - 7.0 x 10^3 psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
   4. Tensile Modulus - 1.6 x 10^5 psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
   5. Water Absorption - 0.72% per ASTM D 570.
   6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
   7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256

C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

D. Front Finish: See below for textures.
   1. FRP1: Marlite Standard FRP
      1. Color: To be selected from manufacturer’s full range of colors including:
         1. 100 White
         2. 106 Beige,
         3. 118 Natural Almond
         4. 140 Ivory
         5. 145 Silver
         6. 151 Light Grey

7. 807 Black
8. 199 Bright White

2. Surface: Pebbled and smooth to be selected

1. Fire Rating: Class A (I).
2. Sizes: Standard sizes are;
    1. Marlite FRP
        1. 48” x 120” [1.2m x 3m] x .090” (3mm) nom.

2.04 MOLDINGS

A. Aluminum Trim: FRP1: Heavy weight extruded aluminum 6063-T5 alloy prefinished at the factory.
1. Profiles:
a. F 550 Inside Corner, 8’ length
b. F 561 Outside Corner, 8’ length
c. F 565 Division, 8’ length
d. F 570 Edge, 8’ length
e. Color: Brite Anodized

2.05 ACCESSORIES

A. Fasteners: Non-staining nylon drive rivets.
1. Match panel colors.
2. Length to suit project conditions.

B. Adhesive: Either of the following construction adhesives complying with ASTM C 557.
1. Marlite C-551 FRP Adhesive - Water- resistant, non-flammable adhesive.
2. Marlite C-375 Construction Adhesive - Flexible, water-resistant, solvent based adhesive, formulated for fast, easy application.
3. Titebond Advanced Polymer Panel Adhesive – VOC compliant, non-flammable, environmentally safe adhesive.

C. Sealant:
1. Marlite Brand MS-250 Clear Silicone Sealant.
2. Marlite Brand MS-251 White Silicone Sealant.
3. Marlite Brand - Color Match Sealant .

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
1. Verify that stud spacing does not exceed 24” (61cm) on-center.

B. Repair defects prior to installation.
   1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.03 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence.

B. Cut sheets to meet supports allowing 1/8" (3 mm) clearance for every 8 foot (2.4m) of panel.
   1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
   2. Pre-drill fastener holes 1/8" (3mm) oversize with high speed drill bit.
      a. Space at 8" (200mm) maximum on center at perimeter, approximately 1" from panel edge.
      b. Space at in field in rows 16' (40.64cm) on center, with fasteners spaced at 12" (30.48 cm) maximum on center.

C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
   1. Install panels with manufacturer's recommended gap for panel field and corner joints.
      a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
      b. Drive fasteners for snug fit. Do not over-tighten.

D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
   1. All moldings must provide for a minimum 1/8 " (3mm) of panel expansion at joints and edges, to insure proper installation.
   2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.04 CLEANING

E. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

F. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates listed in part, 3.6 Exterior Painting Schedule.

B. Related Requirements:

1. Section 05 10 00, Structural Steel for shop priming of metal substrates with primers specified in this Section.
2. Section 09 91 23, Interior Painting for surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 35 units at 85 degrees, according to ASTM D 523

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

H. EG: Ethylene Glycol. Ethylene glycol is listed as a hazardous air pollutant (HAP) by the U.S. EPA.

I. Blocking: Two painted surfaces sticking together such as a painted door sticking to a painted jamb.

J. RAVOC: Reactivity adjusted VOC 'Reactivity' means the ability of a VOC to promote ozone formation.

K. PDCA: Painting & Decorating Contractors of America www.pdca.org

L. SSPC: Scopes of SSPC Surface Preparation Standards and Specifications. www.sspc.org.

M. Green Wise: Green Wise products are tested in an ISO accredited laboratory to meet environmentally determined performance standards established by Coatings Research Group, Inc.

N. Dunn-Edwards Conformance Chart: DE CONFORMANCE TABLE

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

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

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

1. Submit Samples on rigid backing, no smaller than 7 inches by 10 inches (177.8 mm by 254 mm) or larger than 8.5 inches by 11 inches (215.9 mm by 279.4 mm).
2. Label each Sample for project, architect, general contractor, painting contractor, paint color name and number, paint brand name, "P" number if applicable, and application area.

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

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Provide not less than 2 gal. (7.6 L) of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to

demonstrate aesthetic effects and set quality standards for materials and execution.

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

    a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
    b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

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

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F (7 degrees C) or more than 120 degrees F (49 degrees C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 90 degrees F (10 and 32 degrees C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.

C. Painting contractor should follow proper painting practices and exercise judgment based on his or her experience and project specific conditions as to when to proceed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Dunn-Edwards Corporation or approved equal.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

C. Colorants: The use of colorants containing hazardous chemicals, such as ethylene glycol, is prohibited.

D. Colors: As selected by the Architect.

1. Indicate a percentage of the surface area that will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner may engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will comply with requirements to use compatible products and systems as described in Paragraph 2.2.A. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with

requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Portland Cement Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured, including pH testing to determine that alkalinity is within limits established by the manufacturer.

D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

G. Shop Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop primed surfaces.

H. Galvanized Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied at no additional cost to the Owner, to completely hide base material, provide uniform color, and to produce satisfactory finish results.
3. Apply coatings without thinning except as specifically required by label directions or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.
4. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
5. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
6. Paint entire exposed surface of window frames and sashes.
7. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
8. Priming may not be required on items delivered with prime or shop coats, unless

otherwise specified. Touch up prime coats applied by others as required ensuring an even primed surface before applying finish coat.

B. Tint each undercoat to a lighter shade of the finish coat (not to exceed 2 ounces of colorant) to facilitate identification of each coat if multiple coats of same material are to be applied.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Block Fillers: Provide block fill as scheduled to conform to the following: PDCA Standard P12-05.

1. Level 3 - Premium fill: One or multiple coats of high performance block filler manufactured to be applied at a high dry film build. Block filler shall be back-rolled to eliminate voids and reduce the majority of the masonry profile depth.

F. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
   a. Equipment, including panelboards and switch gear.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Tanks that do not have factory-applied final finishes.
   h. Other items as directed by the Architect.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Non-Traffic Surfaces:

1. Ultra-Premium Latex System:

a. Prime Coat: Primer, alkali resistant, waterbased, interior/exterior, Dunn-Edwards, Eff-Stop Premium ESPR00.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, Dunn-Edwards, Evershield EVSH10 100% acrylic, (Gloss Level 1).
Or
d. Topcoat: Latex, exterior, velvet, Dunn-Edwards, Evershield EVSH20 100% acrylic, (Gloss Level 2).

B. Clay-Masonry, CMU (without block filler) Substrates:

1. Ultra-Premium Latex System:

a. Prime Coat: Primer, alkali resistant, waterbased, interior/exterior, Dunn-Edwards, Eff-Stop Premium ESPR00.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, Dunn-Edwards, Evershield EVSH10 100% acrylic, (Gloss Level 1).
Or
d. Topcoat: Latex, exterior, velvet, Dunn-Edwards, Evershield EVSH20 100% acrylic, (Gloss Level 2).

C. CMU Substrates:

1. Ultra-Premium Latex System:

a. Prime Coat: Block filler, latex, interior/exterior, Dunn-Edwards, Smooth BLOCFIL Premium SBPR00.

b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, Dunn-Edwards, Evershield EVSH10 100% acrylic, (Gloss Level 1).
Or
d. Topcoat: Latex, exterior, velvet, Dunn-Edwards, Evershield EVSH20 100% acrylic, (Gloss Level 2).

D. Steel Substrates:

1. Ultra-Premium Latex over a Waterborne Alkyd Primer System:

a. Prime Coat: Primer, rust inhibitive, waterborne alkyd, interior/exterior, Dunn-Edwards, Bloc-Rust Premium BRPR00 Series or Enduraprime Rust Preventative Primer ENPR00.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, Dunn-Edwards, Evershield EVSH10 100% acrylic, (Gloss Level 1).
Or
e. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Evershield EVSH30 100% acrylic, (Gloss Level 3).
Or
g. Topcoat: Latex, exterior, semi-gloss, Dunn-Edwards, Evershield EVSH50 100% acrylic, (Gloss Level 5).

2. Waterborne Urethane Alkyd Enamel System for Handrails:

a. Prime Coat: Primer, rust inhibitive, waterborne alkyd, interior/exterior, Dunn-Edwards, Bloc-Rust Premium BRPR00 Series
b. Intermediate Coat: Waterborne urethane alkyd, interior/exterior matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5)

E. Galvanized Metal Substrates:

2. Ultra-Premium Latex System:

a. Prime Coat: Primer, waterbased, interior/exterior, Dunn-Edwards, Ultrashield Galvanized Metal Primer ULGM00**.**
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, Dunn-Edwards, Evershield EVSH10 100% acrylic, (Gloss Level 1).
Or
e. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Evershield EVSH30

100% acrylic, (Gloss Level 3).
Or

g. Topcoat: Latex, exterior, semi-gloss, Dunn-Edwards, Evershield EVSH50 100% acrylic, (Gloss Level 5).

3. Waterborne Urethane Alkyd Enamel over a Latex Primer System for Handrails:

a. Prime Coat: Primer, waterbased, interior/exterior, Dunn-Edwards Ultrashield Galvanized Metal Primer ULGM00.
b. Intermediate Coat: Waterborne urethane alkyd, interior/exterior, matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards Aristoshield ASHL50, (Gloss Level 5)

F. Aluminum Substrates:

2. Ultra-Premium Latex System:

a. Prime Coat: Primer, waterbased, interior/exterior, Dunn-Edwards, Ultrashield Galvanized Metal Primer ULGM00**.**
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, Dunn-Edwards, Evershield EVSH10 100% acrylic, (Gloss Level 1).
Or
e. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Evershield EVSH30 100% acrylic, (Gloss Level 3).
Or
g. Topcoat: Latex, exterior, semi-gloss, Dunn-Edwards, Evershield EVSH50 100% acrylic, (Gloss Level 5).

G. Wood Substrates:

1. Ultra-Premium Latex System:

a. Prime Coat: Primer, waterbased, exterior, Dunn-Edwards, EZ-Prime Premium EZPR00.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, Dunn-Edwards, Evershield EVSH10 100% acrylic, (Gloss Level 1).
Or
e. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Evershield EVSH30 100% acrylic, (Gloss Level 3).
Or
g. Topcoat: Latex, exterior, semi-gloss, Dunn-Edwards, Evershield EVSH50 100% acrylic, (Gloss Level 5).

H. Portland Cement Plaster (Stucco) Substrates:

1. Ultra-Premium Latex System:

a. Prime Coat: Primer, alkali resistant, waterbased, interior/exterior, Dunn-Edwards, Eff-Stop Premium ESPR00.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat, Dunn-Edwards, Evershield EVSH10 100% acrylic, (Gloss Level 1).
Or
d. Topcoat: Latex, exterior, velvet, Dunn-Edwards, Evershield EVSH20 100% acrylic, (Gloss Level 2).

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates listed in 3.6 Interior Painting Schedule.

B. Related Requirements:

1. Section 05 10 00, Structural Steel for shop priming of metal substrates with primers specified in this Section.
2. Section 09 91 13, Exterior Painting for surface preparation and the application of paint systems on exterior substrates.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 1 to 2 units at 85 degrees.

B. Gloss Level 2: 5 to 9 units at 60 degrees and 10 to 15 units at 85 degrees.

C. Gloss Level 3: 10 to 15 units at 60 degrees and 15 to 30 units at 85 degrees.

D. Gloss Level 4: 20 to 35 units at 60 degrees and 35 to 50 units at 85 degrees.

E. Gloss Level 5: 40 to 50 units at 60 degrees.

F. Gloss Level 6: 70 to 80 units at 60 degrees.

G. Gloss Level 7: More than 80 units at 60 degrees.

H. Blocking: Two painted surfaces sticking together such as a painted door sticking to a painted jamb.

I. Mildew Resistant: Certified products are specially formulated with microbicidal additives that resist mold, mildew, and algae growth on the paint film and inhibit growth of bacterial odors.

J. CHPS: Collaborative for High Performance Schools. A national movement to improve student performance and the entire educational experience by building the best possible schools. www.chps.net.

K. EG: Ethylene Glycol. Ethylene glycol is listed as a hazardous air pollutant (HAP) by the U.S. EPA.

L. PDCA: Painting & Decorating Contractors of America www.pdca.org .

M. RAVOC: Reactivity adjusted VOC. "Reactivity" means the ability of a VOC to promote ozone formation

N. SSPC: The Society for Protective Coatings publishes Scopes of SSPC Surface Preparation Standards and Specifications www.sspc.org .

O. Dunn-Edwards Conformance Chart: D-E CONFORMANCE TABLE

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. LEED v.4 Requirements: Interior paints and coatings must pass CDPH Standard Method V1.1 (also called section 01350) emissions testing; and they must comply with the VOC content limits of the California ARB 2007 Suggested Control Measure for Architectural Coatings.

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

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

1. Submit Samples on rigid backing, no smaller than 7 inches X 10 inches (177 mm X 254 mm) or larger than 8.5 inches X 11 inches (216 mm X 280 mm).
2. Label each Sample for project, architect, general contractor, painting contractor, paint color name and number, paint brand name, "P" number if applicable, and application area.

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

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Provide not less than 2 gal. (7.6 L) of each material and color applied.

1.6 QUALITY ASSURANCE

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

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

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

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

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 90 degrees F (10 and 32 degrees C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.

C. Painting contractor should follow proper painting practices and exercise judgment based on his or her experience and project specific conditions as to when to proceed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Dunn-Edwards Corporation or approved equal.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Provide material that comply with VOC limits of authorities having jurisdiction.

C. Colorants: The use of colorants containing hazardous chemicals, such as ethylene glycol, is prohibited and zero VOC colorants should be used whenever possible.

D. Colors: As selected by the Architect.

1. Indicate a percentage of surface area which will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner may engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will comply with requirements to use compatible products and systems as described in Article 2.2. Contractor will be required to remove rejected materials from previously painted

surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured, including pH testing to determine that alkalinity is within limits established by the manufacturer.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

G. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions, including pH testing to determine that alkalinity is within limits established by the manufacturer.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

G. Shop Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop primed surfaces.

H. Galvanized Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat to a lighter shade of the finish coat (not to exceed 2 ounces of colorant) to facilitate identification of each coat if multiple coats of same material are to be applied.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Block Fillers: Provide block fill as scheduled to conform to the following PDCA Standard P12-05:

1. Level 3 - Premium Fill: One or multiple coats of high performance block filler manufactured to be applied at a high dry film build. Block filler shall be back-rolled to eliminate voids and reduce the majority of the masonry profile depth.

F. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

   a. Equipment, including panelboards and switch gear.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Tanks that do not have factory-applied final finishes.
   h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   i. Other items as directed by the architect.

2. Paint the following work where exposed in occupied spaces:

   a. Equipment, including panelboards.

b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by the Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Ultra-Premium Low Odor/VOC Latex System:

a. Prime Coat: Primer sealer, Dunn-Edwards, Eff-Stop Premium ESPR00.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, flat, Dunn-Edwards, Everest EVER10, (Gloss Level 1).
Or
d. Topcoat: Latex, interior, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or
e. Topcoat: Latex, interior, semi-gloss, Dunn-Edwards, Everest EVER50, (Gloss Level 5).

2. Waterborne Urethane Alkyd Enamel over a Latex Primer System:

a. Prime Coat: Primer, alkali resistant, waterbased, Dunn-Edwards, Eff-Stop Premium ESPR00.
b. Intermediate Coat: Waterborne urethane alkyd, interior/exterior, matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

B. Clay-Masonry Substrates:

1. Ultra-Premium Low Odor/VOC Latex System:

a. Prime Coat: Primer, alkali resistant, waterbased, Dunn-Edwards, Eff-Stop Premium ESPR00.
b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, flat, Dunn-Edwards, Everest EVER10, (Gloss Level 1).
Or
d. Topcoat: Latex, interior, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or
e. Topcoat: Latex, interior, semi-gloss, Dunn-Edwards, Everest EVER50, (Gloss Level 5).

2. Waterborne Urethane Alkyd Enamel over a Latex Primer System:

a. Prime Coat: Prime Coat: Primer, alkali resistant, waterbased, Dunn-Edwards, Eff-Stop Premium ESPR00.

b. Intermediate Coat: Waterborne urethane alkyd matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

C. CMU Substrates:

1. Ultra-Premium Low Odor/VOC Latex System:

a. Block Filler: Block filler, latex, interior/exterior, Dunn-Edwards, Smooth Blocfil Premium SBPR00.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, flat, Dunn-Edwards, Everest EVER10, (Gloss Level 1).
Or
d. Topcoat: Latex, interior, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or
e. Topcoat: Latex, interior, low odor/VOC, semi-gloss, Dunn-Edwards, Everest EVER50, (Gloss Level 5).

2. Waterborne Urethane Alkyd Enamel over a Latex Block Filler System:

a. Block Filler: Block filler, latex, interior/exterior, Dunn-Edwards, Smooth Blocfil Select SBSL00.
b. Intermediate Coat: Waterborne urethane alkyd, interior/exterior, matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).
Or

D. Steel Substrates:

3. Ultra-Premium Low Odor/VOC Latex over a Waterborne Alkyd Primer System:

a. Prime Coat: Primer, rust-inhibitive, water based, Dunn-Edwards, Bloc-Rust Premium BRPR00 Series or Enduraprime Rust Preventative Primer ENPR00.
b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, low odor/VOC, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or

d. Topcoat: Latex, interior, low odor/VOC, semi-gloss, Dunn-Edwards, Everest EVER50, (Gloss Level 5).

2. Waterborne Urethane Alkyd Enamel System for Handrails and Exposed Metal Columns:

a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, Dunn-Edwards, Bloc-Rust Premium BRPR00 Series.
b. Intermediate Coat: Waterborne urethane alkyd matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

E. Galvanized Metal Substrates:

1. Ultra-Premium Low Odor/VOC Latex System:

a. Prime Coat: Primer, waterbased, Dunn-Edwards, Ultrashield Galvanized Metal Primer ULGM00.
b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, low odor/VOC, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or
d. Topcoat: Latex, interior, low odor/VOC, semi-gloss, Dunn-Edwards, Everest, EVER50, (Gloss Level 5).

2. Waterborne Urethane Alkyd Enamel over a Latex Primer System for Handrails:

a. Prime Coat: Primer, waterbased, Dunn-Edwards, Ultrashield Galvanized Metal Primer ULGM00.
b. Intermediate Coat: Waterborne urethane alkyd matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

F. Aluminum (Not Anodized or Otherwise Coated) Substrates: Latex System.

1. Ultra-Premium Low Odor/VOC Latex System:

a. Prime Coat: Primer, waterbased, Dunn-Edwards, Ultrashield Galvanized Metal Primer ULGM00.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or
d. Topcoat: Latex, interior, semi-gloss, Dunn-Edwards, Everest, EVER50, (Gloss Level 5).

2. Waterborne Urethane Alkyd Enamel over a Latex Primer System:

a. Prime Coat: Primer, waterbased, Dunn-Edwards, Ultrashield Galvanized Metal Primer ULGM00.
b. Intermediate Coat: Waterborne urethane alkyd matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

G. Wood Substrates:

1. Ultra-Premium Low Odor/VOC Latex System for Casework:

a. Prime Coat: Primer, latex, for interior wood, Dunn-Edwards, Decoprime DCPR00.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, eggshell, Dunn-Edwards Decoglo DGLO30, (Gloss Level 3).
Or
d. Topcoat: Latex, interior, semi-gloss, Dunn-Edwards, DECOGLO DCGLO50, (Gloss Level 5).

2. Ultra-Premium Low Odor/VOC Latex System:

a. Prime Coat: Primer, latex, for interior wood, Dunn-Edwards, Decoprime DCPR00.
b. Topcoat: Latex, interior, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or
c. Topcoat: Latex, interior, semi-gloss, Dunn-Edwards, Everest, EVER50, (Gloss Level 5).

3. Waterborne Urethane Alkyd Enamel over a Latex Primer System:

a. Prime Coat: Primer, latex, for interior wood, Dunn-Edwards, Decoprime DCPR00.
b. Intermediate Coat: Waterborne urethane alkyd matching topcoat.
c. Topcoat: Waterborne urethane alkyd enamel, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

H. Gypsum Board Substrates:

1. Ultra-Premium Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, latex, interior, Dunn-Edwards, Vinylastic Premium VNPR00.
b. Intermediate Coat: Latex, interior, low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, low odor/VOC, flat, Dunn-Edwards Everest EVER10, (GlossLevel 1)
Or
d. Topcoat: Latex, interior, low odor/VOC, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or
e. Topcoat: Latex, interior, low odor/VOC, semi-gloss, Dunn-Edwards, Everest EVER50, (Gloss Level 5).

2. Pre-Catalyzed Waterbased Epoxy for Restrooms and Kitchen Areas:

a. Prime Coat: Primer sealer, latex, interior, Dunn-Edwards, Vinylastic Premium VNPR00.
b. Intermediate Coat: Pre-catalyzed waterbased epoxy matching topcoat.
c. Topcoat: Waterbased epoxy, interior, semi-gloss, Dunn-Edwards, Enduracat ENPX50, (Gloss Level 5).

I. Plaster Substrates:

1. Ultra-Premium Low Odor/VOC Latex System:

a. Prime Coat: Primer, alkali resistant, water based, Dunn-Edwards, Eff-Stop Premium ESPR00.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, flat, Dunn-Edwards Everest EVER10, (Gloss Level 1).
Or
d. Topcoat: Latex, interior, eggshell, Dunn-Edwards, Everest EVER30, (Gloss Level 3).
Or

e. Topcoat: Latex, interior, semi-gloss, Dunn-Edwards, Everest EVER50, (Gloss Level 5).

2. Waterborne Urethane Alkyd Enamel over Latex Primer System:

a. Prime Coat: Primer, alkali resistant, waterbased, Dunn-Edwards, Eff-Stop Premium ESPR00.
b. Intermediate Coat: Waterborne urethane alkyd matching topcoat.
c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).
Or
d. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

J. Water Based Latex Dry Fall System for Exposed Structure Ceilings:

Topcoat: Dry fall, water based, flat, Dunn-Edwards, Aquafall AQUA10, (Gloss Level 1).
Or
a. Topcoat: Dry fall, water based, low sheen, Dunn-Edwards, Aquafall AQUA30, (Gloss Level 3).
Or
b. Topcoat: Dry fall, water based, low sheen, Dunn-Edwards, Aquafall AQUA50, (Gloss Level 4).

END OF SECTION

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 30 00, Cast-In-Place Concrete, for post footings.

B. Section 08 11 13, Hollow Metal Doors and Frames.

C. Section 09 91 10, Painting.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

1.04 SUBMITTALS

A. Refer to Section 01 30 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Samples: The following samples are required. Submit per Section 01300.

1. Submit sample for each type of material and letter font to Architect for review.

2. Manufacturer's full range of colors for Architect's selection.

D. Shop Drawings: Show all parts, connections and anchorages, adjacent materials, fully dimensioned and noted. Include dimensioned layout and installation details for field installation.

1.05 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. Title 19, CCR, Article 33.01(i).

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.07 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

PART 2 - PRODUCTS

2.01 PLASTIC SIGNS

A. General (unless otherwise noted): 1/8" thick minimum acrylic; subsurface applied 3M (or approved equal) vinyl graphics and subsurface applied paint.

1. Raised Characters and Lettering
    i. Raised characters and Lettering: Symbols and letters shall be raised above subsurface a minimum 1/32".
    ii. Case: Characters and letters shall be uppercase.
    iii. Style: Characters and letters shall be Sans Serif. Characters and letters shall not be italic, oblique, script, highly decorative or of other unusual forms.
    iv. Character proportions: Character shall be proportioned where the width of the uppercase letter “O” is 60 percent minimum and 110 percent maximum of the height of uppercase letter “I”.
    v. Height: Lettering shall be 1 inch high minimum and 2 inch high maximum on the height of an uppercase “I” with 15% stroke width of the uppercase letter “I”.
    vi. Character spacing shall be measured between the two closest points of adjacent raised characters, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch minimum and 4 times the raised character stroke width maximum. Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8” minimum and 4 times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch minimum
    vii. Line Spacing: Spacing between the baselines of separate lines of raised characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.
    viii. Symbols where specified shall be international style.
2. Braille: Braille shall be contracted (Grade 2) Braille
    i. Raised characters and letters shall be duplicated with contracted Grade 2 Braille at **all** locations, except occupancy sign locations.
    ii. Braille dots shall have a domed or rounded shape and shall have the following spacing:

- Dot base diameter: 0.059 (1.5 mm) to 0.063 (1.6 mm)
- Distance between dots in the same cell: 0.100 (2.5 mm)
- Distance between corresponding dots in adjacent cells: 0.300 (7.6 mm)
- Dot height: 0.025 (0.6 mm) to 0.037 (0.9 mm)
- Distance between corresponding dots from one cell directly below: 0.395 (10 mm) to 0.400 (10.2 mm)

iii. Position: Braille shall be positioned below the corresponding text in a horizontal format, flush left or centered. If text is multi-lined, Braille shall be positioned below the entire text. Braille shall be separated 3/8 inch (9.5 mm) minimum and ½ inch (12.7 mm) maximum from any other tactile characters and 3/8 inch (9.5 mm) minimum from raised borders and decorative elements.

3. Occupancy Signs (capacity sign): Capacity to be as indicated on plans or as provided by Architect; sign to read as follows:

   a. At Multi-Purpose Room used for Assembly and Dining: “The number of people permitted in this room shall not exceed 406 Assembly and 290 Dining”.

4. Exit Signs:

   a. General: Signs to be listed by UL for their appropriate use.

   b. All rooms exiting from building to outside shall be provided with a tactile exit sign. Signs shall be 125" thick "Westinghouse Micarta" high pressure laminate. Background shall be sandblasted away leaving integral raised letters and Braille. Paint entire front surface of sign. With the exception of Braille, and unless otherwise noted, all raised typography and symbols shall be colored by the silkscreening process. Braille shall remain the same color as the sign background color.

5. Room Identification Signs: Provide at each classroom and other areas as noted on the Door Schedule or drawings.

   a. .125" thick "Westinghouse Micarta" high pressure laminate. Background shall be sandblasted away leaving integral raised letters and Braille. Paint entire front surface of sign. With the exception of Braille, and unless otherwise noted, all raised typography and symbols shall be colored by the silkscreening process. Braille shall remain the same color as the sign background color.

   b. Provide name and room number at each door indicated. Names and numbers to be reviewed and approved by Architect and School District prior to fabrication. Allow 4 numbers and 14 letters for each sign.

   c. Sign to be as detailed on drawings and installed as directed on, or adjacent to, doors.

6. Assistive Listening Device Sign: To read “LISTENING DEVICE AVAILABLE” with international symbol of access for hearing impaired.

B. All signage to comply with the Americans with Disabilities Act Standards and requirements.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation, carefully inspect and verify that the installed work of other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. In the event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 INSTALLATION OF SIGNS

A. Install signs in compliance with approved Shop Drawings.

B. Sign Mounting:

1. Surface mounted: Use minimum 4 recessed flush head tamper-proof screws per sign in addition to adhesive as recommended by manufacturer for given surface finish. Provide appropriate anchors in substrate as needed (such as expansion shields at masonry, etc.).

    a. Center on door laterally at 60 inches above finish floor.

    b. Install signs on wall adjacent to the latch side of the door. Where there is no wall space to the latch side, including double doors, locate at nearest adjacent wall.

    c. Locate such that a person may approach within 3 feet of signage without encountering protruding objects or standing within door swing path.

C. Locations of all signs must be per approved Shop Drawings.

D. Other Signs: Install at location as directed by the Architect. Mounting method to be permanent, vandal resistant, approved by Architect.

3.03 PROTECTION

A. Protect work and materials of this Section and other Sections prior to and during installation, and protect the installed work and materials of all other trades.

B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

3.04 ADJUSTING AND CLEANING

A. Remove all dust, dirt, fingermarks, etc. from signs and letters, as recommended by manufacturer.

END OF SECTION

FIRE EXTINGUISHERS

Section 10 44 16
23-34-026

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00, Rough Carpentry.

B. Section 09 29 00, Gypsum Wallboard.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. All devices shall be approved by Underwriters' Laboratories, Inc., bear UL Label and be approved by the State Fire Marshal.

1.04 SUBMITTALS

A. Refer to Section 01 30 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Shop Drawings: Submit showing all parts, connections and anchorages, adjacent materials, fully dimensioned and noted.

D. Submittals shall include the statement that all extinguishers and cabinets comply with the current applicable UL and NFPA classifications and ratings. Include in-wall blocking requirements.

E. Provide written instructions to Owner's personnel in the operation, maintenance and charging of the fire extinguishers furnished.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. Conform to all applicable standards of the National Fire Protection Association (NFPA) and

California State Fire Marshal (CSFM) for fire extinguisher cabinets and location.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

PART 2 - PRODUCTS

2.01 EXTINGUISHERS

A. UL Rated 2A-10BC multipurpose chemical extinguishers shall be 5 lb. nominal capacity multi-purpose dry chemical type, bearing U.L. Label; finish shall be red enameled steel: Cosmic Extinguishers by JL Industries.

B. UL Rated Class K 2-A:K wet chemical extinguishers shall be 2-1/2 gallon nominal capacity for commercial kitchen applications, bearing U.L. Label; finish shall be red enameled steel: Saturn Extinguishers by JL Industries.

C. Tamperseals on each extinguisher shall be of the breakable metal type, indicating accidental or unauthorized partial discharge.

D. Pressure gauges on each extinguisher shall be of the dial type.

E. Mounting brackets:

1. Brackets shall be as furnished by the manufacturer of the extinguisher for the equipment specified. Brackets shall be of quick release design, not subject to release by bumping.

2. Bracket attachments shall be furnished with each bracket, suitable for the surface to which attachment is to be made.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. In the event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 PROTECTION

A. Protect work and materials of this Section and other Sections prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

3.03 INSTALLATION

A. Where exact location of cabinets is not indicated, locate as directed by Architect.

B. Install cabinets in accord with manufacturer's instruction and approved shop drawings.

C. Install so that handle of extinguisher is at 48 inches above finished floor line.

D. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions. Provide blocking, backing and other materials necessary for proper attachment and fire rating.

E. Anchor cabinets and brackets securely in place.

3.04 INSTALLATION OF FIRE EXTINGUISHERS

A. Determine approximate completion date of work and then inspect, charge, and tag fire extinguishers not more than 10 days before nor less than one day before actual completion of work.

B. The installation of the specified fire extinguishers in no way relieves the Contractor from providing adequate fire protection during the course of this work.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This section includes furnishing all labor and material required to provide and deliver all Food Service Equipment herein specified into the building, uncrate, assemble, set-in-place, level and completely install, exclusive of final utility connections.

B. Furnish all material and labor required to completely provide, deliver and install all Food Service Equipment as specified herein and as shown on the drawings. This work shall be in strict accordance with the plans and specifications with all dimensions verified in the field prior to any fabrication.

1. Coordinate the Food Service Equipment work with the respective trades performing preparatory work for the installation of the Food Service Equipment.

2. Comply with all Federal, State and Municipal regulations which bear on the execution of this project. Food Service aisles shall be a minimum of 36” wide and tray slides shall be mounted at 34” maximum above the finished floor.

C. WORK INCLUDES:

1. Materials shown on the Food Service Equipment Schedule.

2. Piping, valves, and plumbing accessories that are integral within the equipment.

3. Furnishing control devices such as solenoid valves that are not integral with the equipment, for installation by Mechanical Division 15 and/or Electrical Division 16.

4. Wiring, wiring devices, controls and mechanical accessories that are integral in the equipment.

5. Ventilating ducts, flues, controls and mechanical accessories that are integral in the equipment.

6. Anchors, fasteners, fillers and sealants for mounting equipment securely in place.

7. Cooperation with all other contractors on the job including the furnishing of information in the form of drawings, wiring diagrams and other data.

8. Touch-up painting after the installation of the Food Service Equipment.

D. RELATED SECTIONS INCLUDE THE FOLLOWING:

1. Mechanical

2. Electrical

1.03 QUALITY ASSURANCE

A. QUALIFICATIONS:

1. Installer: Regularly engaged in providing Food Service Equipment from manufacturers of this type of equipment a minimum of five (5) years with at least five (5) installations of this size and type that are at least each three (3) years old.

B. STANDARD OF MANUFACTURE

1. Food Service Equipment that is specified as "custom" having no manufacture name or model number shall be manufactured by a Food Service Equipment Fabricator with at least five (5) years of experience with engineering, design and fabrication of Food Service Equipment. The manufacture shall be subject to the review of the Architect and/or Consultant and shall be approved by the National Sanitation Foundation. All fabricated equipment shall be constructed in strict compliance with the latest standards of the National Sanitation Foundation and shall bear the mark of the National Sanitation Foundation in full compliance with all applicable codes and ordinances.

2. All electrically heated or operated equipment shall bear the seal of approval of the Under Writers Laboratories and shall comply with the National Electrical Code and all local Codes and Ordinances.

3. All Food Service Equipment that is specified as "buy-out" having a specific manufacture name and model number shall comply with the latest editions of the National Sanitation Foundation.

4. All gas-heated or operated equipment shall bear the seal of approval of the American Gas Association (AGA).

5. All steam heated, or operated equipment shall conform to the standard of the American Society of Mechanical Engineers (ASME) and shall be ASME approved.

6. Food shields and sneeze guards shall meet all the requirements of National Sanitation Foundation (NSF) Standard 2.

1.04 SUBMITTALS

A. SHOP DRAWINGS / EQUIPMENT BROCHURES

1. No ordering or fabrication of equipment shall take place until such time as the Equipment Brochures and Shop Drawings have been reviewed in writing by the Architect and/or Consultant. Receipt of this review shall not relieve the Contractor from the responsibility of verifying all quantities and related dimensions, maintaining the specified quality of equipment, and verifying conditions of the job site.

2. Equipment Brochures; within twenty (20) calendar days after award of the contract, submittals in the form of PDF containing Manufacturers specification sheets, dimensioned drawings and/or other pertinent data describing all items of standard manufacture shall be submitted for review by the Architect and/or Consultant. Sheets with the notation "Fabricated Item" and name of the fabricated item, as well as any required mechanical, plumbing or electrical requirements shall be inserted between the Manufacturer's specification sheets describing the "buy-out" equipment; thus, giving a complete Brochure with all times accounted for. These Brochures shall have hard white covers with clear transparent overlays and locking rings. The name of the Contractor, Architect, Consultant and project clearly identified in large readable type. Failure to provide Brochures in the manner as described above will be cause for rejection of said brochures.

3. Rough-in and Equipment Location Drawings; within thirty (30) calendar days after award of the contract, submittals in the form of PDF, complete rough-in and details, electrical and plumbing services with both vertical and horizontal dimensions, from column center-lines or exterior walls for location said connection points and rough-in locations shall be submitted for review by the Architect and/or Consultant. Equipment location plans shall be drawn to scale of not less than 1/4" = 1'-0" and include a schedule of equipment clearly identifying all items. Minimum drawings size shall be 24"x 36".

4. Shop Drawings; within thirty (30) calendar days after award of the contract, submittals in the form of PDF of shop fabrication drawings shall be submitted for review by the Architect and/or Consultant. Plans shall be drawn to scale of not less than 1/2"=1'-0". Additional plan views, elevations and sections at 3/4"=1'-0" shall be supplied of all counters and tables with complete dimensions. All shop practices regarding joints, gussets, bracing, tie-downs, supports, etc. shall be clearly defined as well as gauges and quality of metals and brands and model numbers of all miscellaneous fittings, plumbing and electrical trim. The drawings shall also show locations of blocking (supplied under another sections) for all wall and ceiling mounted Food Service Equipment. Minimum drawings size shall be 24"x36".

B. SAMPLES

1. Provide all samples if specification requested.

C. SUBSTITUTIONS:

1. Manufacturer's listed in this section are used as standards for quality. All substitutions shall be approved by the Architect and/or Consultant prior to installation.

2. Refer to Division 1 - General Requirements for procedures governing substitutions.

3. Only one substitution for each item will be considered.

4. Installation of any qualified substituted equipment is the Food Service Equipment Contractor's responsibility. Including any mechanical, electrical, structural changes required for the installation of qualified substitution shall be without additional cost to the Owner.

D. DEFERRED APPROVAL ITEMS:

1. For the items identified on the Equipment List as (Deferred Approval Item), the following submittal requirements shall be provided:

   a. Product data.

   b. Manufacturer's recommended methods of installation coordinated with actual field conditions for anchorage to actual substrate conditions.

   c. Shop Drawings: Indicate types, sections, gages, materials, completely dimensioned layouts and configurations, hardware, fasteners, operators and shop finishes and other required coatings. Provide calculations for all required connections.

   d. Structural calculations, detail drawings, and all additional necessary drawings and specifications for a deferred approval shall be signed by a Structural Engineer licensed in the State of California.

   e. Provide a copy of the Installer’s Certification and a copy of the Manufacturer’s written certification criteria. Provide list of a minimum of (5) five jobs installed by Installation Company with contact phone numbers of both the project's General Contractor and Owner.

1.05 DISCREPANCIES

A. In the event of discrepancies within the Contract Documents, the Architect and/or Consultant shall be so notified within sufficient time prior to bid opening, ten (10) days to allow issuance of an addendum.

B. In the event where time does not permit notification or clarification of discrepancies prior to the bid opening, the following shall apply: The drawings and drawing schedules shall govern in matters of quantity; the specifications in matter of quality. In the event of conflict within drawings involving quantities, or within the specifications involving quality,

the greater quantity and high quality shall apply. Such discrepancies shall be noted and clarified in the contractors bid. No additional allowances will be made because of errors, ambiguities or omissions that should have been discovered during the preparation of the bid.

1.06 RESPONSIBILITY

A. The work as specified in this division shall include; assuring that all required submittals conform to the intent and meaning of the documents, conditions at the Job Site, and all Local Codes and ordinances.

B. Visit the Job Site to field check actual wall dimensions and utility rough-ins. Be responsible for furnishing, fabricating, and installing the equipment in accordance with the available space and utility services as they exist on the Job Site.

C. Check all door openings, passageways, elevators, etc., to verify that the equipment can be transported to its proper location within the building. If necessary, check the possibility with the General Contractor of holding wall erection, placement of doorjambs, window, etc. for the purpose of moving equipment to its proper location.

D. Notify the Architect and/or Consultant of any discrepancies between the plans and specification prior to fabrication of any equipment, to actual condition on the job.

E. If any special hoisting equipment and operators are required, include cost as part of the bid for this work.

1.07 DELIVERY AND STORAGE

A. All equipment specified herein shall be delivered to the Job Site; received and handled by the Contractor or his authorized agent. The Owner shall in no way be expected to store or handle any such equipment.

B. All equipment shall be delivered in such a manner as to protect it against dirt, water, chemical or mechanical injury.

C. Throughout the progress of the work, the Contractor shall keep the working area free of debris of all types resulting from his work.

D. All packing material shall be removed from the project location by the Contractor.

1.08 COORDINATION

A. Coordinate work with mechanical, electrical, plumbing, interiors and other trades whose work is in conjunction with equipment specified herein.

1.09 MEASUREMENTS

A. Verify all dimensions shown on the drawings by taking field measurements at the Job Site prior to fabrication of equipment or ordering equipment. Proper fit and attachment of all parts is required and is the sole responsibility of the Food Service Contractor. If necessary, all equipment shall be fabricated so that it may be handled through finished door openings.

1.10 PRODUCT REQUIREMENTS

A. Refer to Section 01 60 00.

1.11 GUARANTEE / WARRANTY

A. All work shall be guaranteed by the Foodservice Equipment Contractor against all defects for a term of one (1) year from the date of notice of completion. This guarantee shall cover replacement of defective material at the Foodservice Equipment Contractor expense, including transportation and labor. This guarantee will not cover any cost for replacement of parts or work made necessary by carelessness or misuse of the equipment by others.

B. The Food Service Equipment Contractor shall provide at his own expense the installation, start-up and service for one (1) year from the date of recording the notice of completion of the project; the replacement of all Condensing Units and other Refrigeration Devices supplied under this contract. In addition to this one (1) year free service, the Condensing Units shall have a five (5) year Compressor Warranty; said Warranty commencing at the date of completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal for construction purposes, where entirely concealed, shall be steel of wrought iron sections galvanized by the hot-drip process after fabrication. Bolts, screws, rivets, and similar attachments to this galvanized work shall be galvanized or brass. Exposed screw and rivet work shall be finished to match adjacent surfaces, flush and buffed smooth. Finished work shall be free of tool or construction marks, dents, or other imperfections; and at the completion of the work, all metal shall be gone over with a portable machine and buffed and dressed to perfect surfaces.

B. All materials shall be new and of first grade. All gauges specified herein shall be minimum and shall be established after polishing. They shall refer to:

1. U.S. Standard Gauge for sheets and plates.

2. Stainless steel shall be manufactured by one of the following: Allegheny Ludlum Steel Corporation, American Rolling Mills, U.S. Steel Corporation.

C. The Contractor will be required to furnish a certified copy of the Mill Analysis of materials to the Architect and/or Consultant.

D. Stainless steel sheets shall conform to ASTM A240, Type 304 Condition A, 18-8 having a No. 4 finish. No.2B finish shall be acceptable on surfaces of equipment not exposed to view. All sheets shall be uniform throughout in color, finish and appearance.

E. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.

F. Galvanized steel shall be approved grade of copper-bearing steel sheets with a minimum copper content of 20%. All sheets to be commercial quality, stretcher leveled, bonderized and re-rolled to ensure a smooth surface. Galvanized steel shall not be allowed in the construction and fabrication of any “Fabricated Assembly” items.

G. All millwork materials shall be free from defect impairing strength, durability, or appearance; straight and free from warpage; and the best grade for their particular function. All wood shall be well seasoned and kiln-dried and shall have an average moisture content of 8%, a maximum of 10%, and a minimum of 5%.

H. Plywood and other woodwork of treatable species, where required by code, shall be fire-retardant-treated to result in a flame spread rating of 25 or less with no evidence of significant progressive combustion when tested for 30 minutes duration under ASTM E-84 and shall bear the testing laboratory mark on the surface to be concealed.

I. Concealed softwood or hardwood lumber shall be of Poplar, Douglas Fir, Basswood, Red Oak, Birch, Maple, Beech or other stable wood and shall be select or better grade, unselected for color and grain, surfaced four sides, square-edged, and straight. Basswood may be used where fire-retardant-treated materials are required.

J. Face veneers shall be matched for color and grain to produce balance and continuity of character. Mineral streaks and other discolorations, wormholes, ruptured grain, loose texture, doze or shake will not be permitted. Face veneer leaves on each surface shall be full-length, book matched, center matched, and sequence matched. Surfaces shall be sequenced, and Blueprint matched. Veneers not otherwise indicated shall be plain sliced. Backing veneers for concealed surfaces shall be of a species and thickness to balance the pull of the face veneers.

K. Hardwood plywood for painted surfaces shall conform to U.S. Product Standard PS -51-71, Type I, and shall have sound Birch, Maple or other approved close grain hardwood faces suitable for paint finish.

L. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets in the color, pattern and style as selected by the Architect. Horizontal surfaces shall be laminated with sheets conforming to Federal Specifications L-P-508F, Style D, Type I (general purpose), Grade HP, Class I, 1/16" thick, satin finish with rough sanded backs.

Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II (vertical surface), Grade HP, Class I, conforming, satin finish, 1/32" thick or heavier. Balance sheets for backs in concealed locations shall be .020" thick laminate backing sheets conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.

M. Adhesive for application of plastic laminate to wood surfaces of counter tops shall be Phonetic, Resorcinol or Melamine adhesive conforming to Federal Specification MMM-A-181C and producing a waterproof bond. Adhesive for applying plastic laminate to vertical surfaces shall be either a waterproof type or a water-resistant type such as a Modified Urea Formaldehyde Resin liquid glue conforming to Federal Specification MMM-A-188C. Contact adhesive will not be acceptable.

N. Plate glass shall be 1/2" thick safety glass with polished edges.

O. Sealant shall be equal to that manufactured by General Electric. Silicone construction 1200 sealant; in either clear or approved color to match surrounding surfaces.

P. Sound deadening material shall be equal to that manufactured by H.W. Mortell Co., Kankakee, Illinois, and shall be sprayed by use of a mechanical device to a thickness of not less than 1/8" thick.

2.02 FINISHES

A. Paint and coatings shall be of an NSF approved type suitable for use in conjunction with Food Service Equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking and mildew resistant, shall comply with all governing regulations and shall be applied in accordance with the recommendations of the manufacturer.

B. All exterior, galvanized parts, exposed members of framework where specified to be painted shall be cleaned, properly primed with rust inhibiting primer, degreased, and finished with two (2) coats of epoxy-based grey Hammertone paint, unless otherwise specified.

C. Stainless steel, where exposed, shall be polished to a #4 commercial finish. Where unexposed, finish shall be #2B.The grain of polishing shall run in the same direction wherever possible. Where surfaces are disturbed by the fabricating process, such surfaces shall be refinished to match adjacent undisturbed surfaces.

2.03 SHOP FABRICATED EQUIPMENT CONSTRUCTION

A. Leg stands for open base tables or dish tables shall be constructed of 1-5/8" dia. 16-gauge stainless steel tubing, with stringer and cross braces of the same material. Joints between legs and cross braces shall be welded and ground smooth. Flattened ends on tube stretchers are not permitted. Mechanical fittings are also not permitted.

1. Stainless Steel Leg Sockets: Component Hardware Group, Inc. model A18-0206, or accepted equal; weld to underside of countertop framing or at bottom of enclosed cabinet unit and fastened with flush set screw locking device.

2. Sanitary Type Stainless Adjustable Foot: Component Hardware Group, Inc. model A10-0851, or accepted equal

B. Tabletops shall be 14-gauge stainless steel unless otherwise noted, with all shop seams and corners welded, ground smooth and polished. Tops of closed base fixtures shall be reinforced on the underside with a framework of 1-1/2" angles or 16-gauge stainless steel hat section; and on open pipe frames with a 4" channel at each pair of legs. The leg sockets shall be welded to this channel. The channel in turn stud welded to the top. Tops shall be reinforced so that there will be any noticeable deflection. Unless otherwise shown on the detail drawings, metal tops shall be turned down 2", and back at 15-degree angle, with 1-1/8" turn-under, except where adjacent to walls or other pieces of equipment. The wall side shall be turned up 10" and back 2" at a 45-degree angle. Ends of this splash are to be closed. Free corner of tops shall be spherical. All tops shall have 1/8" of sound-deadening material applied to the underside by use of spray equipment in an oven, smooth application for ease in cleaning.

C. Enclosed bases or cabinet bodies shall be of the material and gauge hereinafter specified. They shall be enclosed on the ends and sides as required. The bases shall be reinforced at the top with a framework of 1-1/2" x 1-1/2" x 1/8" stainless steel angles fully welded to the base with the stainless-steel angles 36” on center (maximum), with all corners of said framework mitered and fully welded. All vertical joints of the bases shall be fully welded, ground and polished. All free corners of enclosed bases or cabinet bodies and all corners against walls and other fixtures shall be square. In the case of fixtures fitting against or between walls, the bodies shall be set in 1" from the wall line, but the tops shall be extended back to the wall line to permit adjustment to wall irregularities. A flush fitting vertical trim strip (extension of the vertical end mullion without vertical seam of the same material as the body shall be provided at each end of the body and shall extend 1" to the wall line). These fixtures shall be constructed to set on bases or legs as hereinafter specified and shall be set in mastic in a vermin-proof manner.

D. Shelves, mullions and aprons shall be fabricated flush with the cabinet body, welded, ground, and polished. Butt joints are not acceptable.

E. Drawers, to be furnished with stainless steel flush pull, Component Hardware Group Inc., model number P63-1012 or equal installed into the 18-gauge double-pan drawer front panel.

1. Stainless steel locks, Component Hardware Group, Inc., model number P30-4781 or equal for each drawer. All drawers are to be keyed alike.

2. Stainless Steel full extension slides, Component Hardware Group, Inc., model no S52-0024 or equal. Provide two (2) per drawer. Slides to be installed so drawer will roll closed when released.

3. Stainless steel removable drawer pan, Component Hardware Group, Inc., model number, S81-1520 or equal one (1) per drawer set loosely in a channel frame so it can be easily lifted out for cleaning. This supporting frame shall be welded stainless steel channel.

4. Drawer face panel to be constructed of 18-gauge stainless steel double pan construction. (Single metal thickness drawer faces are not be expectable.)

F. Hinged doors in base cabinets shall be of double pan construction, insulated and constructed of 18-gauge stainless steel. Doors shall have wire type pull Component Hardware Group Inc., model number P46-1010 or equal installed as shown in elevations. Door pulls to be NSF and ADA compliant.

G. Interior shelves shall be solid, non-removable 16-gauge stainless steel, with ends and backs provided with a 1-1/2" high turn-up against the body of the fixture and welded to the same. Front edge is to be turned down 1-1/2" and under 1/2", at the bottom shelf, beyond the edge of the base to prevent sagging and vermin collection.

H. Under shelves on open tables shall be constructed of 16-gauge stainless steel, flanged down 90 degrees ½". The corners shall be welded to the legs. Under shelves shall be 10" from the floor. Backs shall be turned up 2".

I. Elevated shelves shall be constructed of 16-gauge stainless steel with edges turned down in a square edge, and back 1/8"; except where shelves are adjacent to walls or other fixtures, where they shall be turned up 2". Corners shall be spherical, mounted on 14-gauge stainless steel support brackets.

J. Sinks and drain boards shall be constructed of 14-gauge stainless steel. The working edge of the sink shall be provided with 5/8" radius sanitary rolled edge in one piece with rounded corners. The drain boards shall be made as an integral part of the sink; all vertical and horizontal corners shall be rounded with 5/8" radius; and the working front edges shall be maintained at one level, taking up the pitch of the drain boards by dropping the sink to allow for same. Depth of sink bowl shall be determined from the top bowl. Sinks shall be provided with back and end splashes with top edge flanged back 2-1/4" at 45-degree angle and attached to the building wall with "zee" clips. Splash back of sinks and drain boards shall be grained in the same direction. Suitable openings shall be cut for hot and cold-water supplies and waste outlets. All surface plumbing trim as called for on the drawings and herein specified shall be provided. Bottom of each sink bowl with center drain connection shall be fitted with a 2" lever type action waste valve mounted into the sink and made absolutely watertight. Sink bowls and drain boards shall have 1/8" of sound-deadening material underneath, spray-applied.

K. Rivets, bolts and screws shall not be permitted in any exposed location.

L. All welding shall be of the heliarc method with welding rod of the same composition as the parts welded. Welds shall be complete, strong, and ductile with excess metal ground

off and joints finished smooth to match adjoining surfaces. Welds shall be free of mechanical imperfections and shall be continuously welded so that the fixture shall appear as one-piece construction. Butt welds made by spot solder and finished by grinding are not acceptable.

M. All exposed joints shall be ground flush with adjoining material and finished to harmonize therein. Whenever material has been sunk or depressed by welding operation, such depressions shall be suitably hammered and peened flush with the adjoining surface and, if necessary, again ground to eliminate low spots. In all cases, the grain of rough grinding shall be removed by successive fine polishing operations.

N. All exposed welded joints in stainless steel construction shall be suitably coated with an approved metallic-based paint.

O. After galvanized steel members have been welded, all welds and areas where galvanizing has been damaged shall have a zinc dust coating applied.

P. Seams shall be continuous welds flush and ground smooth.

1. Field Joints: Flush welded, ground smooth and polished on the job, solder or rivets not allowed.

2. Counter Tops: Field joints in stainless steel counter tops and drain boards butt welded with welds ground flush and smooth and polished to match original finish.

3. Pass windows: Provide a complete all welded seamless counter from inside area to the outside ledge at each pass window location. Mechanical joints, butt joints or lap joints will not be accepted.

2.04 ELECTRICAL REQUIREMENTS

A. Standard UL listed materials, devices and components shall be selected and installed in accordance with NEMA Standards and Recommendations and as required for safe and efficient use and operation of the Food Service Equipment without objectionable noise, vibration, and sanitation problems.

B. Motors up to and including ½ HP are to be wired for 120-volt, single phase. Fixtures totaling more than 1000 watts are to be wired for 208-volt, single-phase. Fixtures having multiple number of heating elements, can be wired for three-phase with the load balanced as equally as possible within the fixture.

C. Heating elements having a connected load of up to and including 1000 watts are to be wired for 120-volt, single-phase. Fixtures totaling more than 1000 watts are to be wired for 208-volt, single-phase. Fixtures having multiple number of heating elements can be wired for three-phase with the load balanced as equally as possible within the fixture.

D. Equipment where applicable shall be furnished with three-wire cord and plug.

2.05 PLUMBING TRIM, SINKS

A. All vegetable and pot washing sinks, or other 14" deep sinks shall have Fisher Mfg. Co. Model 22209 series (2" drain size) quick opening drain. Fisher Mfg. Co. Model 60100 splash mounted faucet shall be mounted over each partition as shown on the drawings.

B. All cook sinks, pantry sinks or other 10" or 12" deep sinks shall have Fisher Mfg. Co. Model 22209 series (2" drain size or as shown on the drawings) quick opening drain. Fisher Mfg. Co. Model 57649 faucets mounted as shown on the drawings.

C. All Fisher Mfg., Co. faucets to be furnished as stainless steel to comply with AD1953 Standards and conform to NSF 61 Standard 9.

D. Provide gas pressure regulators for installation by the Plumbing Contractor.

E. FIRE SUPPRESSION GAS SHUT/OFF VALVE: Gas valve to be furnished by the Foodservice Equipment Contractor and furnished to the Plumbing Contractor for installation. Foodservice Equipment Contractor is to verify with Plumbing Division for gas line size. Valve to be located in an accessible location and if necessary, with access panel.

2.06 HARDWARE

A. Elevated shelf brackets shall be as shown on the Drawings.

B. Drawer and door handles shall be as shown on the Drawings.

C. Hinges for all metal doors shall be Klein Hardware Co. 7870 series, finished in satin chrome.

2.07 REFRIGERATION

A. Each refrigeration items specification is written to provide minimum specifications and scope of work. Refrigeration equipment shall be designed and installed to maintain the following general temperature unless otherwise specified.

a.	Walk-In Refrigerators	1.7°C / 35°F
b.	Walk-In Freezers	-23.2°C / -10°F
c.	Reach-In Refrigerators	1.7°C / 35°F
d.	Reach-In Freezers	-23.2°C / -10°F
e.	Undercounter Refrigerators	1.7°C / 35°F
f.	Undercounter Freezers	-23.2°C / -10°F
g.	Cold Pan	5°C / 41°F

PART 3 - INSTALLATION

3.01 POSITIONING OF EQUIPMENT

A. Installation procedure, details and scheduling shall be so arranged that the work of other contractors may progress without unnecessary delay, interference or damage.

B. The Contractor shall do all fitting, joining, fastening, scribing, caulking and adjusting necessary to install any fixed item of equipment in its designated location; and shall locate and/or store portable, non-fixed items as directed by the Architect and/or Consultant with due regard for the security and protection from damage of the items involved.

3.02 WORKMANSHIP

A. Commencement of work shall constitute agreement with and acceptance of all conditions as found.

B. Equipment shall be installed as shown on the plans. Where abutting, curved or irregularly shaped angles or projecting corners of walls occur, equipment shall be made to conform. Where several pieces of equipment are to be assembled in a group, the group shall be complete as whole, with all necessary filler or connecting pieces as may be required to make a complete, sanitary and vermin-proof group.

C. Welded parts shall be non-porous and free of imperfections. Welds on galvanized metal shall be ground smooth, sandblasted and sprayed with molten zinc or 1200 degrees F to a thickness of .004". Tinning of welds will not be acceptable. Welds of stainless steel shall be ground and polished to the original finish and all grained in the same direction.

D. All fixtures, unless made of stainless steel, shall be finished in sprayed lacquer in color as chosen by the architect; or if specifically stated, in “plastic laminate”; in pattern and/or color as selected by the Architect.

3.03 POST INSTALLATION PROCEDURES

A. Prior to being offered for final acceptance, all equipment shall be thoroughly cleaned. This shall include removal of all stains, paint spots, protective wrapping and coatings, tapes, grease, oil, plaster, dust, polishing compounds, etc. and cleaning of floors in food service areas (broom clean) and signed off by the General Contractor with a copy to the Architect and/or Consultant.

B. After installation at least ten (10) days prior to offering for acceptance, all equipment shall undergo a "Start-up" procedure by a Factory Authorized Service Dealer. Equipment is to be inspected, tested, calibrated and adjusted for normal operation conditions. If inspection or testing indicated defects, such defects shall be corrected, and the inspection and test repeated to insure a perfect operation of all equipment, prior to final acceptance and for a period ninety (90) days after final acceptance.

C. Upon completion of the project, the Contractor shall furnish the Owner two (2) sets of Dimensional Prints, Data Sheets, Spare Parts Lists and Operating Manuals for each piece of mechanical equipment; each set shall be neatly bound in a loose-leaf binder, each set shall be complete with and Index of Equipment and with a complete List of Service Contracts with said agencies to perform these services. In addition to this list: The Contractor shall submit for review of the Architect and/or Contractor and submittal to the Owner for his files, copies of Service Contracts with said agencies to perform these services. It shall be the responsibility of this Contractor to fill out and forward all warranty forms as required.

D. This contractor shall arrange demonstrations of the operation and maintenance of all "Buy-Out" equipment by competent instructors. These demonstrations to take place within ten (10) days prior to the acceptance of the kitchen. All instruction periods shall be scheduled with the Architect and/or Consultant fourteen (14) days prior to commencement of same, and at times convenient to the Architect and/or consultant and Owner.

PART 4 - ITEMIZED EQUIPMENT SCHEDULE

4.01 FOOD SERVICE EQUIPMENT LIST AND DESCRIPTION

A. Fabricated Equipment: Wherever the term "Fabricated Assembly" is used within the list noted below and description of Food Service Equipment, it shall be presumed to be followed by the phrase, "constructed to the configuration, dimension, detail and design as shown on the drawings and specifications and with workmanship and materials as specified above" and shall meet the Fabrication Detail Requirements of the latest edition of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA), and National Sanitation Foundation
(NSF Standard 2).

B. All Food Service Equipment shall be installed per the "Guidelines for Seismic Restraints of Kitchen Equipment" by the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

C. All Food Service Equipment shall comply with the standards of The California Code of Regulations, Title 24, Part No. 2.

D. All Food Service Equipment shall comply with the current California Energy Commission Appliance Efficiency Regulations.

E. Equipment in the following schedule is listed by Item Numbers shown on Drawings.

F. Equipment listed is schedule as (OFCI) means Owner Furnished Contractor Installed.

G. Equipment listed in schedule as (CFCI) means Contractor Furnished Contractor Installed.

1. SCHEDULED ITEMS

ITEM #1 BUN / SHEET PAN RACK
Quantity: Five (5)
Manufacturer: New Age (or equal)
Model: 1331
Status: CFCI
Bun Pan Rack, mobile, full height, end loading, open sides, accommodates (20) 18" x 26" pans, slides on 3" centers, all welded aluminum construction, (4) 5" platform casters, NSF, Made in USA, (standard factory lead time)

Accessories:
5 ea. Lifetime warranty against rust & corrosion, 5 year workmanship and material defects warranty, standard
5 ea. 5" platform type casters, std.

ITEM #2 WORK TABLE, STAINLESS STEEL TOP
Quantity: Six (6)
Manufacturer: Eagle Group (or equal)
Model: T3648SE
Status: CFCI
Spec-Master® Series Worktable, 48"W x 36"D, 14/300 series stainless steel top, rolled edge on front & back, adjustable 18/300 series stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs & adjustable bullet feet, NSF

Accessories:
6 ea. Model E36 All welded construction, legs, undershelf & top

ITEM #2.1 THREE STACK UTENSIL DRAWER UNIT
Quantity: Two (2)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following: To be fabricated of 16-gauge stainless steel complete with the following hardware items.

A. Provide stainless steel flush pull, Component Hardware Group, Inc., model no. P63-1012, installed into the 18-gauge double-pan drawer front panel.
B. Provide stainless steel locks, Component Hardware Group, Inc., model no P30-4781 for each drawer. All drawers are to be keyed alike.
C. Provide stainless steel full extension slides, Component Hardware Group, Inc., model No. S52-0024. Provide two (2) per drawer. Slides to be installed so drawer will roll closed when released.
D. Provide stainless steel removable drawer pan. Provide Component Hardware Group, Inc., model No. S81-1520 one (1) per drawer. Pan should be easily lifted out of drawer frame for cleaning.

E. Drawer face panel to be constructed of 16-gauge stainless steel double pan construction. Single metal drawer faces are not acceptable.

ITEM #3 WALL MOUNTED CABINET W/ DOORS

Quantity: Six (6)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following: To be fabricated of 16-gauge stainless steel body and shelves. Furnish with hinged doors and as shown on the drawings.

A. Provide stainless steel pulls, Component Hardware Group, model no. P46-1010 and stainless-steel locks, Component Hardware Group no. P30 series, and a “stay-bolt” to complete the locking of both doors as shown. All doors to be keyed alike.
B. Provide a 16-gauge stainless steel flush bottom panel at this unit as shown.
C. Provide 18-gauge stainless steel double pan hinged doors complete with Component Hardware Group, stainless steel lift off hinges 3" long.
D. Approximate size: 1’-3” deep x length as shown.

ITEM #4 EXHAUST HOOD AND CLOSURE SKIRTING AND INSULATED WALL LINING

Quantity: Three (3)
Manufacturer: STRIEVOR (or equal)
Model: WCBD 135 57 24
Status: CFCI
CKV Hood UL Listed 710 Hood Exhaust: 2363 CFM @ 0.63 (WC)SP
CKV Lights UL Listed 1571
Commercial Kitchen Ventilation Specification
External Front MUA: 1890 CFM @ 0.40 (WC)SP
See plans for location and placement of item with reference to adjoining equipment. Furnish and install per Manufacturer's standard specifications and the following:

* Install in the location as shown on drawings. It is the responsibility of the Installer to verify all clearances and stand offs from the hood to limited combustibles and/or combustible materials. Hood must be installed in accordance with the Manufacturer's specifications. Canopy Hoods to be installed a minimum of 78 inches above the finished floor and level. ADA requires 80 inches minimum above the finished floor.
* The Hood assembly to be size and shape per the drawings. Hood to be U.L. listed #710, NSF listed and built in compliance with the prevailing NFPA Standard #96. The hood ends shall be fabricated from 16-gauge stainless steel or heavier and have a Performedge shape at the lower most part of the end. The remainder of the hood will be fabricated of material not less than 18 gauge. All exposed surfaces to be fabricated from Type 304 stainless steel with a #4 finish. All exposed welds to be ground smooth and polished to a #4 finish. Exhaust airflow volume and static pressure at the duct collar(s) shall not exceed those shown on the drawings.

* Stainless steel matching enclosure panels from the top of the Hood to the finished ceiling to be furnished by KEC. (Verify ceiling height with plan.)

* All electrical connections, materials and labor to connect high and low voltage electrical to the hood lights, temperature monitors, electrical components and/or the Fire Suppression System including micro-switch(es) by other. See fire suppression system for additional detail.

* Hood Manufacturer to provide engineering and shop drawings for approval prior to fabrication.

* Exhaust and Supply Fans to be furnished by Mechanical Division in compliance with local and National Codes. See Hood Manufacturer's specification sheets for CFM and static pressure requirements.
* Duct connections by Mechanical. An air balance test should be performed before cooking start up to insure correct exhaust and supply airflow rates.
* Hood must be manufactured UL 710 Listed, NFPA 96 compliant and installed in accordance with all prevailing codes and standards.

3" Stand Off

Back The hood assembly to be per the size and shape shown on the drawing. A 3" stand off (enclosed on all sides) to be included on the entire back outer perimeter of the hood. Stand off to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. All exposed corners with welded and polished to a #4 finish.
Extractor

FLSS Hood to be fitted with stainless steel baffle filters. Filters to be UL1046 Listed, NSF approved. The filters will be easily removable for cleaning.
Exposed Canopy Material

304 Stainless Steel Type 304 Stainless Steel (SS) is in the "Austenitic group of SS" comprising approximately 18% chromium and 8% nickel. Type 304's resistance to corrosive acids makes it ideal for hoods, sinks and tabletops. Type 304 SS is comprised of no more than 0.8% carbon and at least 50% iron. The chromium binds oxygen to the surface of the product to protect the iron from oxidation (rust). Nickel also enhances the corrosion resistance of stainless steel. Therefore, the higher the nickel content, the more resistant the stainless steel is to corrosion. Type 304 SS is non-magnetic.
Non-Exposed Exhaust Plenum Material

304 Stainless Steel Type 304 Stainless Steel (SS) is in the "Austenitic group of comprising approximately 18% chromium and 8% nickel. Type 304's resistance to corrosive acids makes it ideal for hoods, sinks and tabletops. Type 304 SS is comprised of no more than
0.8% carbon and at least 50% iron. The chromium binds oxygen to the surface of the product to protect the iron from oxidation (rust). Nickel also enhances the corrosion resistance of stainless steel. Therefore, the higher the nickel content, the more resistant the stainless steel is to corrosion. Type 304 SS is non-magnetic.
Containment Panels

Light Duty Left
Hood to be fitted with Light Duty containment panel on the left of the hood (size and shape per the drawings). Containment panel to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. Containment Panel to include a continuous double hemmed edge on the front and bottom exposed edges. Containment Panel to be easily attached or detached to the side of the hood by means of stainless-steel fasteners that screw into recessed noncorrosive rib-nuts installed in the side of the hood.
that do not protrude through the side of the hood. All welds to be ground smooth and polished to a #4 finish.

Light Duty Right
Hood to be fitted with Light Duty containment panel on the right of the hood (size and shape per the drawings). Containment panel to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. Containment Panel to include a continuous double hemmed edge on the front and bottom exposed edges. Containment Panel to be easily attached or detached to the side of the hood by means of stainless-steel fasteners that screw into recessed non corrosive rib-nuts installed in the side of the hood
that do not protrude through the side of the hood. All welds to be ground smooth and polished to a #4 finish.

Make Up Air

SPD

Hood to have a full length add on supply plenum fabricated of 18-gauge stainless steel (material type and finish to be the same as the hood) that facilitates the delivery of downward supply air through a full length perforated metal. (See drawings for location and size). All welds to be polished to a #4 finish. Plenum is to be factory welded to the hood.
Light Fixture

Surface Mounted Warm LED

Hood to be fitted with UL & NSF Listed Surface Mounted Commercial Kitchen Hood light fixtures. Light fixture to have brushed aluminum housing, tempered glass, shatter resistant globe. Light fixture(s) to be prewired to a single connection point for each hood. To be fitted with LED lamp.

Lamps

Surface Mounted Warm LED

LED lamp, 120vac, UL Listed for exhaust canopy hoods, 12 Watt, 960 Lumens, 4500K to 5500K, maximum operating temperature 80 degrees C (176*F). 120-degree Beam angle, rated for 50,000 hour lamp life, mercury-free, instant (no ballast), exceeds Federal Energy Act requirement, no ultraviolet light emission. Fits any A19/E26/E27 fixture (globe must be installed to comply with UL listing).
Auto Fan Start

An Auto Fan Start is required for NFPA 96 Section 8.2.3.3. Auto Fan Switches may be located in each hood exhaust collar or the hood canopy. Auto Fan Switches in the canopy have a maximum spacing of 84".

Access Enclosure Hood Exhaust Collar Mounted

Hood Exhaust Collar to be fitted with UL 710 listed Access Enclosure(s) size and shape per the drawing with a removable cover plate that protects and allows access to monitoring equipment from inside of the hood exhaust plenum. The removable cover to be held in place by stainless steel fasteners. When the Enclosure's cover is removed it allows easy access for installation, adjustments, and service to the equipment inside the hood exhaust collar. Access Enclosures to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. All welds to be ground smooth and polished to a #4 finish.
Hood Utility Cabinet

Hood Utility Cabinet (HUC) assembly to be per size and shape shown on the drawing. Cabinet constructed with angle iron frame and stainless-steel body. All exposed surfaces to be fabricated of 18-gauge Type 304 stainless steel (s/s) with a #4 finish. All exposed welds to be ground smooth and polished to a #4 finish. Cabinet has an open top to enable utility connections from above ceiling and a stainless-steel lift out removable door panel. The removable door panel to have a recessed s/s door pull, full grip type. The removable door panel to be held in place by a full length upper and lower channel.

Ceiling Enclosure

Stainless steel matching enclosure panels from the top of the Hood to the finished ceiling. {Verify ceiling height with plan.) Ceiling Enclosure panels to be fabricated of 18-gauge stainless steel (material type and finish to be the same as the hood). Any exposed welds to be ground smooth and polished to a #4 finish.
Double Wall Construction

Double Wall Panel(s) to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. Panel(s) contain a UL listed fiber insulation that is 1· thick. Panel dimensions and locations to be per size and shape shown on the drawing. Double Wall Panels to be welded to the hood-by-hood manufacturer.

DEMAND AIR

Model: DemandAire Gold Variable Speed DCKV System
Project: Venture Academy - Culinary Lab_R1.0
Hoods Controlled : #4 A #04 B #04 C #33 and #38

UL Listed 508A

* See plans for location and placement of item with reference to adjoining equipment. See schematics for utility connection and operation. Furnish and install per Manufacturer's standard specifications and the following:
* Install in the location as shown on drawings. It is the responsibility of the Installer to verify all clearances.

* The Demand Control Kitchen Ventilation (DCKV) System is to be compliant with the prevailing energy codes including ASHRAE/ANSI 90.1 and California Title 24.

* DCKV Systems are to be UL 508A listed and shall be capable of at least a 50% reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and/or idle.
* DCKV Systems shall provide connections for a run signal for each supply and exhaust fan(s).

* DCKV Systems shall include failsafe controls that result in full fan flow upon a cooking sensor failure, and an adjustable timed override to allow occupants the ability to temporarily override the system to full fan flow.
* DCKV Systems shall include Ambient Temperature Monitoring (ATM) to monitor the temperature of the air in the kitchen space surrounding the hood system.
* DCKV Systems shall include Zonal Temperature Monitoring controls that monitor individual cooking appliances below each hood. Temperature monitors are to be installed in the optimal location within the hood canopy with a maximum spacing of 48" to provide the fastest response time to changes in cooking appliance conditions and increase energy efficiency.

* DCKV Systems shall include UL 710 Listed access enclosure(s) that allow access to the temperature monitors from below the hood for installation and commissioning. Systems that include temperature monitors or other electrical components which are not accessible from below the hood(s) via UL 710 listed access enclosure(s) are not acceptable.

* DCKV systems that only monitor the appliance temperature in the area of the hood exhaust collar(s) are not acceptable.

* DCKV Systems shall compare hood canopy temperatures to the ambient temperature of the kitchen space to determine the state of cooking appliances. Power supplied to the exhaust and/or supply fan(s) shall be adjusted to meet the cooking appliance demand using differential controls and an algorithm to optimize energy savings.
* DCKV Systems shall include fan and lighting controls, diagnostic tools, system settings, and alarm notifications to be provided by means of a Human Machine Interface (HMI) with color touch screen. The HMI is door mounted to a Type I UL Listed stainless steel enclosure which may be recessed into a wall, surfaced mounted on a wall, or flush mounted on the front of a hood utility cabinet.

* DCKV Systems shall include a Programmable Logic Controller (PLC), 24 VDC power supply, relays, terminal blocks, color-coded wiring, housed in Type I UL Listed stainless steel enclosures which may be hood mounted in a utility cabinet or be wall mounted, surface or recessed.
* The HMI shall include manual controls including a 50% exhaust power switch, 100% power switch with timed override, and hood on/off light switch. The HMI shall include diagnostic tools and display screen for hood and ambient temperature status, fan motor status and control history, alarm log with visual and/or audible alarm notification, data logging, and fan operation analysis.

* The HMI shall include password protected settings for temperature monitor set points, minimum and maximum fan speeds to assist with air balancing, 100% override time, fan off-delay time, alarm triggers and fire suppression system settings.
* DCKV Systems shall provide analog output control signals to VFDs, Electronically Commutated (EC) Motors, or BMS (not provided by the manufacturer unless specifically included herein) to control the exhaust and supply fans at variable speeds based on the cooking conditions below each hood based on inputs from hood and ambient temperature monitors, manual controls from the HMI, and fire suppression system actuation.
* DCKV Systems Do not include Variable Frequency Drive(s).

* DCKV Systems shall be capable of providing real time system status such as hood and ambient temperature data, system faults, fan power operating status and other information via Modbus TCP communication.
* Hood and ambient temperature monitors shall be stainless steel Platinum 100 3-Wire Resistance Temperature Detectors (RTD).

* DCKV Systems shall be engineered with connections for shunting electrical equipment below the hood, shunting electric gas valves, shunting SmartAire Internal Hood Fans (IHF), shunting makeup air, operating exhaust fans at full capacity and signaling building alarm system during a fire suppression system actuation.
* DCKV Systems shall have an integrated electric gas valve reset relay that is accessed via the HMI and requires manual reset of the power to the electric gas valve(s) after the fire suppression system has been rearmed following a fire suppression system actuation or loss of power.
* Manufacturer will provide DCKV control schematics, installation and operation manuals, and sequence of operation documents.

* Manufacturer will provide pre-installation phone consultation to answer questions regarding the DCKV system.

* Manufacturer may provide on-site commissioning support during startup of the hood system(s). See contract for on-site duration allocated for commissioning if applicable.
* (Manufacturer will not provide) control panel supply power (120VAC, 20 amps), electric gas valve supply power (120VAC, 20 amps), high voltage VFD supply power, VFDs (Variable Frequency Drives), or field wiring between DCKV control panel and RTD temperature monitors, fire suppression system microswitches, HMI, shunt trip breakers, BMS, exhaust and supply fan VFDs, exhaust and supply fan motors, electrical gas valve(s), and hood lights, unless specifically noted herein or any other unspecified materials or labor.
* The above exclusions, including labor and materials, to be provided by qualified contractor at no expense to Manufacturer.

Insulated Wall Lining

A. 18-gauge stainless steel wall panels (minimum length to be 36”) per California Mechanical Code Chapter 5. Wall lining to be applied with Dow Corning #995 adhesive. " Liquid Nails" not acceptable.
B. Wall panels shall be installed horizontally and fluted vertically every 6” from top of floor base to bottom lip of hood
C. Wall lining shall be installed without exposed screws and bolts.
D. Provide stainless steel “tees” and/or “ells” at each panel on both sides, bottom and top.
E. Wall lining shall meet the requirements of NFPA-96 and all local codes and ordinances.
G. Provide 18-gauge stainless steel closure skirting form top of hood to finish ceiling.
H. Provide all hanging information to the Contractor including the total weight of the hood.
I. Furnish all necessary materials to support this assembly from the building structure. Assembly shall meet the requirements of NFPA-96 and the latest edition of the California Mechanical Code.

ITEM #4.1 FIRE SUPPRESSION SYSTEM
Quantity: Two (2)
Manufacturer: STRIEVOR (or equal)
Status: CFCI
Fire System
Hood# (04 A)(04 B) Ansul R102 UL 300 Listed Restaurant Fire Suppression System. Includes Fire System Drawing, Control Actuator, Cylinder(s) and Chemical Suppressant, Chemical and Detection lines pre-piped at the factory, 1ea electrical gas valve 2" or less in size, 1ea manual pull station, appliance, duct and plenum nozzles. Installation, Start Up and System Test to be performed by a certified professional of Streivor's choosing.

NOT INCLUDED - Connection to Pollution Control Unit(s), Project Labor Agreements (PLA), NICET Certification.

NOT INCLUDED· Fire Suppression Pre-Test. If required, a site visit for each Fire Suppression Pre-Test must also be purchased.

NOT INCLUDED • Fire Permit, Additional Signage, Union installation rates, OCIP, Simultaneous activation of multiple systems, Prevailing Wage installation rates.

FSS Drawing & Engineering • Included Fire Suppression System engineering, drawings, and applicable permits.

K Class Fire Extinguisher -Ansul R102 Class K "Kitchen Use" wall mounted 6 Liter wet chemical Fire Extinguisher.

Manual Reset Relay - Included Includes Manual Reset Relay 120VAC. Provides a manual reset to re-energize and open a gas shutoff valve after the loss of power to the valve.

Y-Strainer (Up to 2") - Included Includes Y-Strainer (Up to 2") with flanged connection and #40 mesh screen. Important: A Y-Strainer must be installed as close to the inlet side of the mechanical or electrical fire suppression system gas shut off valve. The Y-Strainer should be cleaned as often as necessary. Failure to install and maintain a Y-Strainer could result in the valve not operating as designed and will void the warranty on the valve.

Electric Gas Shutoff Valve (Up to 2") - Included Includes up to 2" Electrically Controlled Gas Shutoff Valve 120VAC. Requires a UL Listed Reset Relay.

NOT INCLUDED - Streivor is not responsible for any Fire Suppression System electrical wiring or final wiring connections. Streivor is not responsible for any gas shut-off valve or water plumbing required for a fire suppression system. Y Strainer installation required by gas shut-off valve manufacturer to protect fire system gas shut-off valve.

ITEM #5 RANGE, 60", 6 BURNERS, 24" GRIDDLE
Quantity: Six (6)
Manufacturer: Vulcan (or equal)
Model: 60SC-6B24G
Status: CFCI
Endurance™ Restaurant Range, gas, 60", (6) 30,000 BTU burners with lift-off burner heads, (1) 24" manual griddle, 3/4" thick, 4" wide front grease trough, (1) standard oven base (left), (1) convection oven base (right), stainless steel front, sides, backriser & high shelf, fully MIG welded frame, 6" adjustable legs, 278,000 BTU, CSA Flame, CSA Star, NSF

Accessories:

6 ea. 1 year limited parts & labor warranty, standard
6 ea. K-12 School Nutrition extended warranty extends the warranty for 12 months beyond the 12 month Original Equipment Warranty, not to exceed 24 months from date of installation
6 ea. Gas type to be specified
6 ea. 115v/60/1-ph, cord & plug, standard
6 ea. Manual rotary ignitor with flame safety device, for open top burner, griddle, & oven pilots (one required per 12" section)
6 ea. Griddle on right side, standard
6 ea. Note: The griddle being placed on the right will automatically move the 26" oven to the right
6 ea. Model STUB10-XL60 10" Stub back, for 60" ranges, stainless steel
6 ea. Model CASTERS-ADJRR4 Casters, 6", adjustable (set of 4) (2 with locks) (quantity of 2 required)
6 ea. Model 1INFLEX-4FT 1" X 4' flex hose & quick disconnect with restraining device

ITEM # 6 SPARE NO.

ITEM #7 SPARE NO.

ITEM #8 FLOOR MOUNTED CASTER LOCK PLATES SET OF (2)
Quantity: Six (6)
Manufacturer: Dormont Manufacturing
Model: Safety Set
Status: CFCI

ITEM #9 SINK, (3) THREE COMPARTMENT
Quantity: One (1)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following:

A. Work area top to be 14-gauge stainless steel with a 14-gauge stainless steel backsplash at back 2" thick with a 45-degree top edge to wall, turn down ½" at back and left side to Z-clips. Top to be constructed with a rolled edge as shown. Drainboards are to slope per NSF guidelines to sinks.
B. Three (3) 14-gauge stainless steel formed and welded integral sinks, refer to drawings for bowl dimensional requirements. (Diecast sink bows are not acceptable).
C. Provide and install 16-gauge stainless steel tubular legs, stainless steel welded leg sockets, and stainless-steel cross rail bracing.
D. Provide 16-gauge stainless steel undershelf with 1 ½" turn down at front and 2" turn up at back.
E. Provide adjustable seismic flanged feet. Refer to drawings for configuration and quantity.
F. Twist waste valve to have support bracket installed as part of fabrication with a minimum of 4" clearance from twist handle.

Accessories:

3 ea. Fisher Model 22209 DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual Teflon seals, stainless steel ball, cast red brass body
2 ea. T&S Brass Model B-0290-04 Big-Flo Mixing Faucet, wall mount, 8" adjustable centers, 12" swing nozzle with plain end outlet, 4" wrist handles with color coded indexes, low-lead, 3/4" female NPT, ANSI, NSF, ADA Compliant
4ea. T&S Brass Model B-0427 Supply Nipple, 3/4" x 2-1/2"
T&S Brass Order in quantities of (2) per faucet
2 ea. T&S Brass Model B-0290-K Big-Flo Repair Kit, washers, o-rings, seats & screws

ITEM #10 SPARE NO.

ITEM #11 WALL MOUNTED CABINET W/ DOORS
Quantity: One (1)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following: To be fabricated of 16-gauge stainless steel body and shelves. Furnish with hinged doors and as shown on the drawings.

A. Provide stainless steel pulls, Component Hardware Group, model no. P46-1010 and stainless-steel locks, Component Hardware Group no. P30 series, and a "stay-bolt" to complete the locking of both doors as shown. All doors to be keyed alike.

B. Provide a 16-gauge stainless steel flush bottom panel at this unit as shown.
C. Provide 18-gauge stainless steel double pan hinged doors complete with Component Hardware Group, stainless steel lift off hinges 3" long.
D. Approximate size: 1'-3" deep x length as shown.

ITEM #12 WALL CABINET
Quantity: One (1)
Manufacturer: Advance Tabco (or equal)
Model: WCH-15-36
Status: CFCI
Cabinet, wall mount, enclosed design with (2) hinged doors, 36"W x 15"D, with single intermediate shelf, 18/430 stainless steel construction, NSF

Accessories:
1 ea. Model TA-46 Door lock, one required for each hinge door or for each set of sliding doors
1 ea. Model WC-SHELF Additional fixed mid-shelf for wall mounted cabinet (sold per linear foot) (number of feet must equal width of cabinet)

ITEM #13 MOP HOLDER
Quantity: One (1)
Manufacturer: Advance Tabco (or equal)
Model: K-242
Status: CFCI
Model K-242 Mop Hanger, 23", accommodates (3) mops.

ITEM #14 MOP DRIP TRAY
Quantity:One (1)
Manufacturer: Advance Tabco (or equal)
Model: K-243
Status: CFCI
Model K-243 Mop Drainage Tray, stainless steel

ITEM #15 CLEAN DISHTABLE
Quantity: One (1)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following: To be fabricated of 14-gauge 304 stainless steel.

A. Work area top to be 14-gauge stainless steel with a 14-gauge stainless steel backsplash 2" thick with a 45-degree top edge to wall, turn down ½" at back and right side to Z-Clips. Top to be constructed with a "rolled" edge as shown. Drainboards are to slope per NSF guidelines to sinks.
B. Provide adjustable seismic flanged feet. Refer to drawings for configuration and quantity.
C. Provide and install 16-gauge stainless steel tubular legs, stainless steel welded leg sockets, stainless steel adjustable feet and 16 gauge welded tubular stainless undershelf.
D. Approximate size: 30" deep x as shown.

ITEM #16 CLEAN DISHTABLE (PART OF ITEM 17)
Quantity: One (1)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI

ITEM #17 SINK, (3) THREE COMPARTMENT
Quantity: One (1)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following:

A. Work area top to be 14-gauge stainless steel with a 14-gauge stainless steel backsplash at back 2" thick with a 45-degree top edge to wall, turn down ½" at back and left side to Z-clips. Top to be constructed with a rolled edge as shown. Drainboards are to slope per NSF guidelines to sinks.
B. Three (3) 14-gauge stainless steel formed and welded integral sinks, refer to drawings for bowl dimensional requirements. (Diecast sink bows are not acceptable).
C. Provide and install 16-gauge stainless steel tubular legs, stainless steel welded leg sockets, and stainless-steel cross rail bracing.
D. Provide 16-gauge stainless steel undershelf with 1 ½" turn down at front and 2" turn up at back.
E. Provide adjustable seismic flanged feet. Refer to drawings for configuration and quantity.
F. Twist waste valve to have support bracket installed as part of fabrication with a minimum of 4" clearance from twist handle.

Accessories:

3 ea. Fisher Model 22209 DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual Teflon seals, stainless steel ball, cast red brass body
2 ea. T&S Brass Model B-0290-04 Big-Flo Mixing Faucet, wall mount, 8" adjustable centers, 12" swing nozzle with plain end outlet, 4" wrist handles with color coded indexes, low-lead, 3/4" female NPT, ANSI, NSF, ADA Compliant
4ea. T&S Brass Model B-0427 Supply Nipple, 3/4" x 2-1/2"
T&S Brass Order in quantities of (2) per faucet
2 ea. T&S Brass Model B-0290-K Big-Flo Repair Kit, washers, o-rings, seats & screws

ITEM #18 PLANETARY MIXER
Quantity: Six (6)
Manufacturer: KitchenAid Commercial (or equal)
Model: KSMC895OB
Status: CFCI
KitchenAid® Commercial Stand Mixer, with bowl guard, countertop, 8 quart bowl with lift, PowerCore® technology, commercial attachment power hub, ASF control panel, stainless steel bowl & guard, dough hook, flat beater, and wire whip, speed control protection, onyx black finish, 500 watts, 1.3 HP, 120v/60/1-ph, 4' cord, cULus, NSF

Accessories:

6 ea. Two year replacement warranty from date of purchase,extends to the purchaser and any succeeding owner Commercial Immersion Blenders operated in the 50 United States, the District of Columbia, & Canada, standard

6 ea. Model KSMC8QBOWL KitchenAid® Mixer Bowl, 8 quart capacity, with "J" style handle, polished stainless steel, NSF (for KitchenAid models KSMC895, KSM8990 and KSM7990)
6 ea. Model KSMC7QDH Spiral Dough Hook, 7 and 8 quart, stainless steel, NSF (dishwasher safe) (for KitchenAid models KSMC895, KSM8990 and KSM7990)
6 ea. Model KSMC7QEW Elliptical Wire Whisk, 7 and 8 quart, stainless steel, NSF (dishwasher safe) (for KitchenAid models KSMC895, KSM8990 and KSM7990)
6 ea. Model KSMC7QFB Flat Beater, 7 and 8 quart, stainless steel, NSF (dishwasher safe) (for KitchenAid models KSMC895, KSM8990 and KSM7990)

ITEM #19 WORK TABLE, BAKERS TOP
Quantity: One (1)
Manufacturer: John Boos (or equal)
Model: BAK05
Status: CFCI
Bakery Prep Table, 60"W x 36"D x 39"H overall size, 1-3/4" thick edge grain top with 4" coved riser on back & both ends, Northern Hard Rock Maple, stainless steel fixed undershelf, bun pan rack [holds (8) 18" x 26" pans], legs & gussets, 5" heavy duty casters (2 with locks), NSF, CSA-Sanitation, KD
Accessories:
1 ea. Extra bun rack

ITEM #20 INGREDIENT BIN
Quantity: Two (2)
Manufacturer: Cambro (or equal)
Model: IBS27148
Status: CFCI
Ingredient Bin, mobile, 27 gallon capacity, 1-pc seamless polyethylene bin, 2-pc sliding polycarbonate lid, scoop holder included (scoop sold separately), (4) 3" heavy duty casters (2 front swivel, 2 fixed), white with clear cover, NSF
Accessories:
2 ea. Model SCP12CW135 Camwear® Scoop, 12 oz., polycarbonate, clear, NSF
2 ea. Model IBSH24148 Ingredient Bin Scoop Holder, 24 oz, white, for models IBS20148, IBS27148 and IBSF27

ITEM #21 DECORATIVE LAMP
Quantity: Two (2)
Manufacturer: Hatco (or equal)
Model: DLH-775
Status: CFCI
Decorative Heat Lamp, High Wattage, (1) bulb type (not included), 8-1/2"H x 10-1/2" diameter shade, 375 watt max, CE, cULus, UL EPH Classified, Made in USA
Accessories:
2 ea. 120v/60/1-ph, 375 watt, standard
2 ea. Model WHITE-CTD-120H Lamp Bulb, 375 Watt clear, coated
2 ea. Model DL-SWITCH-16AMP Lamp Toggle Switch, 16 amp (shipped separately)
2 ea. Model SPECIFY MUST SPECIFY designer color selected from list of standard colors & indicated on order (available at time of purchase only)
2 ea. Model SPECIFYN/C MUST SPECIFY designer color selected from list of standard colors & indicated on order (available at time of purchase only)

2 ea. Model R Mounting Style - Retractable (specify cord color) - retractable cord mount, adjusts from 31" to 69-1/2" (available at time of purchase only)
2 ea. Model S Switch Location - Must Specify (available at time of purchase only)
2 ea. Model DL-CORD-BK Black Cord, standard, (CL, CU, CT, RL mounts only) (

ITEM #22 GAS FLOOR FRYER
Quantity: One (1)
Manufacturer: Imperial (or equal)
Model: IFSCB150-OP
Status: CFCI
Fryer, gas, floor model, 50lb. capacity, open pot, built-in filter system, 5.5 GPM roller pump, snap action thermostat, drain station, cabinet, includes: food warmer, dump pan, joiner strips, & filter starter kit, stainless steel frypot, front, sides, landing ledge & cabinet, casters, 120v/60/1-ph, 6.8 amps, 1/3 HP, 140,000 BTU, cETLus, ETL-Sanitation

Accessories:
1 ea. Limited one year parts and labor warranty, standard
1 ea. Gas type to be specified
1 ea. Manifold gas shut-off valve (3/4" N.P.T.)
1 ea. 115v/60/1-ph, 6.8 amps, filter motor voltage, 6 ft. cord with plug
1 ea. Twin baskets (set of 2)
1 ea. Reclamation oil system (ROI)
1 ea. Electronic ignition, per vessel

ITEM #23 MOBILE HEATED CABINET
Quantity: One (1)
Manufacturer: FWE / Food Warming Equipment Co., Inc. (or equal)
Model: UHST-13
Status: CFCI
Heated Cabinet, mobile, slim-line, (13) pair universal tray slides, (13) 18" x 26" or (26) 12" x 20" pan capacity, 4-1/2" OC, adjustable to 1-1/2" increments, top mounted forced air heating system, adjustable thermostat, -90°F to 190°F temperature range, insulated, (1) flush mounted door, push bars, wraparound bumper, stainless steel construction, 5" casters (2) rigid & (2) swivel with brakes, UL, cULus, UL EPH Classified, CE, IPX4, ENERGY STAR®

Accessories:
1 ea. Two year limited parts & one year labor warranty, standard
1 ea. 120v/50/60/1-ph, 14.1 amps, 1692 watts, cord with NEMA 5-15P, standard (US)
1 ea. Electronic Control
1 ea. Full Glass door(s), per door
1 ea. Cord Winding Bracket
1 ea. Humidity pan
1 ea. Tubular Handles, stainless steel, pair
1 ea. All Swivel Casters
1 ea. Floor Lock (includes 6" casters)

ITEM #24 SPARE NO.

ITEM #25 WORK COUNTER W/ SINK
Quantity: Six (6)

Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Fabricated assembly in length and configuration as shown on the drawings and shall include the following:

A. Work area top to be 14-gauge stainless steel with a 14-gauge stainless steel backsplash at back 2" thick with a 45-degree top edge to wall, turn down ½" at back and right side. Top to be constructed with a 2" turn down on 2 sides as shown. Drainboards are to slope per NSF guidelines to sink.
B. One (1) 14-gauge stainless steel formed and welded sinks, refer to drawings for bowl dimensional requirements. (Diecast sink bowls are not acceptable).
C. Legs to be 16-gauge stainless steel tubular, stainless steel welded leg sockets, stainless steel seismic flanged feet and stainless-steel cross rail bracing. Provide 16-gauge stainless steel undershelf as shown.
D. Approximate size: 30" deep x as shown.
E. Twist waste valve to have support bracket installed as part of fabrication with a minimum of 4" clearance from twist handle.

Accessories:

1 ea. Fisher Model 57657 Faucet, deck mount, 8" centers, 10" swing spout, lever handles with color coded indexes, 1/2" male inlets, stainless steel, ADA Compliant
1 ea. Fisher Model 22209 DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual Teflon seals, stainless steel ball, cast red brass body
1 ea. Fisher 5-year warranty against defects in materials or workmanship, standard

ITEM #26 THREE STACK UTENSIL DRAWER UNIT

Quantity: Six (6)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following: To be fabricated of 16-gauge stainless steel complete with the following hardware items.

A. Provide stainless steel flush pull, Component Hardware Group, Inc., model no. P63-1012, installed into the 18-gauge double-pan drawer front panel.
B. Provide stainless steel locks, Component Hardware Group, Inc., model no P30-4781 for each drawer. All drawers are to be keyed alike.
C. Provide stainless steel full extension slides, Component Hardware Group, Inc., model No. S52-0024. Provide two (2) per drawer. Slides to be installed so drawer will roll closed when released.
D. Provide stainless steel removable drawer pan. Provide Component Hardware Group, Inc., model No. S81-1520 one (1) per drawer. Pan should be easily lifted out of drawer frame for cleaning.
E. Drawer face panel to be constructed of 16-gauge stainless steel double pan construction. Single metal drawer faces are not acceptable.

ITEM #27 SPARE NO.

ITEM #28 UNDERCOUNTER REFRIGERATOR

Quantity: Six (6)
Manufacturer: True Mfg. - General Foodservice (or equal)

Model: TUC-27-HC
Status: CFCI
Undercounter Refrigerator, 33 - 38°F, (1) stainless steel door, (2) PVC coated adjustable wire shelves, stainless steel top, front & sides, clear coated aluminum interior with stainless steel floor, 5" castors, R290 Hydrocarbon refrigerant, 1/6 HP, 115v/60/1-ph, 2.0 amps, NEMA 5-15P, cULus, UL EPH Classified, CE, Made in USA

Accessories:

6 ea. Self-contained refrigeration standard
6 ea. Warranty - 7 year compressor (self-contained only), please visit www.Truemfg.com for specifics
6 ea. Warranty - 5 year parts & labor, please visit www.Truemfg.com for specifics
6 ea. Right Hand, Standard: Unit comes with field reversible hinges & is built with hinging on right side of unit.
6 ea. Castors, 3" (34" work surface height = ADA)

ITEM #29 SPARE NO.

ITEM #30 WORK COUNTER W/ SINK TEACHER STATION
Quantity: Six (6)
Manufacturer: American Stainless-Steel Corp. (or equivalent)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following:

A. Work area top to be 14-gauge stainless steel with a 14-gauge stainless steel backsplash at back 2" thick with a 45-degree top edge to wall, turn down ½" at back and right side. Top to be constructed with a 2” turn down on 2 sides as shown. Drainboards are to slope per NSF guidelines to sink.
B. One (1) 14-gauge stainless steel formed and welded sinks, refer to drawings for bowl dimensional requirements. (Diecast sink bowls are not acceptable).
C. Legs to be 16-gauge stainless steel tubular, stainless steel welded leg sockets, stainless steel seismic flanged feet and stainless-steel cross rail bracing. Provide 16-gauge stainless steel undershelf as shown.
D. Approximate size: 30" deep x as shown.
E. Twist waste valve to have support bracket installed as part of fabrication with a minimum of 4” clearance from twist handle.

Accessories:

1 ea. Fisher Model 57657 Faucet, deck mount, 8" centers, 10" swing spout, lever handles with color coded indexes, 1/2" male inlets, stainless steel, ADA Compliant
1 ea. Fisher Model 22209 DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual Teflon seals, stainless steel ball, cast red brass body
1 ea. Fisher 5-year warranty against defects in materials or workmanship, standard

ITEM #31 TRASH RECEPTACLE, INDOOR
Quantity: Two (2)
Manufacturer: Rubbermaid Commercial Products (or equal)
Model: FG354060GRAY
Status: CFCI

Slim Jim® Container, 23 gallon, 22"W x 11"D x 30"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, gray, Made in USA

Accessories:

2 ea. Model FG267360BEIG Slim Jim® Swing Lid, for Slim Jim® Container, beige, Made in USA (contact Rubbermaid for broken case information)

ITEM #32 UNDERCOUNTER REFRIGERATOR

Quantity: One (1)
Manufacturer: True Mfg. (or equal)
Model: TUC-48-HC
Status: CFCI
Undercounter Refrigerator, 33 - 38°F, (2) stainless steel doors, (4) PVC coated adjustable wire shelves, stainless steel top & sides, aluminum interior with stainless steel floor, R290 Hydrocarbon refrigerant, 1/5 HP, 115v/60/1-ph, 3.0 amps, NEMA 5-15P, cULus, UL EPH Classified, CE, Made in USA

Accessories:

1 ea. Self-contained refrigeration standard
1 ea. Warranty - 7 year compressor (self-contained only), please visit www.Truemfg.com for specifics
1 ea. Warranty - 5 year parts & labor, please visit www.Truemfg.com for specifics
1 ea. Castors, 3" (34" work surface height = ADA)

ITEM #33 EXHAUST HOOD AND CLOSURE SKIRTING

Quantity: One (1)
Manufacturer: STREIVOR AIR SYSTEMS (or equal)
Model: ICBD 60 60 24
Status: CFCI
Maximum Appliance Type : 450F I Medium Duty
CKV Hood UL Listed 710 Hood Exhaust : 1750 CFM @ 0.57
CKV Lights UL Listed 1571
Commercial Kitchen Ventilation Specification
External Rear MUA : 1000 CFM @ 0.40
(WC)SP
See plans for location and placement of item with reference to adjoining equipment. Furnish and install per Manufacturer's standard specifications and the following:

* Install in the location as shown on drawings. It is the responsibility of the Installer to verify all clearances and stand offs from the hood to limited combustibles and/or combustible materials. Hood must be installed in accordance with the Manufacturer's specifications. Canopy Hoods to be installed a minimum of 78 inches above the finished floor and level. ADA requires 80 inches minimum above the finished floor.
* The Hood assembly to be size and shape per the drawings. Hood to be U.L. listed #710, NSF listed and built in compliance with the prevailing NFPA Standard #96. The hood ends shall be fabricated from 16-gauge stainless steel or heavier and have a Perform edge shape at the lower most part of the end. The remainder of the hood will be fabricated of material not less than 18 gauge. All exposed surfaces to be fabricated from Type 304 stainless steel with a #4 finish. All exposed welds to be ground smooth and polished to a #4 finish. Exhaust airflow volume and static pressure at the duct collar(s) shall not exceed those shown on the drawings.

* Stainless steel matching enclosure panels from the top of the Hood to the finished ceiling to be furnished by KEC. (Verify ceiling height with plan.)

* All electrical connections, materials and labor to connect high and low voltage electrical to the hood lights, temperature monitors, electrical components and/or the Fire Suppression System including micro-switch(es) by other. See fire suppression system for additional detail.

* Hood Manufacturer to provide engineering and shop drawings for approval prior to fabrication.

* Exhaust and Supply Fans to be furnished by Mechanical Division in compliance with local and National Codes. See Hood Manufacturer's specification sheets for CFM and static pressure requirements.
* Duct connections by Mechanical. An air balance test should be performed before cooking start up to insure correct exhaust and supply airflow rates.
* Hood must be manufactured UL 710 Listed, NFPA 96 compliant and installed in accordance with all prevailing codes and standards.

Extractor

FLSS Hood to be fitted with stainless steel baffle filters. Filters to be UL1046 Listed, NSF approved. The filters will be easily removable for cleaning.
Exposed Canopy Material

304 Stainless Steel Type 304 Stainless Steel (SS) is in the "Austenitic group of SS" comprising approximately 18% chromium and 8% nickel. Type 304's resistance to corrosive acids makes it ideal for hoods, sinks and tabletops. Type 304 SS is comprised of no more than 0.8% carbon and at least 50% iron. The chromium binds oxygen to the surface of the product to protect the iron from oxidation (rust). Nickel also enhances the corrosion resistance of stainless steel. Therefore, the higher the nickel content, the more resistant the stainless
steel is to corrosion. Type 304 SS is non-magnetic.

Non-Exposed Exhaust Plenum Material

304 Stainless Steel Type 304 Stainless Steel (SS) is in the "Austenitic group of SS" comprising approximately 18% chromium and 8% nickel. Type 304's resistance to corrosive acids makes it ideal for hoods, sinks and tabletops. Type 304 SS is comprised of no more than 0.8% carbon and at least 50% iron. The chromium binds oxygen to the surface of the product to protect the iron from oxidation (rust). Nickel also enhances the corrosion resistance of stainless steel. Therefore, the higher the nickel content, the more resistant the stainless steel is to corrosion. Type 304 SS is non-magnetic.

Make Up Air

SPD

Hood to have a full length add on supply plenum fabricated of 18-gauge stainless steel (material type and finish to be the same as the hood) that facilitates the delivery of downward supply air through a full-length perforated metal. (See drawings for location and size). All welds to be polished to a #4 finish. Plenum is to be factory welded to the hood.
Light Fixture

Surface Mounted Warm LED

Hood to be fitted with UL & NSF Listed Surface Mounted Commercial Kitchen Hood light fixtures. Light fixture to have brushed aluminum housing, tempered glass, shatter resistant globe. Light fixture(s) to be prewired to a single connection point for each hood. To be fitted with LED lamp.

Lamps

Surface Mounted Warm LED

LED lamp, 120vac, UL Listed for exhaust canopy hoods, 12 Watt, 960 Lumens, 4500K to 5500K, maximum operating temperature 80 degrees C (176*F). 120-degree Beam angle, rated for 50,000 hour lamp life, mercury-free, instant (no ballast), exceeds Federal Energy Act requirement, no ultraviolet light emission. Fits any A19/E26/E27 fixture (globe must be installed to comply with UL listing).
Auto Fan Start

An Auto Fan Start is required for NFPA 96 Section 8.2.3.3. Auto Fan Switches may be located in each hood exhaust collar or the hood canopy. Auto Fan Switches in the canopy have a maximum spacing of 84".
Access Enclosure Hood Exhaust Collar Mounted

Hood Exhaust Collar to be fitted with UL 710 listed Access Enclosure(s) size and shape per the drawing with a removable cover plate that protects and allows access to monitoring equipment from inside of the hood exhaust plenum. The removable cover to be held in place by stainless steel fasteners. When the Enclosure's cover is removed it allows easy access for installation, adjustments, and service to the equipment inside the hood exhaust collar. Access Enclosures to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. All welds to be ground smooth and polished to a #4 finish.

Ceiling Enclosure

Stainless steel matching enclosure panels from the top of the Hood to the finished ceiling. (Verify ceiling height with plan.) Ceiling Enclosure panels to be fabricated of 18-gauge stainless steel (material type and finish to be the same as the hood). Any exposed welds to be ground smooth and polished to a #4 finish.

Insulated Wall Lining

A. 18-gauge stainless steel wall panels (minimum length to be 36”) per California Mechanical Code Chapter 5. Wall lining to be applied with Dow Corning #995 adhesive. " Liquid Nails" not acceptable.
B. Wall panels shall be installed horizontally and fluted vertically every 6” from top of floor base to bottom lip of hood
C. Wall lining shall be installed without exposed screws and bolts.
D. Provide stainless steel “tees” and/or “ells” at each panel on both sides, bottom and top.
E. Wall lining shall meet the requirements of NFPA-96 and all local codes and ordinances.
G. Provide 18-gauge stainless steel closure skirting form top of hood to finish ceiling.
H. Provide all hanging information to the Contractor including the total weight of the hood.
I. Furnish all necessary materials to support this assembly from the building structure. Assembly shall meet the requirements of NFPA-96 and the latest edition of the California Mechanical Code.

ITEM #34 RANGE, 36", 6 OPEN BURNERS
Quantity: One (1)
Manufacturer: Wolf (or equal)
Model: C36C-6B
Status: CFCI

Challenger XL™ Restaurant Range, gas, 36", (6) 30,000 BTU burners, lift-off burner heads, convection oven, stainless steel front, sides, backriser & lift-off high shelf, fully welded body, 6" adjustable legs, 215,000 BTU, CSA, NSF

Accessories:

1 ea. 1 year limited parts & labor warranty, standard
1 ea. K-12 School Nutrition extended warranty extends the warranty for a period of 12 months beyond the 12 month Original Equipment Warranty, not to exceed 24 months from date of installation.
1 ea. Gas type to be specified
1 ea. 120v/60/1-ph, 4.0 amps, cord & plug, standard
1 ea. Manual rotary ignitor with flame safety device, for open top burner, griddle & oven pilots (one required per 12" section)
1 ea. Model STUB10-XL36 Stub riser, 10", for 36" ranges (packaged & sold separately)
1 ea. Model 6", adjustable flanged feet (set of 4)
1 ea. Model 3/4QD-HOSE-4 3/4" diameter x 48" flex hose & quick disconnect

ITEM #35 WORK TABLE, STAINLESS STEEL TOP

Quantity: One (1)
Manufacturer: Eagle Group (or equal)
Model: T3696SE
Status: CFCI
Spec-Master® Series Work Table, 96"W x 36"D, 14/300 series stainless steel top, rolled edge on front & back, adjustable 18/300 series stainless steel undershelf with marine edge, Uni-Lok® gusset system, (6) stainless steel legs & adjustable bullet feet, NSF

Accessories:

1 ea. Model E36 All welded construction, legs, undershelf & top
1 ea. Model E59 Undershelf upgrade, 16 ga. 304 stainless steel (price per foot)

ITEM #36 WALL MOUNTED CABINET W/ DOORS

Quantity: One (1)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: CFCI
Fabricated assembly in length and configuration as shown on the drawings and shall include the following: To be fabricated of 16-gauge stainless steel body and shelves. Furnish with hinged doors and as shown on the drawings.

A. Provide stainless steel pulls, Component Hardware Group, model no. P46-1010 and stainless-steel locks, Component Hardware Group no. P30 series, and a “stay-bolt” to complete the locking of both doors as shown. All doors to be keyed alike.
B. Provide a 16-gauge stainless steel flush bottom panel at this unit as shown.
C. Provide 18-gauge stainless steel double pan hinged doors complete with Component Hardware Group, stainless steel lift off hinges 3" long.
D. Approximate size: 1’-3” deep x length as shown.

ITEM #37 CONVECTION OVEN, GAS

Quantity: One (1)
Manufacturer: Vulcan (or equal)
Model: SG44

Convection Oven, gas, double-deck, solid state controls, electronic spark ignition, gentle bake mode selector switch, 60 minute timer with audible alarm, 150° to 500°F temperature range, stacking kit, (5) oven racks per section, independently operated doors with windows, porcelain enamel interior, stainless steel doors, front, sides, top & 8" legs, (2) 1/2 HP, (2) 60,000 BTU, CSA, NSF, ENERGY STAR®

Accessories:

1 ea. 1 year limited parts & labor warranty, standard
1 ea. Gas type to be specified
1 ea. (2)120v/60/1-ph, 7.7, 1/2 HP, cord & plug standard
1 ea. Gas manifold piping included with stacking kit to provide single point gas connection
1 ea. Model HTSHLD-LH/V Heat shields for oven sides (left)
1 ea. Model HTSHLD-RH/V Heat shields for oven sides (right)
1 ea. Model 11/4QDH 4FT 1-1/4" dia. x 4' flex hose & quick disconnect with restraining device
1 ea. Model ENCLSUR-SSBACK Stainless steel rear enclosure (per section)

ITEM #38 EXHAUST HOOD AND CLOSURE SKIRTING

Quantity: One (1)
Manufacturer: STREIVOR AIR SYSTEMS (or equal)
Model: WCBD 96 60 24
Status: CFCI
Maximum Appliance Type : 450F I Medium Duty
CKV Hood UL Listed 710 Hood Exhaust: 1680 CFM @ 0.63
CKV Lights UL Listed 1571

Commercial Kitchen Ventilation Specification
External Front MUA: 1746 CFM @ 0.40

See plans for location and placement of item with reference to adjoining equipment. Furnish and install per Manufacturer's standard specifications and the following:

* Install in the location as shown on drawings. It is the responsibility of the Installer to verify all clearances and stand offs from the hood to limited combustibles and/or combustible materials. Hood must be installed in accordance with the Manufacturer's specifications. Canopy Hoods to be installed a minimum of 78 inches above the finished floor and level. ADA requires 80 inches minimum above the finished floor.
* The Hood assembly to be size and shape per the drawings. Hood to be U.L. listed #710, NSF listed and built in compliance with the prevailing NFPA Standard #96. The hood ends shall be fabricated from 16-gauge stainless steel or heavier and have a Perform edge shape at the lower most part of the end. The remainder of the hood will be fabricated of material not less than 18 gauge. All exposed surfaces to be fabricated from Type 304 stainless steel with a #4 finish. All exposed welds to be ground smooth and polished to a #4 finish. Exhaust airflow volume and static pressure at the duct collar(s) shall not exceed those shown on the drawings.

* Stainless steel matching enclosure panels from the top of the Hood to the finished ceiling to be furnished by KEC. (Verify ceiling height with plan.)
* All electrical connections, materials and labor to connect high and low voltage electrical to the hood lights, temperature monitors, electrical components and/or the Fire Suppression System including micro-switch(es) by other. See fire suppression system for additional detail.

* Hood Manufacturer to provide engineering and shop drawings for approval prior to fabrication.

* Exhaust and Supply Fans to be furnished by Mechanical Division in compliance with local and National Codes. See Hood Manufacturer's specification sheets for CFM and static pressure requirements.
* Duct connections by Mechanical. An air balance test should be performed before cooking start up to insure correct exhaust and supply airflow rates.
* Hood must be manufactured UL 710 Listed, NFPA 96 compliant and installed in accordance with all prevailing codes and standards.

3" Stand Off

Back The hood assembly to be per the size and shape shown on the drawing. A 3" standoff (enclosed on all sides) to be included on the entire back outer perimeter of the hood. Standoff to be fabricated from 18 gauge stainless steel of the same material and with the same finish as the hood. All exposed corners with welded and polished to a #4 finish.
Extractor

FLSS Hood to be fitted with stainless steel baffle filters. Filters to be UL1046 Listed, NSF approved. The filters will be easily removable for cleaning.
Exposed Canopy Material

304 Stainless Steel Type 304 Stainless Steel (SS) is in the "Austenitic group of SS" comprising approximately 18% chromium and 8% nickel. Type 304's resistance to corrosive acids makes it ideal for hoods, sinks and tabletops. Type 304 SS is comprised of no more than 0.8% carbon and at least 50% iron. The chromium binds oxygen to the surface of the product to protect the iron from oxidation (rust). Nickel also enhances the corrosion resistance of stainless steel. Therefore, the higher the nickel content, the more resistant the stainless steel is to corrosion. Type 304 SS is non-magnetic.
Non-Exposed Exhaust Plenum Material

304 Stainless Steel Type 304 Stainless Steel (SS) is in the "Austenitic group of ss·comprising approximately 18% chromium and 8% nickel. Type 304's resistance to corrosive acids makes it ideal for hoods, sinks and tabletops. Type 304 SS is comprised of no more than
0.8% carbon and at least 50% iron. The chromium binds oxygen to the surface of the product to protect the iron from oxidation (rust). Nickel also enhances the corrosion resistance of stainless steel. Therefore, the higher the nickel content, the more resistant the stainless steel is to corrosion. Type 304 SS is non-magnetic.
Containment Panels

Light Duty Left
Hood to be fitted with Light Duty containment panel on the left of the hood (size and shape per the drawings). Containment panel to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. Containment Panel to include a continuous double hemmed edge on the front and bottom exposed edges. Containment Panel to be easily attached or detached to the side of the hood by means of stainless-steel fasteners that screw into recessed non corrosive rib-nuts installed in the side of the hood
that do not protrude through the side of the hood. All welds to be ground smooth and polished to a #4 finish.

Light Duty Right
Hood to be fitted with Light Duty containment panel on the right of the hood (size and shape per the drawings). Containment panel to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. Containment Panel to include a continuous double hemmed edge on the front and bottom exposed edges. Containment Panel to be easily attached or detached to the side of

the hood by means of stainless-steel fasteners that screw into recessed non corrosive rib-nuts installed in the side of the hood
that do not protrude through the side of the hood. All welds to be ground smooth and polished to a #4 finish.

Make Up Air

SPD

Hood to have a full length add on supply plenum fabricated of 18-gauge stainless steel (material type and finish to be the same as the hood) that facilitates the delivery of downward supply air through a full length perforated metal. (See drawings for location and size). All welds to be polished to a #4 finish. Plenum is to be factory welded to the hood.
Light Fixture

Surface Mounted Warm LED

Hood to be fitted with UL & NSF Listed Surface Mounted Commercial Kitchen Hood light fixtures. Light fixture to have brushed aluminum housing, tempered glass, shatter resistant globe. Light fixture(s) to be prewired to a single connection point for each hood. To be fitted with LED lamp.

Lamps

Surface Mounted Warm LED

LED lamp, 120vac, UL Listed for exhaust canopy hoods, 12 Watt, 960 Lumens, 4500K to 5500K, maximum operating temperature 80 degrees C (176*F). 120 degree Beam angle, rated for 50,000 hour lamp life, mercury-free, instant (no ballast), exceeds Federal Energy Act requirement, no ultraviolet light emission. Fits any A19/E26/E27 fixture (globe must be installed to comply with UL listing).
Auto Fan Start

An Auto Fan Start is required for NFPA 96 Section 8.2.3.3. Auto Fan Switches may be located in each hood exhaust collar or the hood canopy. Auto Fan Switches in the canopy have a maximum spacing of 84".

Access Enclosure Hood Exhaust Collar Mounted

Hood Exhaust Collar to be fitted with UL 710 listed Access Enclosure(s) size and shape per the drawing with a removable cover plate that protects and allows access to monitoring equipment from inside of the hood exhaust plenum. The removable cover to be held in place by stainless steel fasteners. When the Enclosure's cover is removed it allows easy access for installation, adjustments and service to the equipment inside the hood exhaust collar. Access Enclosures to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. All welds to be ground smooth and polished to a #4 finish.
Hood Utility Cabinet

Hood Utility Cabinet (HUC) assembly to be per size and shape shown on the drawing. Cabinet constructed with angle iron frame and stainless-steel body. All exposed surfaces to be fabricated of 18-gauge Type 304 stainless steel (s/s) with a #4 finish. All exposed welds to be ground smooth and polished to a #4 finish. Cabinet has an open top to enable utility connections from above ceiling and a stainless-steel lift out removable door panel. The removable door panel to have a recessed s/s door pull, full grip type. The removable door panel to be held in place by a full length upper and lower channel.

Ceiling Enclosure

Stainless steel matching enclosure panels from the top of the Hood to the finished ceiling. {Verify ceiling height with plan.) Ceiling Enclosure panels to be fabricated of 18-gauge stainless steel (material type and finish to be the same as the hood). Any exposed welds to be ground smooth and polished to a #4 finish.
Double Wall Construction

Double Wall Panel(s) to be fabricated from 18-gauge stainless steel of the same material and with the same finish as the hood. Panel(s) contain a UL listed fiber insulation that is 1· thick. Panel dimensions and locations to be per size and shape shown on the drawing. Double Wall Panels to be welded to the hood-by-hood manufacturer.

Insulated Wall Lining

A. 18-gauge stainless steel wall panels (minimum length to be 36”) per California Mechanical Code Chapter 5. Wall lining to be applied with Dow Corning #995 adhesive. " Liquid Nails" not acceptable.
B. Wall panels shall be installed horizontally and fluted vertically every 6” from top of floor base to bottom lip of hood
C. Wall lining shall be installed without exposed screws and bolts.
D. Provide stainless steel “tees” and/or “ells” at each panel on both sides, bottom and top.
E. Wall lining shall meet the requirements of NFPA-96 and all local codes and ordinances.
G. Provide 18-gauge stainless steel closure skirting form top of hood to finish ceiling.
H. Provide all hanging information to the Contractor including the total weight of the hood.
I. Furnish all necessary materials to support this assembly from the building structure. Assembly shall meet the requirements of NFPA-96 and the latest edition of the California Mechanical Code.

ITEM #39 SPARE NO.

ITEM #40 SPARE NO.

ITEM #41 PRE-RINSE FAUCET ASSEMBLY
Quantity: One (1)
Manufacturer: T&S Brass (or equal)
Model: B-0133-CR-B8TP
Status: CFCI
EasyInstall DuraPull Pre-Rinse Unit, 8" adjustable wall mount faucet, quarter-turn Cerama cartridges with check valves, lever handles with color coded indexes, 12" riser, accessory fitting tee, 6" wall bracket, stainless steel pull-down activated valve unit with 1.07 GPM insulated grip handle blue sprayer, 30" flexible stainless steel hose, 1/2" NPT female inlets, cCSAus, low lead

Accessories:
1 ea. Model B-0230-KIT Inlet Kit, 1/2" NPT nipple, close elbows, 24" flex supply hoses

ITEM #42 SPARE NO.

ITEM #43 SPARE NO.

ITEM #44 DISHWASHER, DOOR TYPE, VENTLESS
Quantity: One (1)
Manufacturer: Hobart (or equal)
Model: AM16VLT-ADV-2
Status: CFCI
Ventless Dishwashing Machine, tall chamber (27") door type, energy recovery, automatic soil removal (ASR), drain water energy recovery (DWER), high temp sanitizing, 208-240/60/3 (field convertible to single phase), internal condensing system, 38 racks/hour, straight-thru or corner installation, user-friendly smart touchscreen controls, Sense-A-Temp™ booster, electric tank heat, X-shaped wash arms, scrap screen and basket, door actuated start, door lock, stainless steel tank, tank shelf, chamber, trim panels, frame & feet, pumped drain air gap, drain water tempering, cULus, NSF, ENERGY STAR®. Factory Startup - Free for installations within 100 miles of a Hobart Service Office during normal business hours with appropriate notice; installation beyond 100 miles will be quoted by Service.

Accessories:

1 ea. Oversized units with crated shipping dimensions greater or equal to 72" in length and/or 90" in height. If delivery is to a facility without a standard height dock, additional shipping charges will apply depending on the service requested. consult Factory.
1 ea. Standard warranty - 1-Year parts, labor & travel time during normal working hours within the USA
1 ea. Model RAPID-FILL1-AM16 Rapid Fill Kit Single Valve – For faster filling, requires separate hot water connection
1 ea. Model ACC-INSTALL-RAPID16 Accessory Installation - for installation within 100 miles of a Hobart Service Office during normal business hours with appropriate notice; installation beyond 100 miles will be quoted by Service. Includes installation of this item only, final electrical or plumbing connections by others. Recommendation: coordinate accessory installation with machine assembly/ installation (NET)
1 ea. Model WS40-NOINSTALL Water Softening System, 2,527 grains/lb capacity, 5 gallons regeneration volume, & salt alarm, holds 1 bag of salt, pricing DOES NOT include standard installation. INSTALLATION BY AUTHORIZED HOBART SERVICE OFFICE IS RECOMMENDED (NET)

ITEM #45 SPARE NO.

ITEM #46 SPARE NO.

ITEM #47 SPARE NO.

ITEM #48 REACH-IN REFRIGERATOR
Quantity: One (1)
Manufacturer: True Mfg. (or equal)
Model: T-49-HC
Status: CFCI
Refrigerator, reach-in, two-section, (2) stainless steel doors, (6) PVC coated adjustable wire shelves, interior lighting, stainless steel front, aluminum sides, aluminum interior with stainless steel floor, 4" castors, R290 Hydrocarbon refrigerant, 1/2 HP, 115v/60/1-ph, 5.4 amps, NEMA 5-15P, cULus, UL EPH Classified, Made in USA, ENERGY STAR®

Accessories:

1 ea. Self-contained refrigeration standard
1 ea. Warranty - 7 year compressor (self-contained only), please visit www.Truemfg.com for specifics
1 ea. Warranty - 5 year parts & labor, please visit www.Truemfg.com for specifics
1 ea. Left door hinged left, right door hinged right standard
1 ea. Adjustable flanged feet

ITEM #49 REACH-IN FREEZER
Quantity: One (1)
Manufacturer: True Mfg. (or equal)
Model: T-49F-HC
Status: CFCI
Freezer, reach-in, two-section, -10°F, (2) stainless steel doors, (6) PVC coated adjustable wire shelves, interior lighting, stainless steel front, aluminum sides, aluminum interior with stainless steel floor, 4" castors, R290 Hydrocarbon refrigerant, 1 HP, 115v/60/1-ph, 9.6 amps, NEMA 5-15P, Made in USA, cULus, UL EPH Classified, ENERGY STAR®

Accessories:
1 ea. Self-contained refrigeration standard
1 ea. Warranty - 7 year compressor (self-contained only), please visit www.Truemfg.com for specifics
1 ea. Warranty - 5 year parts & labor, please visit www.Truemfg.com for specifics
1 ea. Left door hinged left, right door hinged right standard
1 ea. Adjustable flanged feet

ITEM #50 STACKING WASHER AND DRYER
Quantity: One (1)
Manufacturer:
Model:
Status: OFOI

ITEM # 51 WIRE SHELVING
Quantity: Six (6)
Manufacturer: Metro (or equal)
Model: A2454NS
Status: CFCI
Super Adjustable Super Erecta® Shelf, wire, 54"W x 24"D, stainless steel finish, plastic split sleeves are included in each carton, corner release system, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor.

Accessories:
6 ea. Model 63UPS Quick Ship - Super Erecta® Post, 61-13/16"H, for use with stem casters, type 304 stainless steel
6 ea. Model 5MPRGSA Super Erecta® Cart-Washable Stem Caster, rigid, 5" dia., 1-1/2"W face, 300 lb. capacity, corrosion resistant, flat polyurethane wheel tread, stainless steel bearings, includes bumper

ITEM #52 SPARE NO.

ITEM #53 HAND SINK
Quantity: Two (2)
Manufacturer: Eagle Group (or equal)
Model: HSAP-14-ADA-FW
Status: CFCI
Hand Sink, wall mount, 14" wide x 16" front-to-back x 5" deep bowl, 16/304 stainless steel construction, splash mount gooseneck faucet with wrist handles & mixer valve, marine edge on front & sides, 1/2" NPS water inlet, chrome-plated P-trap, wrist handles, soap dispenser, basket drain, skirt assembly & paper towel dispenser, PHYSICALLY CHALLENGED, NSF

Accessories:

2 ea. Model 313305 T&S Extra Heavy Duty Gooseneck Faucet, wrist handles, splash mount 4" OC, NSF

ITEM #54 WALL MOUNTED SOAP AND TOWEL DISPENSERS
Quantity: Two (2)
Manufacturer: Bobrick (or equal)
Model: B40 W/B-262
Status: CFCI
Install per ADA requirements.

ITEM #55 ICE MAKER, CUBE-STYLE
Quantity: One (1)
Manufacturer: Manitowoc (or equal)
Model: IYT0300A
Status: CFCI
Indigo NXT™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 30"W x 24-1/2"D x 16-1/2"H, production capacity up to 310 lb/24 hours at 70°/50° (230 lb AHRI certified at 90°/70°), easyTouch display with 13 different language options, date/time stamp display, automatic reminder/alert icon, one touch asset information, automatic detection of accessories, continuous operating status, programmable production options (time, weight, day or night), one touch cleaning with displayed instructions, Alpha-San anti-microbial protection, acoustical ice sensing probe, self-diagnostic technology, DuraTech™ exterior, half-dice size cubes, R404a refrigerant, NSF, cULus, CE, ENERGY STAR®

Accessories

1 ea. Model WARRANTY-ICE-SC 3 year parts & labor (Machine), 5 year parts & labor (Evaporator), 5 year parts & 3 years labor (Compressor), standard
1 ea. Model AR-10000-P Arctic Pure® Plus Primary Water Filter Assembly, includes head, shroud, hardware, mounting assembly, & (1) filter cartridge, 15,000 gallon capacity, 0-600 lbs./ice per day
1 ea. Model WARRANTY-ARCPURE 3 year parts & labor warranty on cap, housing, hardware, & mounting assembly (does not refer to filter cartridge), standard
1 ea. Model D400 Ice Bin, 30"W x 34"D x 38"H, with side-hinged front-opening door, side grips, 365 lbs. application capacity, AHRI certified 12.3 cu. ft., for top-mounted ice maker, Duratech exterior, NSF
1 ea. Model WARRANTY-BIN/DISP 3 year parts & labor warranty, standard
1 ea. Model K00463 Ice Scoop, 85 oz (5.3 lbs.) capacity, thumb & knuckle guard, rubber
1 ea. handle, internal or external bin mounting (compatible with D Bins), cast aluminum, NSF
1 ea. Legs, 6" adjustable stainless steel, standard

ITEM #56 AIR CURTAIN
Quantity: One (1)
Manufacturer: Berner (or equal)
Model: SLC07-1072A
Status: CFCI
Sanitation Series Low Profile Air Curtain, 72"L, unheated, (1) 1/5 hp motor, for doors up to 7' high, specify exterior, interior or exterior mounting, UL, cULus, UL EPH, MADE IN USA

Accessories:

1 ea. Five year parts warranty (unheated units)
1 ea. Model A 120v/60/1-ph
1 ea. White powder coat exterior finish, standard
2 ea. Model 9503SD020-P Automatic Door Switch, plunger type, activates air door when door opens, single phase only & max. amp draw of 20 amps, 120-240V
1 ea. Model 66ZPR000WMB-AZ-007-SS Z Wall Bracket, adjustable depth, stainless steel finish, priced per each (one pair)

END SECTION

PROJECTION SCREENS

Section 11 52 13
17-18-016

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00, Rough Carpentry.

B. Section 09 51 13 Acoustical Ceilings.

C. Division 26, Electrical.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

1.04 SUBMITTALS

A. Refer to Section 01 30 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Shop Drawings: Submit showing all parts, connections and anchorages, adjacent materials, fully dimensioned and noted.

D. Submit executed Guarantee of Contractor/Subcontractor per Article 1.05.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 30 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.04.

1.06 REFERENCES AND STANDARDS

A. Title 24, Part 2, CCR, California Building Code.

B. Screen shall be listed with Underwriters Laboratories (UL).

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Type 1: Projection Screen; DA-LITE Screen Company, Inc.: Tensioned Cosmopolitan Series Automatic Electric Projection Screen Model: Projection screen(s), (57.5” H) x (92”W), electrically operated 120 volt (60Hz) not more than 2.4 amp. Shall have specially designed motor mounted inside the roller, to be three wire with ground quick reversal type, oiled for life, with automatic thermal overload cut-out, integral gears, capacitor and an electric brake to prevent coasting. To have pre-set but adjustable limit switches to automatically stop picture surface in the “up” and “down” positions. The roller to be of aluminum. Screen fabric to be flame retardant and mildew resistant vinyl with black masking borders standard. Each side of fabric to have a tab guide cable system to maintain even lateral tension and hold surface flat. Bottom of fabric to be inserted into a custom aluminum slat bar with added weight to provide vertical tension on the screen surface. The ends of the slat to be protected by heavy duty plastic caps enclosing a preset adjustable mechanism for screen tensioning. Case to be a two-piece design made of extruded aluminum with a white, lightly textured powder coat finish. Screen to include a three-position control switch and cover plate. Screen to be listed by Underwriters’ Laboratories.

1. Screen surface: HD Progressive 1.3.

2. Size: 57.5” high x 92” wide viewing area. Wide (16:10) aspect ratio.

3. Switch: key operated switch with locking switch cover plates.

4. Case finish: Aluminum, white powder coated.

5. Mounting: Ceiling Trim Kit for recessed installation into suspended acoustical ceiling

B. Projector Mount: Chief's SYSAU Suspended Ceiling Projector System, universal suspended ceiling mount kit series.

1. Color: White

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 INSTALLATION

A. Install in location indicated on plans in accordance with manufacturer's written installation instructions.

B. Suspend from ceiling from end caps with hooks and cables or wall brackets as shown. Attach securely to solid blocking in ceiling or wall.

C. Set square and level.

3.03 ADJUSTING AND CLEANING

A. Completely adjust all structural leveling supports for proper operation without jamming due to deflection. Adjust operating hardware for smooth functioning and tight perimeter seals.

B. Remove fingerprints, stains and the like from surfaces.

3.04 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

END OF SECTION

DIVISIONS 15-33

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Valve Boxes.
   2. Access doors.
   3. Expansion loops.
   4. Insulation.

1.2 RELATED REQUIREMENTS

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

B. This Section is part of each Division 21 Section.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.

B. Make temporary connections required to maintain services during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before interrupting services.

1.4 REFERENCES AND STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at time of bid shall be used.
   1. ANSI - American National Standards Institute.
   2. ASME - American Society of Mechanical Engineers.
   3. ASTM - American Society for Testing and Materials.
   4. CCR - California Code of Regulations.
      a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
   5. NCPWB - National Certified Pipe Welding Bureau.
   6. CEC - California Electrical Code.
   7. NEMA - National Electrical Manufacturers' Association.
   8. NFPA - National Fire Protection Association, as amended by the CBC.
   9. OSHA - Occupational Safety and Health Act.
   10. UL - Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:
   1. The publications listed below form part of this Specification. Comply with provisions of these publications except as otherwise shown or specified.
      a. California Building Code, 2022.
      b. California Electrical Code, 2022.
      c. California Energy Code, 2022.
      d. California Fire Code, 2022.
      e. California Green Building Standards Code, 2022.
      f. California Mechanical Code, 2022.
      g. California Plumbing Code, 2022.
      h. California Code of Regulations, Title 24.
      i. California Health and Safety Code.
      j. CAL-OSHA.
      k. California State Fire Marshal, Title 19 CCR.
      l. DSA - Division of the State Architect. Interpretive Regulations (IR's).
      m. National Fire Protection Association, as amended by the CBC.
      n. Occupational Safety and Health Administration.
      o. Other applicable state laws.
   2. Nothing in Drawings or Specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or Specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

A. Examine Contract Documents prior to bidding of Work and report discrepancies in writing to Architect.

B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The fire protection Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
   1. Architectural and structural Drawings are part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over fire protection Drawings.
   2. Because of the small scale of fire protection Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in locations shown. Obtain Architects' approval prior to relocation of equipment and materials.
   3. Relocate equipment and materials installed without prior approval of Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.
   4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing

such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with the requirements of Division 01.

B. Arrange for utility connections and pay charges incurred, including excess service charges.
   1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. General:
      a. Coordinate Work in this Section with trades covered in other Specification Sections to provide a complete and operable installation of highest quality workmanship.
   2. Electrical Coordination:
      a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified in this Section. Contractor has full responsibility for the following items of work:
         1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
         2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of bid.
         3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
   3. Mechanical Coordination:
      a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
      b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.

c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”

1.8 SUBMITTALS - GENERAL

A. Refer to Division 01 Submittals Section(s) for additional requirements.

B. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
   1. Partial or incomplete submittals will not be reviewed.
   2. Quantities are Contractor's responsibility and will not be reviewed.
   3. Provide materials of same brand or manufacturer for each class of equipment or material.
   4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
   5. Identify each submittal item by reference to items’ Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
   6. Organize submittals in same sequence as in Specification Sections.
   7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
      a. Submit shop drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
      b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
      c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
      d. Catalog cuts and published material may be included with supplemental scaled drawings.

C. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor’s responsibility and will not be reviewed by Architect.

D. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
   1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Contract Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from Contract Documents shall be clearly identified and appear at the beginning of submittal package and shall be referenced to applicable Contract Documents requirements.

E. Furnish to Project Inspector complete installation instructions on material and equipment before starting installation.

1.9 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for fire protection systems materials and products.

B. Shop Drawings.

C. Provide product data for insulation products, including insulation, insulation facings, jackets, adhesives, sealants, and coatings, indicating compliance with requirement that these products contain less than 0.1 percent (by mass) polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations.

D. Product Data for California Green Building Standards Code Compliance: For adhesives and sealants, including primers, documentation of compliance including printed statement of VOC content and chemical components.

1.10 INFORMATIONAL SUBMITTALS

A. Provide coordination drawings for fire protection systems in accordance with the requirements of Specification Section 21 10 00.

B. Provide layouts for fire protection systems, for inclusion in coordinated layout specified in Section 23 80 00. Comply with requirements for layouts specified in Section 23 80 00.

1.11 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
   1. Refer to Division 01 for complete instructions.
   2. Furnish three complete sets of Operating and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operating and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Start compiling data upon approval of submittals.

a. Sets shall incorporate the following:
   1) Product Data.
   2) Shop Drawings.
   3) Record Drawings.
   4) Service telephone number, address and contact person for each category of equipment or system.
   5) Complete operating instructions for each item of fire sprinkler system.
      a) Original manual of NFPA-25 for fire sprinkler system.
   6) Copies of guarantees/warrantees for each item of equipment or systems.
   7) Test data as specified.
   8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
   9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
   10) A complete list or schedule of scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
   11) Check test and start reports for each piece of fire protection equipment provided as part of the Work.
   12) Commissioning and Preliminary Operation Tests required as part of the Work.

b. Post service telephone numbers and addresses in an appropriate place designated by Architect.

B. Record Drawings:
   1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
   2. Upon completion of the work, deliver to Architect the following:
      a. Originals of drawings showing the Work exactly as installed.
      b. One complete set of reproducible drawings showing the Work exactly as installed.
      c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
      d. Provide Contractor’s signature, verifying accuracy of record drawings.
      e. Obtain the signature of the Project Inspector for all record drawings.

1.12 SUBSTITUTIONS

A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given in this Section and those of Division 01, Division 01 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.

C. Substitutions will be interpreted to be manufacturers other than those specifically listed in Contract Documents by brand name, model, or catalog number.

D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:
   1. Reason for substitution request.
   2. Complete submittal information as described herein; see “Submittals.”
   3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
   4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
   5. Explanation of impact on connected utilities.
   6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is Contractors’ responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.

G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

1.13 DELIVERY, STORAGE AND HANDLING

A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.

B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by Architect and shall be made without additional cost to Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.

B. Repair or replace defective work, material, or part that appears within warranty period, including damage caused by leaks.

C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum.

C. Refer to Section 21 10 00 for specific system piping materials.

2.2 MATERIALS

A. No material installed as part of this Work shall contain asbestos.

B. California Green Building Code Compliance:
   1. Fire protection equipment shall not contain CFCs.
   2. Fire protection equipment shall not contain Halons.

2.3 VALVE BOXES

A. General:
   1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular "vault" type adequately sized for condition and similar in construction to those specified above.
   2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
   3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.

B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.

C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron or steel locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

2.4 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to fire protection equipment or devices, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
   1. Access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 08, except as noted in this Section.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for other areas.

D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with Architect when access is required in these areas.

E. Where specific information or details relating to access panels different from the above is shown or given on Drawings or other Divisions of work, that information shall supersede this specification.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
   1. Milcor:
      a. Style K (plaster)
      b. Style DW (gypsum board)
      c. Style M (masonry)
      d. Style "Fire Rated” where required

2.5 EXPANSION LOOPS

A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend or center section of flexible hose. Flexible hose shall consist of corrugated metal inner hose and braided outer sheath. Provide UL listed assembly selected for 4 inches of movement.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   1. Metraflex Inc., Fireloop series.
   2. Unisource Manufacturing, Inc., V series.

2.6 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

B. Text of Signs: Provide identification of equipment unit number, and room or area served. Coordinate name of area served with final room names and numbers for the facility. In addition, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

2.7 PIPE IDENTIFICATION

A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.

B. The legends and flow arrows shall conform to ASME A13.1.

2.8 INSULATION WORK

A. General:
   1. Adhesives shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
   2. The term "piping" used herein includes pipe, valves and fittings.
      a. Apply insulating cement to fittings, valves and strainers and trowel smooth to equal the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to bonnet. Leave strainer cleanout plugs accessible.
      b. Provide pre-formed PVC valve and fitting covers.
      c. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
   3. Test insulation, jackets, and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723, ASTM E84, or NFPA 255.
   4. Clean thoroughly, test and have approved, piping and equipment before installing insulation and/or covering.
   5. Repair damage to existing pipe insulation whether or not caused during Work of the Contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:
   1. Insulate fire protection piping located outside building exposed to weather with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness for all pipe sizes: 2 inches.
   2. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2-inch stainless-steel bands on 12-inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
      a. Fitting covers:
         1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
         2) Tee covers.
         3) Flange and union covers.
         4) End caps.
         5) Beveled collars.
         6) Valve covers.
         7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
      b. Pipes 10 inches diameter and smaller: Minimum .016-inch-thick jacket.
      c. Pipes 12 inches diameter and larger: Minimum .020-inch-thick jacket.

PART 3 - EXECUTION

3.1 EXISTING MATERIALS

A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.

B. Removed materials which will not be reinstalled, and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.

C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

D. Existing piping and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

3.2 FRAMING, CUTTING AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

3.3 DEMOLITION

A. Refer to Division 01 Sections “Cutting and Patching” and/or “Selective Demolition” for general demolition requirements and procedures.

B. Disconnect, dismantle and remove fire protection systems, equipment, and components indicated to be removed. Coordinate with all other trades.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material.
   3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
   4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.4 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the fire protection Work with the electrical Work to comply.

B. Furnish necessary control diagrams and instructions for controls. Before permitting operation of equipment which is furnished, installed, or modified under this Section, Contractor shall review associated electrical work, including overload protection devices, and assume complete responsibility for correctness of electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. Equipment and connections exposed to weather shall be installed in NEMA IIIR enclosures with factory wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with fire protection system are included in this Section. Wiring and conduit shall comply with Division 26.

3.5 PIPING SYSTEM REQUIREMENTS

A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.6 PRIMING AND PAINTING

A. Perform priming and painting on the equipment and materials as specified herein.

B. See Division 09 Painting Section(s) for detailed requirements.

C. Priming and Painting:
1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
    a. Black Steel Piping:
        1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
        2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the highest grade zinc rich primer. After erection or installation, primed surfaces shall be properly cleaned of foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Abrasion or other

damage to shop or field prime coat shall be properly repaired and touched up with same material used for original priming.

3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.7 EXCAVATING

A. Perform excavating required for Work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide 3 foot minimum cover for fire piping, or 1 foot below frost line, whichever results in deepest installation. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For PVC pipe, bed pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. Other materials should have minimum sand equivalent of 50. Only a small proportion of native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that less than 100 percent will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain warning signs, barricades, flares, and red lanterns as required.

D. For trenches 5 feet or more in depth, submit copy of permit, and detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during excavation of such trenches. Obtain a permit from Division of Industrial Safety prior to beginning excavations. A copy of permit shall be available at the Project site.

3.8 BACKFILLING

A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.

1. Backfill plastic pipe and insulated pipe with sand for minimum distance of 12 inches above the top of pipe. Compact using mechanical tamping equipment.

C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase minimum compaction within uppermost two feet of backfill to 95 percent.

D. Replace or repair to its original condition sod, concrete, asphalt paving, or other materials disturbed by trenching operation. Repair within warranty period.

E. Thrust Blocks:
   1. Provide concrete anchors or thrust blocks on PVC and cast iron water lines installed underground. Install thrust blocks at changes in direction and at connections to mains 1-1/2 inches and larger. Form thrust blocks by pouring concrete between pipes and trench wall. Thrust blocks shall be adequate in size and placed to take thrusts created by the maximum internal water pressure; sizing and placement shall be per manufacturer's recommendations and in accordance with requirements of NFPA 24.
   2. Anchor piping to building construction.

3.9 PIPING SYSTEMS INSTALLATION

A. At time of final connection, and prior to opening valve to allow pressurization of water piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on fire protection piping is greater than 175 psi, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

B. General:
   1. Piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
   2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
   3. Install piping to permit application of insulation where required and to allow valve servicing.
   4. Where piping or conduit is left exposed within a room, the piping or conduit shall be run true to vertical, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
   5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from Architect.
   6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
   7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
   8. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
   9. Install horizontal valves with valve stem above horizontal.

10. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
11. Verify final equipment locations for roughing-in.
12. Service Markers: Mark location of each plugged or capped pipe with 4 inch round by 30 inch long concrete marker, set flush with finished grade. Provide 2-1/2 inch diameter engraved brass plate as part of service marker.
13. Where piping is installed in walls within one inch of face of stud, provide 16 gauge sheet metal shield plate on face of stud. The shield plate shall extend minimum 1-1/2 inches beyond outside diameter of pipe.

C. Expansion Loops:
1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
2. Install expansion loops of sizes matching sizes of connected piping.
3. Install grooved-joint expansion joints to grooved-end steel piping.
4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by piping system in which expansion loop is installed.

D. Sleeves:
1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations, as directed, shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate pipe from concrete.

E. Floor, Wall, and Ceiling Plates:
1. Fit pipes, with or without insulation, passing through walls, floors, or ceilings, and hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

F. Firestopping:
1. Pack annular space between pipe sleeves and pipe through floors and walls with UL listed fire stop, and seal at ends. Pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
    a. Install fire caulking behind fire protection services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators, or equal, for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have built in anchor ring for waterproofing and anchoring into concrete pours or use special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal, or equal, plugs on both sides of penetrator to reduce noise and to provide waterproofing.

5. All above systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved as equal. Contractor is responsible for determining suitability of alternate products for their intended use, and shall assume all risks and liabilities in connection with the use of alternate products.

G. Flashing:
1. Flashing for penetrations of metal or membrane roof for fire protection items shall be coordinated with roofing manufacturer and roofing installer for specific roofing type utilized. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for fire protection work.
   a. Furnish and install flashing and counterflashing in strict conformance with requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
   b. Furnish and install counterflashing above each flashing required. Elmdor/Stoneman Model 1540, or equal.
2. For other types of roofing systems, furnish and install around each pipe, where pipe passes through roof, a flashing and counterflashing. Flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. Elmdor/Stoneman Model 1100-4, or equal.

H. Hangers and Supports:
1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers as required. Hangers and supports shall be UL listed for fire protection service. Components shall support weight of equipment, pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, shall be of same size as pipe or tubing on which used, or nearest size available. Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide “trapeze” (bridging) support members attached to building structural members by methods approved by structural Engineer.
   a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
2. Hanger components shall be provided by one manufacturer. B-Line, Grinnell, Tolco, Afcon, Loos & Co., Uni-Strut, or equal.
3. Hanger and Supports:
   a. Vertical Piping: Tolco Fig. 6, or equal, clamps attached to pipe above each floor to rest on floor. Provide intermediate support for vertical piping greater than 25 feet in length.
   b. Individually Suspended Piping: Tolco Fig. 200 or Fig. 1 Clevis, complete with threaded rod, or equal.

Pipe Size	Rod Size
4" and Smaller	3/8"
5" to 6"	5/8"

c. Trapeze Suspension: Sch-10 or Sch-40 steel pipe trapeze member in accordance with NFPA 13 published load ratings.
d. Pipe Clamps and Straps: B-Line B2000 or B2400, Tolco, Fig. 200 or Fig. 1, or equal. Where used for seismic support systems, provide B-line B2400, Tolco fig. 69 series retainer pipe straps, or equal.
e. Steel Connectors: Tolco Fig. 65 beam clamps with Fig. 69 retainer straps, or equal.
f. Deck Connectors: Afcon Fig. 610 steel ceiling plate, or equal, where approved by structural Engineer.

4. Support to Structure:
   a. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of structural components. Burning or welding on structural member may only be done if approved by Architect.
5. Pipe hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced per NFPA 13, and per pipe manufacturer's listing, except as noted below.
6. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
7. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
8. Insulate copper piping from ferrous materials and hangers with two layers of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
9. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
10. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.10 UNION AND FLANGE INSTALLATION

A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel pipe or material. Bushings or couplings shall not be used.

B. Install unions in piping NPS 2” and smaller and flanges in piping NPS 2-1/2” and larger whether shown or not at each connection to equipment and tanks, and at connections to automatic valves.

C. Locate unions for easy removal of equipment, tanks, or valves.

3.11 ACCESS DOOR INSTALLATION

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of fire protection systems. Access doors shall provide for complete removal and replacement of equipment.

3.12 CONCRETE WORK

A. Concrete work required for Work of this Section shall be included under another section of the Specification, unless otherwise noted, including reinforced concrete bases for pumps, tanks, compressors unless the work is specifically indicated on Drawings to be furnished under this Section.

B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specifications. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

3.13 PIPE IDENTIFICATION

A. Provide temporary identification of each pipe installed, at time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the Work.

B. Apply legend and flow arrow at valve locations; at points where piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with approval of Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
   1. Apply legend and flow arrow at approximately 10’-0” intervals in science classrooms and science prep rooms.

C. Wherever two or more pipes run parallel, markings shall be supplied in the same relative location on each.

D. Apply markings after painting and cleaning of piping and insulation is completed.

3.14 EXPANSION ANCHORS IN HARDENED CONCRETE:

A. Refer to Structural Drawings.

B. Qualification Tests: The specific anchor shall have a current ICC-ES report and have been evaluated in cracked concrete in accordance with Acceptance Criteria AC193. The design

shear and withdrawal load shall not be more than 80% of allowable load listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor.

C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

D. Testing: Fifty percent of anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of the project inspector.

E. The load may be applied by any method that will effectively measure tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor, or calibrated spring-loading devices. Anchors in which torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.15 TESTS AND ADJUSTMENTS

A. Test installations in accordance with the following requirements and all applicable codes:
1. Project Inspector should witness tests of piping systems.
2. Notify Architect at least seven days in advance of tests.
3. Notify local fire department of time and date of fire systems testing.
4. Piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
5. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
6. Isolate from system equipment that may be damaged by test pressure.
7. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems only. Remove plate and complete connection to existing system at completion of testing.
    a. Project Inspector shall witness final connection to system.

B. Test Schedule: No loss in pressure or visible leaks shall show after four hours at pressures indicated:

System Tested	Test Pressure PSI	Test With
Fire Sprinkler Piping	200	Water
Compressed Air	200	Air & Non-corrosive Leak Test Fluid
Dry Standpipes	300	Water
Wet Standpipes	200	Water

1. Piping, including underground piping, connected to fire sprinkler system shall be tested and certified in accordance with NFPA requirements, except where requirements listed in this Section exceed requirements of NFPA.
2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with type of gas conveyed by piping system.

C. Should material or work fail in any of these tests, it shall be immediately removed and replaced with new material, and portion of work replaced shall again be tested by Contractor at his own expense.

D. Lubricate each item of equipment, including motors, before operation.

3.16 TRACER WIRE INSTALLATION

A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #14 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.

B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as previously specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than l/2 inch within the top 12 inches of backfill. Take precautions to ensure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

3.17 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of fire protection equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
1. As part of the submittal process, provide a copy of each manufacturer’s printed startup form to be used.
2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer’s employees. See specific equipment Articles in these Specifications for this requirement.

3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.18 COMMISSIONING AND PRELIMINARY OPERATIONAL TESTS

A. Prior to observation to determine final acceptance, put fire protection systems into service and check that work required has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of tests.
1. Equipment has been started, checked, lubricated and adjusted in accordance with manufacturer's recommendations.
2. Correct rotation of motors and ratings of overload heaters are verified.
3. All manufacturers' certificates of start-up specified have been delivered to Owner.
4. All equipment has been cleaned, and damaged painted finishes touched up.
5. Missing or damaged parts have been replaced.
6. Flushing of piping systems has been completed and water treatment equipment, where specified, is completed.
7. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
8. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
9. Maintenance manuals have been delivered and Owner training has been completed.

B. Review of Contractor's Tests:
1. Tests made by Contractor or manufacturers' representatives are subject to observation and review by Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon completion of tests, provide letter to confirm that testing has been successful.

C. Test Logs:
1. Maintain test logs listing the tests on mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of tests.

END OF SECTION 21 00 50

FIRE SPRINKLER SYSTEMS
Section 21 10 00
Project #23-34-026

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sprinkler heads.
   2. Pipe and Fittings.
   3. Valves.
   4. Water flow alarm switch.
   5. Fire Department connection.

1.2 RELATED REQUIREMENTS

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

B. Section 21 00 50 Basic Fire Sprinkler Materials and Methods.

1.3 REFERENCES AND STANDARDS

A. It is the intent of these Specifications to provide for complete and operating fire protection automatic sprinkler system in full compliance with the following standards:
   1. National Fire Protection Association (NFPA) Standard No. 13, 2022, as amended by the CBC.
   2. CBC Chapter 9.

B. The work shall also be in accordance with local or state requirements that apply.

1.4 DESCRIPTION OF WORK

A. Work of this section includes, but is not necessarily limited to, the following:

B. Furnish all coordination, labor, materials, tools, and equipment to install a wet pipe automatic fire sprinkler system as described in this Specification Section, and shown on Contract Drawings.
   1. The Work includes, but is not limited to the following:
      a. Complete automatic fire risers, including valves, fire department connections, flow switches, pressure switch and service mains as indicated on Drawings.
      b. Complete interior wet type automatic fire protection spray type sprinkler distribution system, including overhead service and branch mains, lateral supply piping, supports, hangers, seismic bracing, and heads, as indicated on Drawings.
      c. Required tests and inspections.

d. Provide electrical work required to complete the system. Contractor shall be responsible for providing complete and operable systems, including electrical wiring. Install wiring in conduit, in accordance with Division 26.
e. Protected areas include areas above and below the finished ceilings, exterior exposure, canopies, stairways, rooms, areaways, entry, etc, and other areas requiring sprinklers.
f. Tags, identification labels and instruction manuals for proper operation and maintenance.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:
1. It is expected that the Project shall progress according to the following sequence of events:
a. Upon award of bid, Contractor shall begin preparing coordination drawings. See Coordination Article.
b. Completed coordination drawings shall be submitted to Architect for review. See Submittals Article in this Section and in Section 21 00 50.
c. Engineer will determine need for Project re-submittal to DSA:
1) No DSA re-submittal required: Coordination drawings will be returned to Contractor with comments noted and Contractor shall proceed with fabrication and erection of system in accordance with Contract Documents and reviewed submittal.
2) DSA re-submittal required: Engineer will incorporate changes depicted in coordination drawings into Contract Drawings and hydraulic calculations for re-submittal to DSA. Upon DSA approval of re-submittal, Contractor shall proceed with fabrication and erection of system in accordance with modified Contract Documents.
d. Contractor shall issue Request for Information (RFI) for each field change required after approval of coordination drawings or approval of DSA re-submittal has been obtained. Contractor shall not proceed with changes prior to RFI response.
e. Contractor shall inform Architect immediately if deviating from this sequence of events.
2. The coordination process may not be used to redesign an automatic fire sprinkler system by the Contractor. Only those changes required for coordination with the work of other trades will be allowed.

B. Coordination:
1. Coordinate Work in this Section with trades covered in other Sections of Specifications to provide a complete and operable installation of highest quality workmanship.
2. Coordinate location of fire protection piping, mains and branches, to avoid interference with work by other trades. Plumbing drainage piping and ductwork shall have right-of-way over fire protection piping. Wherever conflicts exist, fire protection piping shall be offset or rerouted at no additional cost to Owner. Provide locations of piping for use in Coordinated Layout called for in Specification Section 23 80 00.

3. Piping shall be concealed, except where so indicated or where absolutely necessary to be exposed. Exposed piping shall be placed as approved by Architect prior to installation. Heads shall be fully coordinated with architectural reflected ceiling plan and placed in center of ceiling tiles.
4. On-site measurement of pipe will be required. Offsets, pipe, fittings, drains, etc., required to meet job conditions shall be furnished and installed at no extra cost to Owner.
5. Additional heads required by NFPA 13 regulations shall be provided at no extra cost, if required as a result of Contractors' coordination. Location of heads and mains shall not be changed unless approved by Architect.
6. Coordinate layout and installation of sprinklers with other construction penetrating ceilings, including light fixtures, HVAC equipment, and partition assemblies.
7. The Architect shall decide any differences or disputes concerning coordination, interference or extent of work, and his decision shall be final.
8. Contract Drawings are schematic. Rerouting of pipe and the addition, deletion or relocation of sprinkler heads may be necessary. Contractor shall prepare coordination drawings documenting changes. Contractor shall not proceed with fabrication or installation of fire protection system prior to approval of coordination drawings by Architect.
    a. Re-submittal of revised Contract Drawings and calculations to DSA will be required when changes to the system design, made during Project coordination phase, alter parameters used in calculations furnished to DSA for permitting purposes. If re-submittal to DSA is required, mechanical Engineer shall prepare revised Drawings and hydraulic calculations. Contractor shall not proceed with fabrication or installation of fire protection system prior to approval of revised calculations by DSA.
    b. Contractor-proposed changes to supports, anchorages, and seismic restraints for fire protection system shall conform to the following.
        1) Calculations performed for use in selection of supports, anchorages, and seismic restraints shall utilize criteria indicated in Structural Contract Documents.
        2) Supports, anchorage and seismic restraints for piping and equipment shall be an OSHPD pre-approved system such as Tolco, Afcon, ISAT, Badger, Mason, or equal. Pipes and equipment shall be seismically restrained in accordance with requirements of current editions of California Building Code and NFPA 13. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping and restraint locations.
            a) Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.

3) In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, equipment, and restraint locations, and detailing supports, attachments and restraints. Furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with California Building Code, and NFPA 13.
4) Additional Requirements: In addition to the above, conform to State and local requirements.

1.6 DRAWINGS

A. Contractor shall thoroughly examine architectural, structural, and other Drawings provided as part of this Contract.

B. Number of sprinkler heads indicated on Contract Drawings shall not be reduced. Provide additional heads required for coordination and to obtain approvals. Coordinate suitable head locations and spacing with Architect.

C. Installation Criteria: Provide complete fire protection systems as indicated and as required by authority having jurisdiction.
1. When there is conflict between requirements of authority having jurisdiction or requirements of other agencies and these Drawings and Specifications, requirements of authority having jurisdiction and recommendations of standards agencies shall govern.
2. Install entire system in accord with applicable codes, standards, and regulations.
3. The automatic sprinkler system shall conform to requirements of the National Fire Protection Association, Standard No. 13, as amended by the CBC.
4. FM Compliance: Comply with Factory Mutual “Approval Guide.”
5. Supply equipment and accessories in accordance with requirements of applicable national, state and local codes.
6. Items of a given type shall be the products of the same manufacturer.
7. Scheduled equipment performance is minimum capacity required.
8. Scheduled electrical capacity shall be considered as maximum available.

1.7 ACTION SUBMITTALS

A. For additional requirements, refer to Section 21 00 50, Basic Fire Sprinkler Materials and Methods.

B. Product Data: Submit manufacturer's technical product data and installation instructions for fire protection systems materials and products.

C. Samples: Provide one sample of each sprinkler head type.

1.8 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 21 00 50, Basic Fire Sprinkler Materials and Methods.

B. Welding operator qualification certificates.

C. Office of the State Fire Marshall (OSFM) certification cards for automatic fire extinguishing systems sprinkler pipefitters.

D. Coordination Drawings: Submit in accordance with Division 01, and as follows:
   1. Provide minimum 1/4 inch equals one foot scaled coordination drawings showing plan and pertinent section or elevation views of fire protection piping, equipment, and accessories. Drawings shall be reproducible and work represented shall be fully coordinated with structure, other disciplines, and with finishes. Drawings shall be presented on a single size sheet. Coordination drawings shall have title block, key plan, north arrow and sufficient grid lines to provide cross-reference to DSA approved Drawings.
   2. Coordination drawings shall depict changes and additions to fire protection system required for coordination with work of other trades. Changes and additions shall be clouded.
   3. Note on coordination drawings piping which will project beyond finished surfaces of normally occupied rooms, exterior of building or other locations which will expose system to view.
   4. Coordination drawings shall be provided with note affirming that the fire sprinkler system shown has been coordinated with the HVAC Contractor for inclusion in Coordinated Layout specified in Section 23 80 00. Provide signature of person responsible for information supplied and date of transmission.

E. For proposed changes to supports, anchorage, and seismic restraints shown on DSA approved Contract Drawings, submit details and calculations prepared, sealed, and signed by a California registered structural engineer. Comply with requirements of Coordination Article in this Section.

F. Test Reports: As indicated in paragraph “Tests.”
   1. Sprinkler pressure test.
   2. Standpipe pressure test.
   3. Alarm system test.
   4. Underground piping test.

1.9 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 21 00 50, Basic Fire Sprinkler Materials and Methods.

B. Operation and Maintenance Manual:

1. Operation and Maintenance Manual in accordance with Section 21 00 50. Include an original copy of NFPA 25, California edition, in Operation and Maintenance Manual for fire sprinkler system.
2. Guarantees in accordance with Division 01.

1.10 TEMPORARY CONNECTIONS

A. Temporary connections required to maintain services during the course of the Contract shall be made without additional cost to Owner. The normal function of the building must not be interrupted; notify Owner minimum seven days in advance before interrupting any service.

1.11 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer Qualifications: A firm with at least five years of successful installation experience on projects with fire sprinkler piping systems similar to that required for this Project.
   1. A State of California Fire Protection Contractor's license (C-16) is required.

C. Fire Sprinkler Fitter Certification:
   1. Automatic fire extinguishing systems sprinkler pipefitters shall be certified by Office of the State Fire Marshall (OSFM).

PART 2 - PRODUCTS

2.1 GENERAL

A. The equipment to be furnished under this Specification shall be standard product of manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, component parts of system need not be products of the same manufacturer.

2.2 MATERIALS AND EQUIPMENT

A. Unless otherwise shown on Drawings, specified, or directed by Architect, materials and equipment used in installation of sprinkler systems shall be listed as approved by FM or UL for fire protection systems, and shall be the latest design of the manufacturer.

2.3 SPRINKLER HEADS

A. Provide spray pattern type sprinkler heads, of ordinary degree temperature rating, except that sprinkler heads for installation in vicinity of heating equipment, and in other areas noted on Drawings, shall have temperature ratings required for such locations by NFPA 13.

B. Sprinkler heads shall be upright, pendent or sidewall, as required.
   1. Heads in ceilings of occupied spaces with recessed lights shall be chrome plated, semi-recessed pendent type, with white escutcheon.
   2. Sprinkler heads in rooms with surface mounted lights shall be chrome plated pendant style, with two-piece white escutcheon.
   3. Provide head guards in equipment rooms and storage rooms and all other locations where subject to damage.
   4. Upright heads in areas with no ceilings shall be rough bronze finish.
   5. Provide quick response type heads in light and ordinary hazard occupancies.
   6. Side wall heads may be used (except in extended coverage type) to cover special areas where overhead piping and heads are impractical or considered a visual problem by the Architect or Owner. Side wall heads shall be chrome finish.
   7. Outdoor heads, if required shall be dry or freeze resistant.
   8. Adjustable drop nipples are not acceptable.

C. Recessed sprinkler heads shall have chrome finish and adjustable chrome finish escutcheons; exposed pendent heads in finished ceilings shall have chrome finish and white ceiling escutcheons. Concealed (flush) heads shall be all brass, with white cover plate.
   1. Provide oversized escutcheons where required to meet the requirements of ASCE 7.

D. Spare Heads: Furnish spare heads equal to one percent of total number of heads installed under Contract, but not less than twelve. Spare head types furnished shall be representative of types and temperature ratings of heads installed, and in proportion to number of each type and temperature rating of heads installed. Furnish not less than two sprinkler head wrenches, with at least one wrench for each type of sprinkler head installed. Place spare heads and wrenches in wall mounted box manufactured for this purpose.

2.4 PIPE AND FITTINGS

A. For Installation Aboveground: Schedule 40 black steel pipe, ASTM A 53 with ductile or cast iron screwed fittings.
   1. Schedule 10 black steel pipe, ASTM A 135 or ASTM A 795, with grooved fittings and associated couplings may be used for pipe sizes 2 inches through 5 inches. Provide NFPA 13-specified wall thickness for pipe sizes 6 inches through 10 inches. Threading of piping will not be accepted.

B. For Installation Underground to 12 inches Above Ground:
   1. Pipe and fittings shall be approved for fire protection use.
   2. Underground Piping Outside Building: PVC Pipe: AWWA C900 or UL 1285, Class 200, with bell end with gasket, and with spigot end. PVC Fittings: AWWA C900 or UL 1285, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   1) Diamond Plastics Corporation.
   2) J.M. Eagle, Inc.

3. Underground Piping Below Building Footing and Slab: One-piece, 304 stainless steel 90-degree fitting, with AWWA C900 bell-and-spigot gasketed inlet connection with lugs on inlet end, and AWWA C606 groove on outlet end, for connection to in-building riser using AWWA C606 grooved couplers and gaskets.
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      1) Ames Fire and Waterworks, a Watts Water Technologies Company.
      2) Wilkins, a Zurn Company.

C. Standpipes: Schedule 40 galvanized steel with 300 psi galvanized fittings.

D. Mechanical tees, saddle fittings, bushings and mechanical sprinkler head fittings shall not be used.

2.5 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density PE film of 0.008-inch minimum thickness.

C. Form: Tube.

D. Color: Natural.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      a. Northtown Pipe Protection Products; Polywrap.

2.6 VALVES

A. Angle, Check, and Globe Valves: Fed. Spec WW-V-51; Class A, type as suitable for application.
   1. Select check valves for installation in vertical lines recommended by manufacturer as suitable for vertical installation. Install in vertical lines only where flow is upward.

B. Gate Valves:
   1. Sizes 1-1/2 inches or less: Fed. Spec WW-V-54, Class A.
   2. Sizes above 1-1/2 inches: Fed. Spec WW-V-58, Class A, designation OS or OF, as required. Provide OS&Y type, 175 pound rated working pressure.
   3. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

C. Drain Valves: angle, or globe. Fed. Spec WW-V-51; Class A, type as suitable for application.
   1. UL listed and FM approved combination test and drain fittings may be used.

D. Zone Control Valves: UL listed, outside screw and yoke or butterfly. Valves shall be sealed open with approved seal. Provide weatherproof actuator housing, with two single pole, double throw switches.
   1. Supervisory Switch: Fit the control valves on the fire sprinkler risers with supervisory switch, with single pole double throw switch actuator installed to change switch position when valve is being closed.

E. Sprinkler Inspector's Test Fittings:
   1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
   2. Pressure Rating: 175-psig minimum.
   3. Body Material: Cast- or ductile-iron housing with sight glass.
   4. Integral factory or field-installed pressure relief valve.
   5. Size: Same as connected piping.
   6. Inlet and Outlet: Threaded.

2.7 WATER FLOW ALARM SWITCH

A. UL listed water flow alarm switch suitable for variable pressure, complete with instantaneous recycling retard and two single pole double throw electrical contacts. Provide continuously monitored water flow alarm switch and trouble sensor, automatically transmitted to an approved control alarm station.

2.8 FIRE DEPARTMENT CONNECTION

A. Post mounted, complying with Local Fire Marshal standards cast brass two-way inlet body with drop clappers. Furnish with two brass double female snoots with rigid end N.P.T.X. pin lug house thread swivels, plugs and chain.

B. Provide check valve in piping between inlet connection and fire protection system. Provide ball drip at low point of piping, below grade on the inlet side of the check valve, and drain to gravel sump. Provide gravel sump with minimum 3 cubic feet of course gravel.

2.9 UNION AND FLANGES

A. Size and Type:
   1. Steel 2 inches and smaller: 150 pound screwed black or galvanized malleable iron, match pipe, ground joint, brass to iron seat.
   2. Steel 2-1/2 inches and larger: 150 pound black flange union, flat faced, full gasket.

B. Gaskets: 1/16 inch thick rubber Garlock #122, Johns-Manville, or equal.

C. Flange Bolts: Open hearth bolt steel, square heads, with cold pressed hexagonal nuts, cadmium plated when installed below ground. Provide copper plated steel bolts and nuts or brass bolts and nuts for brass flanges.

2.10 GAUGES

A. Marsh "Quality Gage", U.S. Gage, Danton 800, or equal, U.L. listed, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at midscale. Provide a three-way valve on each gauge connection.

2.11 SEISMIC SEPARATION ASSEMBLY

A. Provide seismic separation assembly as defined in NFPA 13 at locations where piping crosses building seismic joints and at locations where required to prevent pipe breakage due to building movement.
   1. At Contractors option, provide Metraflex “Fireloop” UL listed assembly, or equal at each seismic joint location, in lieu of seismic separation assembly.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation of the sprinkler system shall not be started until complete plans and specifications (including water supply information and type of existing sprinkler system, if any) have been approved by DSA.
   1. Piping shall be concealed unless shown or otherwise directed.
   2. Where piping is left exposed within a room, it shall be run true to vertical, horizontal or intended planes. Where possible, uniform margins shall be maintained between parallel lines and/or adjacent wall, floor or ceiling surfaces.
   3. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for maximum headroom clearance. This clearance shall not be less than 6'-6" without written approval from Architect.
   4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by Architect at no additional cost to Owner, providing such change is ordered before such items of work, or work directly connected to same, are installed, and providing no additional material is required.
   5. Grade all piping as required by NFPA 13.
   6. Close ends of pipe immediately after installation; leave closure in place until removal is necessary for completion of installation.
   7. Piping systems shall be thoroughly flushed and proved clean before connection to equipment.
   8. Pipe discharge of each drain valve to floor sink or drain.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Support piping so that it is firmly held in place by approved iron hangers and supports and by special hangers as required in accordance with NFPA 13. Hangers shall support loads specified in NFPA 13, and, in addition, shall support weight of pipe, fluid and pipe insulation, based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments, or hangers, shall be of same size as pipe or tubing on which used, or nearest larger size available. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS) Standard Practice SP-58, provide branch line restraints where hangers exceed 6 inches long, in accordance with NFPA 13. Install concrete anchors required. Hanger material shall be approved by Architect before installation. Do not support piping by plumbers' tape, wire, rope, wood or other makeshift devices.

B. Suspend rods from angle clips, in accordance with Section 21 00 50.

3.3 SEISMIC REQUIREMENTS

A. Comply with CBC, Volume 2, Chapter 16A and CBC Chapter 9 and NFPA 13.

B. Items of equipment shown or specified to be anchored shall maintain integrity at point of anchor after being subjected to accelerations equivalent to those established herein

C. Anchors: Piping shall be provided with anchors for protection of piping against damage due to earthquakes, as required by CBC Chapter 16A, NFPA 13, and other sections of this Specification.

3.4 TESTS

A. At various stages and upon completion, the system shall be tested in the presence of the enforcing agency.

B. Upon completion and prior to acceptance of the installation, subject entire new system to tests required by NFPA 13, and furnish Owner with certificates as appropriate.

3.5 IDENTIFICATION

A. Coordinate requirements with the authority having jurisdiction.

B. Provide brass valve tags at each system valve, indicating valve service.

C. Provide signage at each sprinkler valve, with sign indicating specific portion of system controlled by valve.

D. Provide signage at each outdoor alarm device, with sign indicating which authority to call if device is activated.

E. Prior to final acceptance, Contractor shall provide accurate color-coded Building Plan at riser location, clearly depicting fire protection system area of coverage, location of inspectors' test/drain connection and auxiliary drain connections. Provide this information at each system or building at riser location for building. Plan(s) shall be one-half size and plastic laminated.

F. Provide hydraulic data signage permanently attached to risers, indicating location, basis of design, water supply and pressure requirements of system.

3.6 ELECTRICAL WIRING

A. Coordination of wiring systems is part of this work. Contractor shall ensure that the following is completed.
   1. Work provided in other Specification Sections:
      a. Supervised wiring to fire alarm control panel.
      b. Supervised wiring from main waterflow indicator to fire alarm panel.
      c. Supervised wiring from sprinkler flow switches to fire alarm panel.
      d. Supervised wiring from valve water flow alarm switches to fire alarm panel.
   2. Work provided in this Specification Section:
      a. Wiring diagrams for devices.
      b. Other wiring not specified to provide an operating system.

3.7 SPRINKLER HEAD INSTALLATION

A. Heads shall be placed upright where on exposed piping, unless otherwise noted, and in pendant position on concealed piping, unless noted otherwise, with deflectors parallel to the ceiling or roof slope. Clearance between deflectors and ceilings, electric, or heating equipment, or other obstruction shall be in accordance with the requirements of NFPA 13. Provide sprinkler head guards where heads are subject to mechanical damage, for example, at mechanical rooms, and storage rooms and gymnasiums.

B. Mount box containing spare sprinkler heads and wrenches on wall in location selected by Owner.

C. Do not install pendent sprinkler heads until flushing of piping has been completed.

D. Provide return bend as illustrated in NFPA 13 (NFPA exceptions do not apply) for each sprinkler head installed in finished ceiling.

3.8 PIPING INSTALLATION

A. Pipe shall be assembled in accordance with the applicable requirements of NFPA 13 and NFPA 24.

B. Install pipe encasement on underground and under-slab metal piping.

C. Provide concrete thrust blocks for underground and underslab piping in accordance with NFPA 24 and CBC.

3.9 VALVE IDENTIFICATION

A. All valves shall be identified by permanent metal tags or other approved means.

3.10 DRAIN INSTALLATION

A. Auxiliary drains shall be installed on low points in each system.
   1. Five or fewer trapped gallons will not require a drain valve but may be drained through a plugged fitting. Drain valves shall be in accordance with requirements of NFPA 13.

B. Install one inspector's test drain on sprinkler system. Extend drain to outside in location approved by Architect. Water discharge shall be positioned such that landscaping will not be damaged.

C. Drain valves shall be piped to a safe place of discharge and discharge shall be visible either by open-end drainpipe or sight drain fitting.

D. Provide flushing connections at ends of cross-mains.

3.11 SLEEVE INSTALLATION

A. Install AMI Products, Adjus-to-Crete, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.

B. At walls below grade: Link-Seal casing seals, or equal, may be used in lieu of caulking. Pipes penetrating walls below grade shall be anchored at wall.

3.12 FLOOR, WALL, AND CEILING PLATE INSTALLATION

A. Fit pipes with or without insulation passing through walls, floors, or ceilings, and hanger rods penetrating finished ceilings with chrome plated or stainless steel plates.

3.13 FIRESTOPPING

A. The annular space between pipe sleeves and pipe passing through all floors and walls shall be packed with incombustible mastic or other suitable material, in accordance with U.L. Fire Resistance Directory.

B. Penetrations in fire rated assemblies shall also be protected in accordance with CBC Chapter 7, Section 712, and UL Fire Resistance Directory.

3.14 UNION AND FLANGE INSTALLATION

A. Install unions whether shown or not at each connection to equipment and at one connection to each valve or cock.

B. Locate the unions for easy removal of the equipment or valve.

3.15 CLEANING

A. Upon completion of tests, clean equipment, piping, etc., installed under this Section of the Specifications.

3.16 PIPING SYSTEM FLUSHING

A. Entire system shall be flushed out and cleaned after completion of piping, and prior to installation of sprinkler heads. Flush shall be continued until water runs clear at drain connections.

END OF SECTION 21 10 00

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Electric motors.
2. Motor starters.
3. Strainers.
4. Valve boxes.
5. Gauges.
6. Thermometers.
7. Access Doors.
8. Flexible joints.
9. Insulation.

1.2 RELATED REQUIREMENTS

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

B. This Section is a part of each Division 22 Section.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.

B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.

C. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems.

1.4 REFERENCES AND STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
1. CSA – Canadian Standards Association International.
2. ANSI - American National Standards Institute.
3. ASTM - American Society for Testing and Materials.
4. CCR - California Code of Regulations.

5. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
6. NCPWB - National Certified Pipe Welding Bureau.
7. CEC - California Electrical Code.
8. NEMA - National Electrical Manufacturers' Association.
9. NFPA - National Fire Protection Association.
10. OSHA - Occupational Safety and Health Act.
11. UL - Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:
1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
   a. California Building Code, 2022.
   b. California Electrical Code, 2022.
   c. California Energy Code, 2022.
   d. California Fire Code, 2022.
   e. California Green Building Standards Code, 2022.
   f. California Mechanical Code, 2022.
   g. California Plumbing Code, 2022.
   h. California Code of Regulations, Title 24.
   i. California Health and Safety Code.
   j. CAL-OSHA.
   k. California State Fire Marshal, Title 19 CCR.
   l. National Fire Protection Association.
   m. Occupational Safety and Health Administration.
   n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.

B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.
2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required

to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.

3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.
4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work or work directly connected to same are installed and providing no additional material is required.

C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.

B. Arrange for utility connections and pay charges incurred, including excess service charges.
1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.

C. Prior to the start of construction, contact local gas company representative and coordinate location of gas meter and piping. In addition, coordinate time required for installation, in order to avoid delay to the Project.

D. Coordination:
1. General:
    a. Coordinate plumbing Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
2. Electrical Coordination:
    a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
        1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
        2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors,

larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.

3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

3. Mechanical Coordination:
   a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
   b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
   c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”
   d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.7 SUBMITTALS - GENERAL

A. Refer to Division 01 Submittals Section(s) for additional requirements.

B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.

C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
   1. Partial or incomplete submittals will not be considered.
   2. Quantities are Contractor's responsibility and will not be reviewed.
   3. Provide materials of the same brand or manufacturer for each class of equipment or material.
   4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
   5. Identify each submittal item by reference to items’ Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
   6. Organize submittals in same sequence as in Specification Sections.
   7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
   8. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.

a. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
b. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
c. Catalog cuts and published material may be included with supplemental scaled drawings.

D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.

F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

1.8 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.

B. Shop Drawings.

C. Sustainable Design Submittals:
1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

D. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 68 75. Provide submittal information for products third-party certified

by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

E. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.
   1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
   2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
   3. Supports, anchorages and restraints for piping, ductwork, and equipment shall be an OSHPD pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
   4. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation. Gas pipe bracing shall be designed in accordance with California Building Code Section 1615A.1.22 and ASCE 7-10 Section 13.6. Coefficient Ip = 1.5 shall be used for gas piping bracing calculations.
      a. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2022 California Building Code
   5. Additional Requirements: In addition to the above, conform to all state and local requirements.

1.9 INFORMATIONAL SUBMITTALS

A. Provide layouts for plumbing systems, for inclusion in coordinated layout specified in Section 23 80 00. Comply with requirements for layouts specified in Section 23 80 00.

1.10 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
   1. Refer to Division 01 for complete instructions.

2. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
3. Sets shall incorporate the following:
    1) Product Data.
    2) Shop Drawings.
    3) Record Drawings.
    4) Service telephone number, address and contact person for each category of equipment or system.
    5) Complete operating and maintenance instructions for each item of plumbing equipment and systems.
    6) Copies of guarantees/warrantees for each item of equipment and systems.
    7) Test data and system balancing reports.
    8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
    9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
    10) Control diagrams and literature.
    11) A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
    12) Check test and start reports for each piece of plumbing equipment provided as part of the Work.
    13) Commissioning and Preliminary Operation Tests required as part of the Work.

B. Record Drawings:
1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
2. Upon completion of the work, deliver to Architect the following:
    a. Originals of drawings showing the Work exactly as installed.
    b. One complete set of reproducible drawings showing the Work exactly as installed.
    c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
    d. Provide Contractor’s signature, verifying accuracy of record drawings.
    e. Obtain the signature of the Project Inspector for all record drawings.

1.11 SUBSTITUTIONS

A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.

C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.

D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:
   1. Reason for substitution request.
   2. Complete submittal information as described herein; see “Submittals.”
   3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
   4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
   5. Explanation of impact on connected utilities.
   6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is the Contractors’ responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.

G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

1.12 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with plumbing systems work similar to that required for this Project.

C. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

D. Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.

E. All materials and products shall be new and shall match existing.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.

B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.

B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

C. On failure to comply with the warranty requirements within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.

C. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

2.2 MATERIALS AND PRODUCTS

A. No material installed as part of this Work shall contain asbestos.

B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.3 ELECTRIC MOTORS

A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   2. U.S. Motors.
      a. Century Electric.
      b. General Electric.
      c. Lincoln.
      d. Gould.

B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
   1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.

C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.
   1. Multispeed motors shall have separate windings for each speed.

D. Polyphase Motors with Additional Requirements:

1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
2. Motors Used with Variable Frequency Controllers:
3. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
    a. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
    b. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
    c. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
    d. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
    e. Each motor shall be provided with a shaft grounding device for stray current protection.
4. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:
1. Select motors with service factor of 1.15.
2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
3. Permanent-split capacitor.
    a. Split phase.
    b. Capacitor start, inductor run.
    c. Capacitor start, capacitor run.
4. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
5. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
6. Motors 1/20 HP and Smaller: Shaded-pole type.

F. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 MOTOR STARTERS

A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.

B. Provide magnetic motor starters for equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
1. All starters shall have the following:

2. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
   a. Ambient compensated thermal overload.
   b. Fused control transformer (for 120 or 24 volt service).
   c. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
3. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
4. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
5. Provide OSHA label indicating the device starts automatically.

2.5 VALVE BOXES

A. General:
   1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular “vault” type adequately sized for condition and similar in construction to those specified above.
   2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
   3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.

B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.

C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron or steel locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

2.6 GAUGES

A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

2.7 THERMOMETERS

A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.
   1. Provide extension for insulation.
   2. Provide thermometers with steel bulb chambers and brass separable sockets.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, and heat exchanger and provide two digital electronic test thermometers for each range of fluid temperature and where shown on Drawings.

2.8 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
   1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.

D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
   1. Milcor
      a. Style K (plaster).
      b. Style DW (gypsum board).
      c. Style M (Masonry).
      d. Style "Fire Rated" where required.

2.9 FLEXIBLE JOINTS

A. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

2.10 PIPE GUIDES

A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

2.11 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.12 PIPE IDENTIFICATION

A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.

B. The legends and flow arrows shall conform to ASME A13.1.

2.13 INSULATION WORK

A. General:
   1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
   2. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
   3. The term "piping" used herein includes pipe, valves, strainers and fittings.
   4. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
   5. Provide pre-formed PVC valve and fitting covers.
   6. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
   7. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.

8. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
9. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:
1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:
2. Pipe 3/4 inches and smaller: 1 inch thick.
   a. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
   b. Pipe 2 inches and larger: 2 inches thick.
3. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.
4. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
   a. Fitting covers:
      1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      2) Tee covers.
      3) Flange and union covers.
      4) End caps.
      5) Beveled collars.
      6) Valve covers.
      7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
   b. Jacket thickness:
      1) Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket with smooth finish.
      2) Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket with smooth finish.

PART 3 - EXECUTION

3.1 EXISTING MATERIALS

A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.

B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.

C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

3.2 FRAMING, CUTTING AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure and obtain Structural Engineer's approval prior to coring through existing construction.

3.3 PLUMBING DEMOLITION

A. Refer to Division 01 Sections “Cutting and Patching” and “Selective Demolition” for general demolition requirements and procedures.

B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.4 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.

B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.5 PIPING SYSTEM REQUIREMENTS

A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.6 PRIMING AND PAINTING

A. Perform priming and painting on the equipment and materials as specified herein.

B. See Division 09 Painting Section(s) for detailed requirements.

C. Priming and Painting:
   1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
      a. Black Steel Piping:
         1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
         2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
   2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
   3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.7 EXCAVATING

A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain all warning signs, barricades, flares, and red lanterns as required.

D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard

of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.8 BACKFILLING

A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
   1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.

C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.

D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.9 PIPING SYSTEMS INSTALLATION

A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

B. General:
   1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
   2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
   3. Install piping to permit application of insulation and to allow valve servicing.
   4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
   5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
   6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.

7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
10. Install horizontal valves with valve stem above horizontal.
11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
12. Verify final equipment locations for roughing-in.
13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.
15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.
16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

C. Sleeves:
1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

D. Floor, Wall, and Ceiling Plates:
1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

E. Firestopping:

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
2. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
3. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
4. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
5. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
6. All above Systems to be installed in strict accordance with manufacturer's instructions.
7. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

F. Flashing:
   1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
   2. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
      a. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.
   3. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.

G. Hangers and Supports:
   1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where

building structural members do not match piping support spacing, provide “bridging” support members firmly attached to building structural members in a fashion approved by the structural engineer.

2. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
    1) Provide copper-plated or felt-lined hangers for use on copper tubing.
3. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
4. Riser clamps: B-line model B3373, or equal.
5. Pipe Hanger and Support Placement and Spacing:
    a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 3)	Steel Gas	Copper Brazed or Soldered (Note 3)	CPVC & PVC (Note 2)
1/2 - 1”	12 ft.	6 ft.	Each Floor, Not to Ex-ceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2”	12 ft.	Each Floor, Not to Ex-ceed 10 ft.	Each Floor, Not to Ex-ceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3”	12 ft.	Each Floor, Not to Ex-ceed 10 ft.	Each Floor, Not to Ex-ceed 10 ft.	Base and Each Floor (Note 1)
Over 4”	12 ft.	Each Floor, Not to Ex-ceed 10 ft.	Each Floor, Not to Ex-ceed 10 ft.	Base and Each Floor (Note 1)

        1) Note 1: Provide mid-story guides.
        2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
        3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
    b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.

c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 2)	Steel Gas	Copper Brazed or Soldered (Notes 2, 3)	CPVC & PVC (Note 1)
1/2 - 1"	6 ft.	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	10 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	10 ft.	4 ft.

1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.

d. Horizontal cast iron piping support spacing:
1) Support piping at every other joint for piping length of less than 4 feet.
2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
3) Hanger shall not be installed on the coupling.
4) Provide support at each horizontal branch connection.
5) Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.
6) Provide a brace on each side of a change in direction of 90 degrees or more.

6. Suspended Piping:
a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

Pipe Size	Rod Size Diameter
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.
c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.
f. Steel Connectors: Beam clamps with retainers.

7. Support to Structure:
   a. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.
8. Rubber Neoprene Pipe Isolators:
   a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
   b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
   c. Acceptable Suppliers:
      1) Vertical runs: Acousto-Plumb or equal.
      2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.
9. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
10. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
11. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
12. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
13. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.10 UNION AND FLANGE INSTALLATION

A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.

B. Install unions in piping NPS 2” and smaller, and flanges in piping NPS 2-1/2” and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.

C. Locate the unions for easy removal of the equipment, tank, or valve.

3.11 ACCESS DOOR INSTALLATION

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.12 CONCRETE WORK

A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.

B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

3.13 PIPE PROTECTION

A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
   1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Roystron Products, or equal.
   2. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Roystron Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

3. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-l0 or V-20", "Scotchwrap 50", Slipknot l00, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.

B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.

C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Rasor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.

D. Cleaning: Clean all piping thoroughly before wrapping.
1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

E. Sleeve copper piping/tubing installed below slab with “Polywrap-C” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer’s recommendations and instructions.

F. Sleeve copper piping/tubing installed outside building below grade with “Polywrap-C” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer’s recommendations and instructions.

G. Sleeve cast iron and ductile iron pipe below grade and below slab with “Polywrap” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer’s recommendations and instructions.

H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

3.14 PIPE IDENTIFICATION

A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.

B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and

at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.

C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.

D. Apply markings after painting and cleaning of piping and insulation is completed.

3.15 PIPING SYSTEM PRESSURE TESTING

A. General:
   1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.
   2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:
   1. Authority having jurisdiction shall witness tests of piping systems.
   2. Notify Architect at least seven days in advance of testing.
   3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
   4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
   5. Isolate from system equipment that may be damaged by test pressure.
   6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.
   7. Authority having jurisdiction shall witness final connection to system.

C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.

D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer’s recommendations. Test to 10 feet above highest point in the system.

System Tested	Test Pressure PSI	Test With
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Storm Drain, Condensate Drains	10 Ft. Hd.	Water
Domestic Water	125	Water
Natural Gas (PE)	60	Air & Non-corrosive Leak Test Fluid
Natural Gas (Steel)	100	Air & Non-corrosive Leak Test Fluid
Compressed Air	200 lb.	Air & Non-corrosive Leak Test Fluid
Deionized Water	50	Water

1. Flush deionized water lines with deionized water after test and approval.
2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of gas conveyed by the piping system.

3.16 OPERATION OF SYSTEMS

A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:
   1. Complete all requirements listed under “Check, Test and Start Requirements.”
   2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
   3. Filters, strainers etc. are in place.
   4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
   5. Equipment has been run under observation, and is operating in a satisfactory manner.

B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

3.17 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification

from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.18 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.

1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.
2. Correct rotation of motors and ratings of overload heaters are verified.
3. Specified filters are installed and spare filters have been turned over to Owner.
4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
5. All equipment has been cleaned, and damaged painted finishes touched up.
6. Missing or damaged parts have been replaced.
7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
10. Preliminary test and balance work is complete, and reports have been forwarded for review.
11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.

B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
   1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
   2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
   3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
   4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. Review of Contractor's Tests:
   1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

D. Test Logs:
   1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

E. Preliminary Operation:
   1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

3.19 CERTIFICATES OF INSTALLATION

A. Contractor shall complete applicable “Certificates of Installation” forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

3.20 DEMONSTRATION AND TRAINING

A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
   1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.

2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
4. Listing of Owner-designated personnel completing training, by name and title.
   a. Name and title of training instructor.
   b. Date(s) of training.
   c. List of topics covered in training sessions.
5. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 22 00 50

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings.
2. Valves.
3. Domestic water piping specialties.
4. Gas piping specialties.
5. Drain and waste piping specialties.

1.2 RELATED REQUIREMENTS

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

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

1.4 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Provide welding certificate for all gas pipe welders.

C. Gas Pipe Installer Qualifications: Provide evidence of current qualifications for individuals performing work requiring qualifications.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data in Operation and Maintenance Manual.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

1.7 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Gas Pipe Installer Qualifications: Individuals performing tasks requiring qualifications under Federal and State regulations shall be qualified by the gas utility supplying Project site. The qualifications shall be current at the time of performing the Work.

C. NFPA/ANSI Compliance: Fabricate and install natural gas systems in accordance with latest edition of NFPA 54/ANSI Z223.1 "National Fuel Gas Code."

D. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

E. Fabricate and install natural gas systems in accordance with California Plumbing Code.

F. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Plastic piping components shall be marked with "NSF-pw."

2.2 PIPE AND FITTINGS ATTACHED TO AND BELOW BUILDINGS INCLUDING 5 FEET FROM BUILDINGS

A. Piping and fittings attached to covered walkways and corridors shall comply with the requirements of this article.

B. Drain and Waste Pipe Above Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard (CISPI) 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV weld pipe and fittings.
   1. Joints above grade: No-Hub pipe conforming to ASTM A888 and CISPI 301. Couplings conforming to ASTM 1277 and CISPI 310, with stainless steel bands. Provide products by ANACO-Husky, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at each floor and at 15 foot maximum intervals (also see Specification Section 22 00 50).

C. Drain and Waste Pipe Below Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and CISPI 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, hub and spigot cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A-74 and so marked, may be used.
   1. Joints below grade: ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
   2. Joints below grade (hub and spigot option): Neoprene gaskets conforming to ASTM C564, as manufactured by Ty-Seal, Dual-Tite, or equal.

D. Vent Pipe:
   1. 3 inch and larger: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe above grade.
   2. 2-1/2 inch and smaller: Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.
   3. Vent pipe buried in ground and to 6 inches above ground: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.

E. Grease Waste (GW) and Vent (GV) Pipe Underground to 6 Inches Aboveground: George Fisher Sloane, Inc., "Fuseal PP," Orion Fittings, Inc., "Rionfuse CF," IPEX, Inc., "Enfield," or equal, Schedule 40 polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.

F. Grease Waste (GW) and Vent (GV) Pipe Aboveground:
   1. In inaccessible spaces or within walls, George Fisher Sloane, Inc., "Fuseal PP," Orion Fittings, Inc., "Rionfuse CF," IPEX, Inc., "Enfield," or equal, flame-retardant schedule 40 polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.
   2. In accessible areas: George Fisher Sloan, Inc. "Fuseal PP," Orion Fittings, Inc. "Blueline," IPEX, Inc. "Labline," or equal, flame retardant Schedule 40 polypropylene

drainage pipe and fittings, with mechanical joints. Piping shall comply with ASTM F1412.

3. Vent pipe aboveground: 3 Inches and Larger: Service weight cast iron soil pipe and fittings; 2-1/2 inches and smaller: Schedule 40 galvanized steel pipe with black cast iron drainage fittings.

G. Water Pipe (Tempered Water, Tempered Water Return, Hot Water, Hot Water Return and Cold Water): ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: ASTM B88, Type K copper tubing, hard temper, with wrought copper fittings. At Contractor's option, pipe runs below slab having no branches may be ASTM B88, Type K annealed copper tubing without joints. See Section 22 00 50 for pipe protection requirements for below slab copper piping.

H. Temperature and Pressure Relief Valve Piping: ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.

I. Gas Pipe: Schedule 40 black steel conforming to ASTM A53, with malleable iron threaded fittings above grade for piping 2 inch and smaller; welded piping below grade and for above grade piping larger than 2 inches, with Class 150 welding fittings.
   1. Appliance Flexible Connectors for Indoor Equipment Without External Spring Isolation:
      a. Contractor may choose one of the following:
         1) Direct gas pipe connection.
         2) Appliance flexible connector:
            a) Comply with ANSI Z21.24.
            b) Polymer or hot-dipped PVC coated corrugated 304 stainless steel.
            c) Operating-Pressure Rating: 0.5 psig.
            d) End Fittings: Zinc-coated steel.
            e) Maximum Length: 30 inches.
            f) Manufacturers: Dormont, Series 30C, 31, 40C, 41, and 51, Brasscraft model ProCoat, or equal.
      b. Provide with end connections compatible with equipment and piping system.
      c. Equipment located in spaces normally accessible to building occupants, other than maintenance personnel, shall utilize direct gas pipe connection.
      d. Provide anti-microbial PVC coating for use with appliances located in kitchen areas.
   2. Flexible Gas Connector for Outdoor Equipment Without External Spring Isolation:
      a. Contractor may choose one of the following:
         1) Direct gas pipe connection.
         2) Corrugated stainless steel hose with 304 stainless steel braid covering, CSA certified. Metraflex model GASCT, Unisource Manufacturing series 400, or equal. Provide with end connections compatible with equipment and piping system.
   3. Flexible Gas Connection System for Movable Gas-Fired Cooking Equipment:
      a. System shall include flexible PVC coated braided stainless steel hose, quick disconnect fitting, full port CSA certified ball valve, 2 swivel elbows, coiled steel

restraining cable and mounting hardware. Assembly shall be certified per ANSI Z21.69/CSA 6.16, "Connectors for Movable Gas Appliances." Size as required for appliance connection, 48" minimum hose length. Install per manufacturer's instructions. Connectors shall be Dormont Safety System, T&S Safe-T-Link, or equal.

J. Condensate Drain Piping:
   1. Inside buildings provide ASTM B88, Type L copper tubing and fittings. Provide Wye fittings with capped cleanout plug for tubing up to 1 inch size. Provide wrought or cast DWV fittings for sizes 1-1/4 inch and larger.
   2. Connect condensate drains to mechanical equipment per equipment manufacturer's recommendations; provide P-trap where required. Slope piping to drain, with 1 inch in 10 foot minimum pitch. Provide di-electric couplings or unions at connections to dissimilar materials.
   3. Where condensate drain P-traps are required, install trap using Wye fitting on inlet and outlet of trap. Provide cap on top of each Wye, made removable for cleaning and inspection. Drill 1/8 inch diameter hole in cap at outlet of the trap to allow venting of the system. Minimum depth of trap should be 4 inches, or as recommended by the manufacturer in printed literature.
   4. Provide cleanout tees or "Y" at each change in direction.

K. Condensing-Type Equipment Condensate Drain Pipe: CPVC pipe and fittings conforming to ASTM D-2846.
   1. Provide CPVC condensate drain pipe for condensing water heaters, furnaces, and where shown on Drawings.
   2. Provide continuous support for horizontal piping, B-line, Grinnell, or equal PVC coated channel systems, series B11 through B72 with matching pipe clamps as appropriate, or equal.
   3. Piping and fittings shall be as manufactured by Spears Manufacturing, Charlotte Pipe and foundry Co., or equal.

2.3 SITE PIPING AND FITTINGS TO 5 FEET FROM BUILDINGS

A. Buried Drain, Waste, and Vent Piping:
   1. Install piping from street connection to the property line in accordance with local requirements.
   2. 4 inches and larger: PVC, ASTM D3034 - SDR 35; use matching Ring Tite fittings.
   3. 3 inches and smaller: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler pipe, or equal. Provide ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540. Pipe and fittings shall be the product of a single manufacturer.

B. Grease Waste (GW) and Vent (GV) Pipe: George Fisher Sloane, Inc., “Fuseal PP,” Orion Fittings, Inc., “Rionfuse CF,” IPEX, Inc, “Enfield,” or equal, polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.

C. Water Service Piping:
   1. Sizes 2 inches and larger (not under building): Gasket style PVC conforming to ASTM D2241-SDR21, Class 200 with gasket type fittings or ductile iron mechanical joint couplings. Gasket fittings shall be one piece injection molded PVC fittings, equal to Flo-Seal water main fittings for PVC pressure pipe, 200 psi, ASTM D-3139.
   2. Sizes less than 2 inches: Type K copper tubing, hard temper, with wrought copper fittings. See Section 22 00 50 for pipe protection requirements for below grade copper piping.
   3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      a. J.M. Eagle.
      b. P.W. Pipe.
      c. Ipex Series Pipe.

D. Water Service Piping Above Grade:
   1. Sizes 2 inches and larger: Class 150 flanged ductile cast iron water pipe conforming to AWWA/ANSI C150/A21.50 and manufactured in accordance with AWWA/ANSI C151/A21.51. Fittings shall conform to AWWA/AWWA C110/A21.10, Class 250 pattern. Pipe and fittings shall have factory applied cement-mortar lining in accordance with AWWA/ANSI C104/A21.4. Flanges shall conform to ASME/ANSI B16.1.
   2. Piping 1-1/2 inches and smaller: Type L copper tubing, hard temper, with brazed wrought copper fittings.

E. Gas Piping Underground: Performance Pipe, “DriscoPlex” 6500 PE 2708 (yellow), Polypipe, Inc., “Polypipe”, or equal, polyethylene gas distribution pipe, ASTM D2513, ASTM D3261, and ASTM D2683 fittings with fusion welded joints. Provide piping labeled for natural gas in accordance with CPC.
   1. Electrically isolate underground ferrous gas piping from the rest of the gas system with listed or approved isolation fittings installed a minimum of six inches above grade.
   2. Provide Central Plastics Corp., Perfection, or equal, anodeless, single seal riser for transition from below grade polyethylene to schedule 40 steel piping above grade. Minimum horizontal length shall be 30 inches. Minimum vertical length shall be 30 inches, or greater as required. Provide fusion connection to polyethylene pipe below grade, and screwed connection to steel pipe above grade.

F. Gas Piping Aboveground to 30 inches Belowground: Schedule 40 black steel with beveled ends for welding, with Class 150 welding fittings. Mitering to form elbows or tees will not be permitted; where branch tee connections of welded piping are required, Bonney "Weldolet" Allied Pipe Fittings, or equal fittings may be used if the branch is one-half of the diameter of the main or less.

G. Drainage Pipe, Perforated or Un-perforated: J-M PVC, P.W. Pipe, or equal drainage pipe and fittings or non-reinforced concrete sewer pipe ASTM C14.

2.4 PIPE JOINING MATERIALS

A. Refer to piping Articles in this Section for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated
      a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.
   2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.
   3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.
   4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, 100 percent lead free alloys. Include water-flushable flux according to ASTM B813.

D. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.

E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Solvent Cements for Joining CPVC Piping: ASTM F 493.
   1. CPVC solvent cement shall have VOC content of 490 g/L or less.
   2. Adhesive primer shall have VOC content of 550 g/L or less.
   3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   1. PVC solvent cement shall have VOC content of 510 g/L or less.
   2. Adhesive primer shall have VOC content of 550 g/L or less.
   3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

2.5 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS

A. General:
   1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 11 68 75.
      a. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.

1) Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 11 68 75.

B. Gate Valves:
1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.
3. 2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
4. Main distribution gate valves underground outside building above 1-1/2 inches:
   a. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
      1) Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
      2) Furnish and deliver to Owner one wrench of each size required for operating underground valves.

C. Ball Valves:
1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.
2. 2-1/2 inches: Apollo 77C-LF10, or equal.

D. Swing Check Valves:
1. Minimum 200 psi CWP, bronze or brass body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Milwaukee UP509, Nibco T-413LF, Kitz 822T, or equal.

E. Butterfly Valves:
1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.
2. Provide valves with the following:
   a. Seats: suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
   b. Bodies: ductile iron or cast iron.
   c. Discs: Bronze or stainless steel.
   d. Stems or Shafts: Stainless steel. Install valves with stems horizontal.
   e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. 2 through 12 inches: Watts Regulator Co., model DBF-03.

F. Silent Check Valves (for use on pump discharge):
1. General: Provide spring loaded check valves at pump discharge of all pumps.
   a. 2 inches and smaller: Minimum 300 psi CWP, bronze body, Apollo 61LF, Milwaukee UP548-T, or equal.
   b. 2-1/2 inches and larger: Class 250, cast iron body, suitable for regrinding, Mueller 103MAP, or equal.

G. Calibrated Balancing Valves:
1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating pressure.
   a. Body: Brass.
   b. Ball: 304 Stainless Steel.
   c. Seat: Glass and Carbon filled TFE.
   d. End Connections: Threaded.
   e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
   f. Handle Style: Dial, with memory stops to retain set position.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. 1 inch and smaller: Bell & Gossett model CB, “LF” series.

2.6 VALVES AND FITTINGS FOR NON-POTABLE WATER, COMPRESSED AIR, AND GAS SYSTEMS

A. Gate Valves:
1. 2-1/2 inches and smaller: Class150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.
2. 3 inches and larger: Class 125, iron body, bronze mounted, bolted bonnet, non-rising stem, solid wedge, flanged ends, conforming to MSS SP-70. Hammond IR-1138, Nibco F619, Milwaukee F2882A, Stockham G-612, or equal.
3. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
   a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
   b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

B. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, 150 psi SWP, cast bronze body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T585-70, Milwaukee BA-400, Stockham T-285, or equal.
2. 2-1/2 inches and larger: Class 150, carbon steel body, full port, two piece, stainless steel vented ball, flanged ends, and reinforced PTFE seal, conforming to MSS SP-72. Nibco F-515-CS-F-66-FS, Milwaukee F20-CS-15-F-02-GO-VB, or equal.
3. Compressed Air Services: 600 psi CWP, 150 psi SWP, bronze body, full port, three piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco Model T-595-Y, Milwaukee BA-300, or equal.

C. Swing Check Valves: Class 125 or 150, bronze body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Stockham B-321, Milwaukee 509, Nibco T-433, or equal.

D. Butterfly Valves:
1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.
2. Provide valves with the following:
   a. Seats: Suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
   b. Bodies: Ductile iron or cast iron.
   c. Discs: Bronze or stainless steel.
   d. Stems or Shafts: Stainless steel.
   e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. 2 through 12 inches: Milwaukee Valve, CL series, Nibco, Inc., Model LD2000-3, or equal.

E. Silent Check Valves (for use on pump discharge):
1. General: Provide spring loaded check valves at pump discharge of all pumps.
2. 2 inches and smaller: 250 psi CWP, bronze body, Nibco Model T-480, Milwaukee 548-T, or equal.
3. 2-1/2 inches and larger: Class 250, cast iron body, wafer style, suitable for regrinding. Nibco Model F960, Milwaukee 1400, Mueller 103MAP, or equal.

F. Calibrated Balance Valves (Symbol CBV): Provide globe style valves for precision regulation and control rated 175 psi for sizes 2-1/2 inches through 12 inches and rated 240 psi for bronze sizes 2 inches and below. Each valve shall have two metering/test ports with internal check valves and protective caps. All valves must be equipped with visual position readout and concealed memory stops for repeatable regulation and control.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Bell & Gossett Circuit Setter Plus.
b. Armstrong CBV.
c. Flow Design Inc. Accusetter.
d. Tour & Andersson.
e. Circuit Sensor with butterfly valve above 3 inches.
f. Illinois Series 5000 through 2 inches.

G. Flow Control Valves: Automatic pressure compensating flow control valves shall be Griswold, Flow Design, Inc., or equal.

H. Building Gas Shut-Off Valves:
1. 2 inches and smaller: Provide 175 psi SWP ball valve, CSA listed, full port, lockwing type, with AGA painted grey finish. Jomar 175-LWN, or equal.
2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

I. Gas Shut-off Valve Above Grade:
1. 2 inches and smaller: Provide Milwaukee BB2-100, Jomar T-100NE, or equal, ball valve, CSA listed, full port.
2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

J. For Gas Service Below Grade:
1. Lubricated plug cocks: ReSun Model D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide extended lubrication stem, arranged to allow for lubrication of the valve from grade. The extension must be constructed to allow for lubrication of the valve and for operation of the valve from grade. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
a. Provide flanged ends on valves installed below grade. Connect to polyethylene piping with flanges and stainless steel bolts.
b. Anchor each valve flange to valve box with welded angle iron, or provide vertical stiff leg, minimum 18 inches into earth.

c. Provide Central Double O Seal Transition Fittings, or equal, flanged style for connection between valve and piping system.
d. Wrap valve, flanges and exposed pipe with PASCO Specialty & Mfg., Inc., or equal tape wrap, installed in accordance with requirements listed under “Pipe Protection”.

2. Molded polyethylene body ball valves: Nordstrom Valves - Polyvalve II for sizes 1-1/4 inches to 2 inches, and Polyvalve for sizes 2 inches and larger, or equal. Valves 1 inch and smaller shall be listed lubricated plug cocks, with transition fittings..
   a. Provide stub ends to match SDR of the piping, arranged for butt fusion welding. Provide valve body material to suit the adjacent piping system.
   b. Provide wrench to suit the valve operator.

2.7 DOMESTIC WATER PIPING SPECIALTIES

A. Water Hammer Arrestors:
1. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 11 68 75, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.
2. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.
3. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Josam Company, series 75000.
   b. Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050.
   c. Mifab, series WHB.

B. Potable Water Pressure-Regulating Valve:
1. Provide pressure-regulating valves, single-seated, direct-operated type, bronze body, integral strainer, complying with requirements of ASSE Standard 1003, and the lead-free requirements of California Health and Safety Code Section 11 68 75. Size for maximum flow rate and inlet and outlet pressure indicated on Drawings.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Cla-Val Company.
   b. Watts Regulator Company.

C. Relief Valves:
1. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.

2. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Watts Regulator Company.
   b. Cash (A.W.) Valve Manufacturing Corporation.
   c. Zurn Industries, Inc.; Wilkins-Regulator Division.

D. Trap Primers:
1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
   a. MiFab, Inc.
   b. Precision Plumbing Products.
   c. Sioux Chief Manufacturing Company.

2.8 GAS PIPING SPECIALTIES

A. Gas Pressure Regulating Valves:
1. Provide single-stage, spring-loaded, corrosion-resistant gas pressure regulators, with die-cast aluminum or cast iron body, complying with ANSI Z21.80. Unit shall be with atmospheric vent, internal relief overpressure protection, threaded ends for 2 inches and smaller, flanged ends for 2-1/2 inches and larger. For inlet and outlet gas pressures, specific gravity, and volume flow refer to Drawings schedule.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

Size	Manufacturer/Model
1/2 inch	Elster (American, Singer) model 1213B Itron (Actaris, Slumberger, Sprague) model B42R.
3/4 thru 1-1/4inches	Elster (American, Singer) model 1813C Sensus (Ivensys, Equimeter, Rockwell) model 143-80-12 Itron (Actaris, Slumberger, Sprague) models B42R, B57R, B58R
1-1/2 thru 2 inches	Elster (American, Singer) models 1813, 1813B Sensus (Ivensys, Equimeter, Rockwell) model 243 Itron (Actaris, Slumberger, Sprague) models B43SR, B34R, B38R

2.9 DRAIN AND WASTE PIPING SPECIALTIES

A. Cleanouts:
   1. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts where indicated on drawings, and where required for satisfactory use.
      a. Provide cleanouts in waste drop from each sink and urinal.
      b. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.
   2. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.
   3. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).
   4. Cleanouts in concealed, aboveground cast-iron soil or waste lines: Zurn Z-1440A, or equal, with ABS plastic plug.
   5. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within ½ inch of front face of finished wall.
      a. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.
      b. Install face of cleanout plug within 1/2 inch of front face of finished wall.

6. Cleanouts exterior to building in landscaped areas: Zurn Z-1449-BP, or equal, cleanout ferrule with tapered bronze plug. Where located at grade, provide 18 by 18 by 6 inch concrete pad; Trowel concrete smooth and edge; set flush with finished grade.
7. Cleanouts in drive areas: Zurn -1400-HD-KC, or equal, with heavy-duty top and ABS plastic plug.

B. Floor Drains:
1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
   a. J.R. Smith.
   b. MIFAB.
   c. Watts.
   d. Zurn.

C. Floor Sinks:
1. Floor Sinks: Provide anchoring flange (seepage pan) at all floor sinks, and provide flashing clamp in locations where floor membrane is used. Provide cast iron "P" trap and trap primer connection at P-Trap.
2. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
   a. J.R. Smith.
   b. MIFAB.
   c. Watts.
   d. Zurn.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.

B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including gas service and meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.

C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.

D. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

3.2 INSTALLATION OF WATER PIPING

A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.

B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.
   1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.
   2. Install water hammer arresters above accessible ceilings or install access doors for service.

C. Install piping on room side of building insulation.

D. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.

3.3 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS

A. Make joints in PVC sewer pipe with PVC-type couplings and rubber rings.

B. Check final location of rubber rings within the couplings with gauge or as recommended by the manufacturer. Make joints between PVC pipe and cast iron pipe or fittings using cast iron adapter fittings, installed as recommended by the manufacturer.
   1. Ring-Tite cast iron pipe fittings may be used in lieu of standard fittings. Make connection to valves with cast iron adapters connected to the pipe with PVC couplings.

C. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.

D. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.

E. Grade all vent piping so as to free itself quickly of any water condensation.

F. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.

G. Install drip pan under storm drain piping, sanitary drain piping, and vent piping that must be run over kitchen areas.

H. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

3.4 INSTALLATION OF GREASE WASTE PIPING SYSTEMS

A. Install to comply with all manufacturers' recommendations.

B. All buried pipe shall be bedded in and backfilled with 4 inches of sand, and installed as recommended by manufacturer.

C. Install piping at concrete slabs or footings with 1 inch minimum polystyrene surrounding piping.

D. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Maintain continuous pressure test on piping installed below grade, until all work has progressed to above grade.

E. Electrofusion joints: Make polypropylene drainage piping joints according to ASTM F 1290.

3.5 INSTALLATION OF NATURAL GAS PIPING

A. Install natural gas piping in accordance with Division 22 Basic Plumbing Materials and Methods sections.

B. Use sealants on metal gas piping threads that are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.

C. Remove cutting and threading burrs before assembling piping.

D. Do not install defective piping or fittings. Do not use pipe with threads that are chipped, stripped, or damaged.

E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.

F. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.

G. Install drip-legs in gas piping where indicated and where required by code or regulation.
1. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.

2. Where gas supply is connected to equipment with flexible connectors, install drip-leg in piping on downstream side of flexible connector, and install shut off valve on piping on upstream side of flexible connector.

H. Install piping with 1/64 inch per foot (1/8 percent) downward slope in direction of flow.

I. Install piping parallel to other piping.

J. Paint all gas piping installed in exposed exterior locations. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods, article, Painting.

K. Provide exterior shutoff valve at each building. Provide sign affixed to wall at valve location reading: “Gas Shut-Off.” Size and location of the sign shall be as required by the Authority Having Jurisdiction. Where gas piping enters a building in more than one location, exterior shutoff valves shall have a permanently attached metal tag identifying the area served by that valve, in addition to sign on wall.

L. Provide watertight Schedule 40 PVC conduit to protect gas piping installed below covered walk, covered driveways, and where noted on Drawings. Extend sleeve at least 12 inches beyond any area where it is required to be installed, and terminate with valve box extended to grade, and marked “GAS”.

M. Maintain minimum of 12 inch clearance between gas piping and steam piping above 200 degrees F.

3.6 PIPE JOINTS AND CONNECTIONS

A. General:
1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

D. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Piping: Join according to ASTM D 2855.

E. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.
1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.

F. Cast Iron Soil Pipe:
1. No-Hub fittings shall be made with a torque wrench.
2. Hub joints shall be with Ty-Seal couplings.
3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified LOP reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.

G. Welded Pipe:
1. Make up with oxyacetylene or electric arc process.
2. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
3. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

H. PVC Sewer and Drainage Pipe (outside building as allowed only): Four inches and larger shall be bell and spigot, assembled in accordance with manufacturer's recommendations. Joint shall be tested in accordance with ASTM D3212. Solvent weld joints below 4 inches in size, schedule 40 PVC with matching fittings, assembled per manufacturer’s instructions.

I. Polyethylene and Polypropylene Pipe: Assemble with fusion joints in strict accordance with manufacturer's instructions.

J. Flexible Connections:
1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Anchor piping securely on the system side of each flexible connection.

3.7 INSTALLATION OF VALVES

A. Install valves as indicated on Drawings and in the following locations:

1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.
3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:
1. Valves shall be full line size unless indicated otherwise on Drawings.
2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
4. Locate valves for easy access and provide separate support where necessary.
5. Install valves in position to allow full stem movement.
6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
7. Butterfly valves conforming to the paragraph “Butterfly Valves” may be used in lieu of gate or globe valves for locations above grade.
8. Ball valves conforming to the paragraph “Ball Valves” may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Gate Valves:
1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:
   a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
   b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

D. Swing Check Valves: Install in horizontal position with hinge pin level.

E. Butterfly Valves: Install with stems horizontal.

F. Silent Check Valves: Install in horizontal or vertical position between flanges.

G. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers’ recommendations, including requirements for straight pipe lengths at valve inlet and outlet.

H. Gas Shut-Off Valves:
1. Provide line size ball valve in gas line to each appliance.
2. Provide line size electric solenoid gas valve in gas line to kitchen equipment (if not supplied with appliance) under Type 1 hood. Interlock with hood fire alarm system.

I. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.8 INSTALLATION OF CLEANOUTS

A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.

B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

3.9 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS

A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains with lip of drain slightly below finished floor to ensure drainage. Install floor sinks flush with finished floor. Coordinate with other trades to ensure that floor slopes to drain. Provide flashing flange and clamping device with each drain passing through water resistant membrane.

B. Install vented P-trap below each drain. Where trap primers are indicated, install trap primer connection in the P-trap.

3.10 TRAP PRIMER INSTALLATION

A. Install as indicated in manufacturers printed literature, with 1/2 inch, Type L, hard copper piping to trap primer connection on floor drains and floor sinks where indicated on Drawings. At Contractor’s option, Type K annealed copper tubing without joints may be used be used below slab only. See Section 22 00 50 for pipe protection requirements for below slab copper piping/tubing.

B. Install trap primer piping with 1/4 inch per foot slope, to insure that the line will drain fully to the floor drain or floor sink.
   1. Provide ball valve to the inlet at each trap primer location.

C. Install trap primer and distribution unit exactly as called for in manufacturers printed installation instructions. Connect to domestic water piping from the top of the water line, in order to prevent foreign material from entering directly into primer assembly.

D. Mount trap primer in wall, in sheet metal box, with Karp or equal access door. Size access door and box to suit valve operation, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door where installed in occupied spaces.

E. Where one trap primer will be used for more than one trap, provide a distribution unit with feeder piping for a maximum of four traps sized for equal pressure drop to each trap.

3.11 INSTALLATION OF GAS PRESSURE REGULATING VALVES

A. Install as indicated; comply with utility requirements. In locations where regulators are installed in confined spaces, pipe atmospheric vent to outdoors, full size of outlet. Install gas shutoff valve upstream and downstream of each pressure-regulating valve.

3.12 GAS PIPING EQUIPMENT CONNECTIONS

A. Connect gas piping to each gas-fired equipment item, with union, drip leg and shutoff gas cock full size of supply line shown. Reduce only at connection to equipment. Comply with equipment manufacturer's instructions.
   1. Route gas vent and gas relief to outside.
   2. Gas shutoff valve shall be placed as close as possible to equipment in a location where it can be serviced. Distance from equipment to valve shall not exceed 6 feet.

3.13 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.

B. Mechanical Equipment Connections: Connect hot and cold water piping system and gas piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

3.14 KITCHEN EQUIPMENT INSTALLATION

A. Coordinate all work with Specification Section for Kitchen Equipment.

B. All equipment shall be fully connected.

C. Furnish and install all required "P" traps.

D. Provide stops on all hot and cold water lines at equipment, in an accessible position. Include lines to kettle and range swing faucets.

E. Water pressure for dishwasher and glass-washer to be 25 pound maximum. Provide pressure reducing valves on water line to washers.

F. All floor openings are to be sealed watertight.

G. Indirect waste lines required for standard or fabricated items of kitchen equipment, except sinks, shall be furnished and installed by the Kitchen Equipment Contractor.

H. Provide all sink drains. All indirect drains shall terminate above floor sinks at least 1-1/2 times ID of drain line and shall be so set that flare will not spill on floor area.

I. Provide approved vacuum breaker or anti siphon device on water lines to equipment wherever required.

J. Provide gas pressure regulators for modular front manifold cooking equipment assemblies. Pressure regulators shall be adjustable from 2 inch to 7 inch water column and shall be set for approximately 6 inches W.C. at manifold connection.

K. All gas pressure regulators shipped loose with gas fired equipment shall be installed by Plumbing Contractor.

L. The Kitchen Equipment Contractor will provide all equipment trim including faucets and sink wastes and swing faucets at kettles all to be installed by Plumbing Contractor.

M. All horizontal piping lines connected to equipment shall be run at the highest possible elevation not less than 6 inches above floor. Piping rough-in shall be stubbed in walls wherever possible.

N. Vent piping for waste lines shall be concealed wherever possible and vertical vents for island or free-standing equipment shall be avoided. Any required exposed vents shall be submitted to the Architect for approval.

O. Fire protection systems for ventilators and cooking equipment are furnished and installed by Kitchen Equipment Contractor unless shown otherwise on the drawings. Gas valves which are a part of the fire protection systems are furnished only. Plumbing Contractor shall install gas valves.

P. Connect movable gas-fired cooking equipment utilizing flexible gas connection system.

3.15 DOMESTIC WATER SYSTEM STERILIZATION

A. Clean and disinfect new or altered hot and cold water piping connected to domestic water systems using methods prescribed by the Health Authority. If the Health Authority does not prescribe methods, clean and disinfect new or altered hot and cold water piping using methods given in the California Plumbing Code.
   1. A water treatment company that has a current state EPA license to apply disinfectant chlorine in potable water shall perform the procedure.

3.16 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

3.17 OPERATIONAL TESTS

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.18 TESTING AND BALANCING

A. See Section 23 05 93 of Specifications for testing and balancing requirements.

3.19 CLEANING UP

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 10 00

PLUMBING FIXTURES

Section 22 40 00
Project #23-34-026

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water supplies and stops.
   2. Plumbing fixture hangers and supports.
   3. Refrigerator ice maker outlet boxes.

1.2 RELATED REQUIREMENTS

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

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

1.4 INFORMATIONAL SUBMITTALS

A. Refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this Section:
   1. California Building Code – CBC
   2. California Plumbing Code – CPC
   3. California Health and Safety Code
   4. American National Standards Institute - ANSI
   5. Federal Standards - F.S.
   6. National Sanitary Foundation – NSF International

C. ANSI Standards: Comply with ANSI/NSF 61, “Drinking Water System Components – Health Effects.”

D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.

E. Americans with Disabilities Act (ADA).

F. California Green Building Standards Code Requirements:
   1. Tank-type water closets shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Tank-Type Toilets.
   2. Single Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.
   1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.
   2. Take location and mounting heights for roughing-in from Architectural Drawings.
   3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.
   4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

2.2 MATERIALS

A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.

B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.

C. Handles on all faucets and stops shall be all metal chromium plated.

D. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES

A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.
   1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.

B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.

C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.

D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.

F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.

G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

2.4 MANUFACTURERS

A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.

B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

2.5 FIXTURE CONNECTIONS

A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.

B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      a. Dearborn Brass, Commercial series with brass nuts.
      b. Delta Commercial.
      c. McGuire Manufacturing Co., Inc.

C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.

D. Plumbing fixture traps connected to special waste systems shall be constructed of materials to suit the waste system.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      a. Orion.
      b. Enfield

E. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

2.6 WATER SUPPLIES AND STOPS

A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 11 68 75, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.

B. Provide water supplies to fixtures with compression shut-off stops with threaded inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and threaded inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.

C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.

D. Provide cast brass escutcheon.

E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1. McGuire Manufacturing Company, Inc., model LFH2167LK.
2. T & S Brass and Bronze Works, Inc., model B-1305.

2.7 PLUMBING FIXTURE HANGERS AND SUPPORTS

A. Residential type fixture supports are not acceptable.

B. Install wall mounted water closets with combination support and waste fittings, with feet of support securely anchored to floor.

C. Install floor mounted water closets with J.R. Smith, Zurn, or equal government pattern cast iron closet flanges with brass bolts, nuts, washers, and porcelain caps secured with Spackle.

D. Install the following fixtures on concealed support with feet of support securely anchored to floor. Anchor top of support to wall construction in an approved manner.
1. Wall hung lavatories.
2. Wall mounted urinals.
3. Drinking fountains.
4. Electric water coolers.

2.8 PLUMBING FIXTURES

A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.

B. Special Requirements For Accessible Fixtures:
1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with less than 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.
2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded “closed-cell” vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 50 when tested in

accordance with ASTM E-84, and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

C. Refrigerator Ice Maker Outlet Boxes:
   1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
      a. Guy Gray.
      b. Water-Tite.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING AND PROTECTION

A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

3.2 PREPARATORY PROVISIONS

A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.3 INSPECTION AND PREPARATION

A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.

C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.

D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.

3.4 CLEAN AND PROTECT

A. Clean plumbing fixtures of dirt and debris upon completion of installation.

B. Protect installed fixtures from damage during the remainder of the construction period.

C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

3.5 FIELD QUALITY CONTROL

A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

3.6 EXTRA STOCK

A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

END OF SECTION 22 40 00

PLUMBING EQUIPMENT

Section 22 50 00
Project #23-34-026

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES
   1. Gas fired water heaters.
   2. Expansion tanks.
   3. In-line domestic hot water recirculation pumps.
   4. Hydromechanical Grease Interceptors

1.2 RELATED REQUIREMENTS

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

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, capacity and ratings, with selection points clearly indicated.

1.4 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Trade names or catalog numbers stated herein indicates grade or quality of materials desired.

C. Dimensions, sizes, and capacities shown are minimum and shall not be changed without permission of Architect.

D. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.

E. CEC Compliance: Comply with California Electrical Code (Title 24, Part 3) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.

F. ANSI Compliance: Comply with ANSI Z223.1 (NFPA 54) "National Fuel Gas Code", as applicable to installation of gas-fired water heaters.

G. CSA/UL Labels:
   1. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.1-CSA 4.1 standards governing storage-type water heaters with input ratings of 75,000 BTU/hr. or less.
   2. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.3-CSA 4.3 standards governing storage-type water heaters with input ratings of greater than 75,000 BTU/hr.

H. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.

I. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME Code symbol:
   1. Water Heaters 200 MBH and greater.

J. California Energy Commission Compliance: Provide written confirmation of listing of all water heaters in the "Appliance Efficiency Database."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

1.8 WARRANTY

A. Atmospheric Gas Fired Water Heaters: Three-year minimum limited warranty on tank.

B. Power Gas Fired Water Heaters: Three-year minimum limited warranty on tank.

C. Direct Vented Sealed Combustion Condensing Gas-Fired Water Heater: Three-year minimum limited warranty on tank.

D. Instantaneous Gas-Fired Water Heater: three-year minimum limited warranty on heat exchanger and parts.

PART 2 - PRODUCTS

2.1 MATERIALS

A. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.2 GAS FIRED WATER HEATERS

General: All units shall comply with the emissions requirements of the Air Quality Management District (AQMD) in which they are to be installed.

B. Atmospheric Gas Fired Water Heaters:
1. General: Provide commercial atmospheric gas-fired water heater of size, capacity, and electrical characteristics indicated on Drawings. Comply with ASHRAE 90.1 for energy efficiency. Provide UL or CSA International listing.
2. Heater: Working pressure of 150 psi, rigidly supported magnesium anode rod, glass lining on internal surfaces exposed to water. Provide gas pressure regulator, adjusted for operation on natural gas, with pressure rating to suit heater listing. Provide hand-hole cleanout through tank and jacket.
3. Jacket: Insulate tank with rigid polyurethane foam or fiberglass insulation. Provide heavy-gauge steel jacket and baked enamel finish.
4. Accessories: Provide brass drain valve and 3/4 inch temperature and pressure relief valve. Provide thermometer, installed in the top 1/3 of the tank or at hot water discharge at the tank.
5. Controls: Adjustable immersion thermostat with safety shutoff.
6. Vent: Furnish and install "Metalbestos", Selkirk, or equal, Type B vent, UL listed. Furnish complete with roof support, flashing, Briedert Type L, Metalbestos, or equal stainless stack cap, and all supports and accessories required for a complete installation.
7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Bradford White Corporation.
   b. Lochinvar Corporation.
   c. PVI Industries, LLC.
   d. Rheem Manufacturing Company.
   e. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.

C. Power Gas Fired Water Heaters:
   1. General: Provide commercial power gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Comply with ASHRAE 90.1 for energy efficiency. Provide UL or CSA International listing. Units with gas input above 200 MBH shall be ASME constructed and listed, stamped for 125 PSIG.
   2. Heater: Working pressure of 150 psi, magnesium anode rod, glass lining on internal surfaces exposed to water.
   3. Jacket: Insulate tank with vermin-proof glass fiber or polyurethane foam insulation. Provide heavy-gauge steel jacket and baked enamel finish.
   4. Accessories: Provide brass drain valve and 3/4 inch temperature and pressure relief valve. Provide thermometer, installed in the top 1/3 of the tank or at hot water discharge at the tank.
   5. Provide equal flow manifold for piping entering and leaving the water heaters. Manifold shall be provided as a standard option for the heaters proposed.
   6. Controls: Adjustable immersion thermostat with safety shutoff.
   7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      a. Bradford White Corporation.
      b. Lochinvar Corporation.
      c. PVI Industries, LLC.
      d. Rheem Manufacturing Company.
      e. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.
   8. Vent: Furnish and install "Metalbestos", Selkirk, or equal, Model PS, all-steel vent, UL listed. Furnish complete with roof support, flashing, Briedert, Metalbestos, or equal, Type L stainless stack cap, .035" stainless steel inner pipe, and all supports and accessories required for a complete installation. All joints shall be sealed with silicone sealant as recommended by the manufacturer for pressure-tight joints.
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
         1) American Metal Products
         2) Selkirk
         3) Metalbestos

D. Direct Vented Sealed Combustion Condensing Gas-Fired Water Heater:
   1. General: Provide commercial direct vented sealed combustion condensing gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Provide UL or CSA International listing. Design unit to conform to the following:
      a. ASHRAE/IESNA 90.1.
      b. California NOx emission requirements.
      c. Units with gas input above 200 MBH shall be ASME constructed and listed, stamped for 150 PSIG.
      d. Minimum efficiency of 95 percent.
   2. Storage Tank Construction: Seamless steel with 150 psig working-pressure rating, glass lining on internal surfaces exposed to water.
   3. Factory-Installed Storage Tank Appurtenances:
      a. Anode Rods: Magnesium.

b. Jacket: Heavy-gauge steel with enameled finish.
c. Cleanout: Hand-hole cleanout though tank and jacket.
d. Burner: Low NOx, pre-mix powered type, down-fired configuration.
e. Insulation: Non-CFC foam.
f. Drain Valve: Brass construction.
g. Heat Exchanger Coil: Located within submerged combustion chamber.
h. Combination Temperature and Pressure Relief Valve.
i. Dielectric Fittings.

4. Accessories: Provide thermometer, installed in the top 1/3 of the tank or at hot water discharge at the tank.
5. Controls: Adjustable electronic immersion thermostat with safety shutoff.
6. Condensate Drain Piping: CPVC piping as defined in Section 22 10 00.
7. Vent and Exhaust Piping: CPVC piping as defined in Section 22 10 00
8. See equipment Schedule and details on Drawings for additional accessories and requirements.
9. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Bradford White Corporation.
   b. Lochinvar Corporation.
   c. PVI Industries, LLC.
   d. Rheem Manufacturing Company.
   e. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.

E. Instantaneous Gas-Fired Water Heater:
1. General: Provide instantaneous gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Unit shall be suitable for interior or exterior installation and multiple-unit battery configuration as shown on Drawings, and shall be design certified and listed by CSA International. Design unit to conform to the following:
   a. ASHRAE/IESNA 90.1.
   b. California NOx emission requirements.
   c. Minimum efficiency of 82 percent.
   d. 150 PSI maximum water pressure.
2. Factory-Installed Appurtenances:
   a. Jacket: Heavy-gauge steel with enameled finish.
   b. Burner: Low NOx, horizontal stainless steel, direct electronic ignition.
   c. Gas Valve: Automatic modulating type.
   d. Gas Pressure Regulator.
   e. Heat Exchanger Coil: Copper, integral fin and tube type.
3. Accessories: Provide with the following:
   a. Thermometer, as described in Section 22 00 50.
   b. Wall mounting bracket.
   c. ASME pressure relief valve.
4. Controls and Safeties: Shall provide the following features:
   a. Flame proof sensor.
   b. High temperature shut-off.
   c. Over-current protection.
   d. Freeze protection.

5. Vent and Exhaust Piping: Provide field-fabricated or factory furnished piping as required by unit manufacturer for exterior or interior installations. Piping material shall be per unit manufacturers' requirements. Provide factory furnished vent termination cap for exterior installations.
6. See equipment Schedule and details on Drawings for additional accessories and requirements.
7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Bradford White Corporation.
   b. Rinnai Corporation.
   c. Takagi Industrial Corporation.

2.3 EXPANSION TANKS

A. Provide thermal expansion tanks of size and number as indicated on Drawings, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75. Construct tank of welded steel for working pressure of 125 psi. Provide specially compounded flexible diaphragm securely sealed into tank to permanently separate air charge from system water, to maintain design expansion capacity.
   1. Tanks shall be IAPMO approved and listed for use with domestic water systems.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   1. Amtrol, Inc.
   2. A.O. Smith Water Products Company.
   3. Watts Water Technologies, Inc.

2.4 IN-LINE DOMESTIC HOT WATER RECIRCULATION PUMPS

A. Provide lead-free in-line domestic water recirculation pumps where indicated on Drawings and of capacities as scheduled on Drawings. Pumps shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

B. Pumps shall be of the centrifugal type with non-overloading characteristics and shall not overload the motor above its nameplate horsepower rating under any operating condition. No allowance for service factor shall be used in pump selection. Motor horsepower shown is minimum; furnish larger motors if necessary to meet the non-overloading requirements.

C. Type: Horizontal, designed for 125 thru 150 psi maximum working pressure and 225 degrees F continuous water temperature.

D. Construction: Bronze casing, non-metallic impeller.

E. Shaft: Ceramic, supported by carbon bearings. Bearings shall be lubricated by the pumped water.

F. Motors shall have permanently lubricated ball bearings. Motors shall meet NEMA specifications. Motors shall have built-in thermal overload or impedance protection.

G. Provide control wiring between field-installed controls, indicating devices, and pump control panels as work of this section, complying with requirements of Division 26 sections:
   1. Control wiring specified as work of Division 23 for Automatic Temperature Controls is work of that section.

H. Wire pumps to mechanical control circuits to shut down pump when building is not occupied. Where no control system is installed, furnish pump manufacturers standard timer to automatically turn off circulating pump when hot water is not required.

I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   1. Grundfos Pumps Corporation.
   2. Bell & Gossett, ITT Corporation.
   3. Taco Incorporated.
   4. Armstrong Pumps, Inc.

2.5 HYDROMECHANICAL GREASE INTERCEPTOR

A. Furnish and install grease interceptor with minimum capacity indicated on Drawings, complete as cataloged. Provide extension to suit installation requirements. Provide flow control device, lift out sediment bucket, anchor flange and flashing clamp, cover recessed for tile floor, and no hub adapter for piping.

B. Available Manufacturers: Subject to compliance with requirements, manufacturer offering grease interceptors which may be incorporated in the work include the following, or equal:
   1. Jay R Smith
   2. Zurn

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor shall be responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section and shall not proceed until all unsatisfactory conditions have been corrected. Commencing work shall be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.2 GAS-FIRED WATER HEATER INSTALLATION

A. Install gas-fired water heaters as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.

B. Furnish wiring diagram to Electrical Installer. Refer to Division 26 for wiring of units, not work of this section.

C. Connect to hot and cold water lines with shutoff valves and dielectric unions. Install ASME standard pressure and temperature relief valve. Connect drain and relief piping as noted on Drawings.

D. Start-up, test, and adjust water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

E. Install thermometer, in the top 1/3 of the tank or at hot water discharge at the tank.

F. Confirm that water heater proposed is suitably equipped to be brought into the building through building openings provided, and that heater may be installed and removed through building openings provided.

G. Additional requirements for direct vented sealed combustion condensing water heaters:
   1. Install vent and exhaust piping for direct vented sealed combustion condensing gas-fired water heaters strictly in accordance with unit manufacturers' recommendations.
   2. Trap condensate drain line per manufacturers' recommendations and run to nearest code-compliant point of disposal.

3.3 PUMP INSTALLATION

A. Install pumps where indicated, in accordance with manufacturer's published instructions, complying with recognized industry practices to ensure that pumps comply with requirements and serve intended purposes.

B. Provide access space around pumps for service as indicated, but in no case less than that recommended by manufacturer.

C. Install in-line pumps with support from overhead structure on each side of pump, or as indicated on Drawings.

D. Support piping from the building structure so as to prevent any strain on the pump casings. Provide a final check for perfect alignment of the piping connections after pump has been secured to its base. Provide valves, accessories, gauges, flexible connections, and supports as indicated.

E. Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

F. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is complete and correct.

G. Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer.

H. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

I. Increase piping immediately at pump suction and discharge; flexible couplings and all valves shall be full line size.

J. Trim pump impeller to obtain the desired water flow after installation, without cost to Owner.

K. Pumps shall not be connected to piping before piping is thoroughly flushed and cleaned of all dirt and grit. After piping connections have been made, systems shall be filled before starting pumps. Pumps shall not be run dry under any circumstances.

3.4 INTERCEPTOR INSTALLATION

A. Install interceptors as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.

B. Support: Anchor interceptors securely to substrate. Locate interceptors so that adequate clearance is provided to remove covers and sediment baskets. Set recessed units so top of cover is flush with finished grade.

C. Piping: Connect inlet and outlet piping to interceptors.

D. Refer to local standards for special installation requirements.

3.5 DEMONSTRATION AND TRAINING

A. Provide a minimum of 8 hours of training and orientation of Owners staff in proper care and operation of Plumbing Equipment.

3.6 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Leave systems and equipment in satisfactory operating condition.

3.7 OPERATIONAL TESTS

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.8 CLEANING UP

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 50 00

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Electric motors.
   2. Motor starters.
   3. Access Doors.

1.2 RELATED REQUIREMENTS

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

B. This Section is a part of each Division 23 Section.

C. Refer to Section 23 08 00.13, T-24 Commissioning of HVAC for Title 24 commissioning requirements.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.

B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.

C. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

1.4 REFERENCES AND STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
   1. AABC - Associated Air Balance Council
   2. AFBMA - Anti Friction Bearing Manufacturer's Association
   3. AMCA - Air Moving and Control Association Inc.
      a. Standard 210 - Laboratory Methods of Testing Fans
   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. CCR - California Code of Regulations
    a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36
10. CSA – Canadian Standards Association International
11. CSFM - California State Fire Marshal
12. NCPWB - National Certified Pipe Welding Bureau
13. NIST - National Institute of Standards and Technology
14. NEMA - National Electrical Manufacturers' Association
15. NFPA - National Fire Protection Association
16. OSHA - Occupational Safety and Health Act
17. SMACNA - Duct Manuals
18. UL - Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:
    1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
        a. California Building Code, 2022.
        b. California Electrical Code, 2022.
        c. California Energy Code, 2022.
        d. California Fire Code, 2022.
        e. California Green Building Standards Code, 2022.
        f. California Mechanical Code, 2022.
        g. California Plumbing Code, 2022.
        h. California Code of Regulations, Title 24.
        i. California Health and Safety Code.
        j. CAL-OSHA.
        k. California State Fire Marshal, Title 19 CCR.
        l. National Fire Protection Association.
        m. Occupational Safety and Health Administration.
        n. Other applicable state laws.
    2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.

B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.

1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.
2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.
4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

C. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.

B. Arrange for utility connections and pay charges incurred, including excess service charges.

C. Coordination:
   1. General:
      a. Coordinate HVAC Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
   2. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.
   3. Electrical Coordination:
      a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
         1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
         2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.

3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

4. Mechanical Coordination:
   a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
   b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during construction.
   c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”
   d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.7 SUBMITTALS - GENERAL

A. Refer to Division 01 Submittals Section(s) for additional requirements.

B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.

C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
   1. Partial or incomplete submittals will not be considered.
   2. Quantities are Contractor's responsibility and will not be reviewed.
   3. Provide materials of the same brand or manufacturer for each class of equipment or material.
   4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
   5. Identify each submittal item by reference to items’ Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
   6. Organize submittals in same sequence as in Specification Sections.
   7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
      a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
      b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.

c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
d. Catalog cuts and published material may be included with supplemental scaled drawings.

D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal as a complete package.
1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.

F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

1.8 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.

B. Shop Drawings.

C. Sustainable Design Submittals:
1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

D. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.
1. Calculations performed for use in selection of seismic supports, anchorages, restraints, and vibration isolators shall utilize criteria indicated in Structural Contract Documents.
2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis

data signed and sealed by the California registered structural engineer responsible for their preparation.

3. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an OSHPD pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
   a. Bracing of Piping, Ductwork, and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping and ductwork, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.
   b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2022 California Building Code
4. Additional Requirements: In addition to the above, conform to all state and local requirements.

1.9 INFORMATIONAL SUBMITTALS

A. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 80 00.

B. Provide evidence of equipment certification to California Energy Code Section 110.1 or 110.2, if not providing Electrically Commutated motors for HVAC fans sized below 1 hp and above 1/12 hp. Refer to specific equipment articles requiring electrically commutated motors.

C. Check, Test, and Start forms, from equipment manufacturers.

D. Check, Test and Start reports.

1.10 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
   1. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.

a. Sets shall incorporate the following:
   1) Product Data.
   2) Shop Drawings.
   3) Record Drawings.
   4) Service telephone number, address and contact person for each category of equipment or system.
   5) Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
   6) Copies of guarantees/warrantees for each item of equipment or systems.
   7) Test data and system balancing reports.
   8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
   9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
   10) Temperature control diagrams and literature.
   11) Check test and start reports for each piece of mechanical equipment provided as part of the Work.
   12) Commissioning and Preliminary Operation Tests required as part of the Work.

2. Post service telephone numbers and addresses in an appropriate place designated by Architect.

B. Record Drawings:
1. Refer to Division 01 for additional requirements.
2. Upon completion of the Work, deliver to Architect the following:
   a. Originals of drawings showing the Work exactly as installed.
   b. One complete set of reproducible drawings showing the Work exactly as installed.
   c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
   d. Provide Contractor’s signature, verifying accuracy of record drawings.
   e. Obtain the signature of the Inspector of Record for Record Drawings.

1.11 SUBSTITUTIONS

A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.

C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.

D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:
   1. Reason for substitution request.
   2. Complete submittal information as described herein; see “Submittals.”
   3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
   4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
   5. Explanation of impact on connected utilities.
   6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is Contractors’ responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.

G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

1.12 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of HVAC systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with HVAC systems work similar to that required for this Project.

C. Comply with applicable portions of California Mechanical Code pertaining to selection and installation of HVAC materials and products.

D. All materials and products shall be new.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.

B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.

B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.

C. Refer to Division 221000 and 238000 for specific system piping materials.

2.2 MATERIALS

A. No material installed as part of this Work shall contain asbestos.

B. California Green Building Code Compliance:
   1. HVAC and refrigeration equipment shall not contain CFCs.
   2. HVAC and refrigeration equipment shall not contain Halons.

2.3 ELECTRIC MOTORS

A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      a. U.S. Motors.
      b. Century Electric.
      c. General Electric.
      d. Lincoln.
      e. Gould.

B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
   1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.

C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.
   1. Multispeed motors shall have separate windings for each speed.

D. Polyphase Motors with Additional Requirements:
   1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
   2. Motors Used with Variable Frequency Controllers:
      a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
      b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
      c. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
      d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
      e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
      f. Each motor shall be provided with a shaft grounding device for stray current protection.

3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:
   1. Select motors with service factor of 1.15.
   2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
      a. Permanent-split capacitor.
      b. Split phase.
      c. Capacitor start, inductor run.
      d. Capacitor start, capacitor run.
   3. Motors for HVAC exhaust, transfer, and supply fans larger than 1/12 hp and smaller than 1 hp shall be the following:
      a. Electronically Commutated motor (EC type): Motor shall be electronically commutated type specifically designed for applications, with heavy duty ball bearings. The motor shall be speed controllable down to 20% of full speed and 85% efficient at all speeds.
         1) Exceptions:
            a) Motors in fan-coils and terminal units that operate only when providing heating to the space served.
            b) Motors installed in space conditioning equipment certified under 2013 California Energy Code Section 110.1 or 110.2.
   4. Contractor's Option: Motors scheduled on Drawings as single-phase, and larger than 1/12 hp and smaller than 1 hp, for applications other than HVAC fans, may be EC type.
   5. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
   6. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
   7. Motors 1/20 HP and Smaller: Shaded-pole type.
   8. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 MOTOR STARTERS

A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.

B. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
   1. All starters shall have the following:
      a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
      b. Ambient compensated thermal overload.
      c. Fused control transformer (for 120 or 24 volt service).

d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.

2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
4. Provide OSHA label indicating the device starts automatically.

2.5 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
   1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.

D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.

E. Provide insulated doors where located in internally insulated ducts or casings.

F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.

H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
   1. Milcor
      a. Style K (plaster).
      b. Style DW (gypsum board).
      c. Style M (Masonry).
      d. Style "Fire Rated” where required.

2.6 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

PART 3 - EXECUTION

3.1 EXISTING MATERIALS:

A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.

B. Removed materials which will not be re-installed and which are not claimed by Owner shall become the property of Contractor and shall be removed from the Project site. Consult Owner before removing any material from the Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.

C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from the premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

3.2 FRAMING, CUTTING, AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

3.3 MECHANICAL DEMOLITION

A. Refer to Division 01 Sections “Cutting and Patching” and “Selective Demolition” for general demolition requirements and procedures.

B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
   3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.
   4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
   5. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
   6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.4 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.

B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.5 PIPING SYSTEM REQUIREMENTS

A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.6 PRIMING AND PAINTING

A. Perform priming and painting on the equipment and materials as specified herein.

B. See Division 09 Painting Section(s) for detailed requirements.

C. Priming and painting:
   1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
      a. Black Steel Piping:
         1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
         2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
      b. Interior Ductwork: Refer to Division 09 Painting Section(s). Architect shall select paint color.
   2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
   3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.7 EXCAVATING

A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain all warning signs, barricades, flares, and red lanterns as required.

D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.8 BACKFILLING

A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
   1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.

C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.

D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.9 UNION AND FLANGE INSTALLATION

A. Install Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain piping. Bushings or couplings shall not be used.

B. Install unions in piping NPS 2” and smaller 3 or flanges in piping NPS 2-1/2” and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves.

C. Locate the unions for easy removal of the equipment, tank, or valve.

D. Do not install unions or flanges in refrigerant piping systems.

3.10 ACCESS DOOR INSTALLATION

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.11 CONCRETE WORK

A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.

B. Underground anchors, and pads for valve access boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

3.12 PIPE PROTECTION

A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
   1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Roystron Products, or equal.
      a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Roystron Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
   2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-l0 or V-20", "Scotchwrap 50", Slipknot l00, PASCO Specialty & Mfg., Inc., or equal, with continuous

identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.

B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.

C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Rasor Co. holiday detector, or equal.

D. Cleaning: Clean all piping thoroughly before wrapping.
1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

E. Covering: No rocks or sharp edges shall be backfilled against the wrap. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

3.13 PIPING SYSTEM PRESSURE TESTING

A. General:
1. Perform operational tests under simulated or actual service conditions.
2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

B. Piping Systems: Test the installations in accordance with the following requirements and applicable codes:
1. Notify the Architect at least seven days in advance of testing.
2. Authority having jurisdiction shall witness tests of piping systems.
3. Piping shall be tested at completion of roughing-in, or at other times as directed by the Architect.
4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
5. Isolate from system equipment that may be damaged by test pressure.
6. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.

System Tested	Test Pressure PSI	Test With
All Hot, Chilled, Combination, Condenser Water Piping	Greater of 1-1/2 x WP or 100 psi	Water

3.14 OPERATION OF SYSTEMS

A. Do not operate any mechanical equipment for any purpose, temporary or permanent, until all of the following has been completed:
   1. Complete all requirements listed under “Check, Test and Start Requirements.”
   2. Ductwork and piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
   3. Filters, strainers etc. are in place.
   4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
   5. Equipment has been run under observation, and is operating in a satisfactory manner.

B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

3.15 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
   1. As part of the submittal process, provide a copy of each manufacturer’s printed startup form to be used.
   2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer’s employees. See specific equipment Articles in these Specifications for this requirement.
   3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
   4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner’s representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.16 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

A. Prior to observation to determine final acceptance, put HVAC, plumbing, and fire protection systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
   1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.
   2. Correct rotation of motors and ratings of overload heaters are verified.
   3. Specified filters are installed and spare filters have been turned over to Owner.
   4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
   5. All equipment has been cleaned, and damaged painted finishes touched up.
   6. Damaged fins on heat exchangers have been combed out.
   7. Missing or damaged parts have been replaced.
   8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
   9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
   10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
   11. Preliminary test and balance work is complete, and reports have been forwarded for review.
   12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
   13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.

B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
   1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
   2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.
   3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
   4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
   5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. Before handing over the system to Owner replace all filters with complete new set of filters.

D. Review of Contractor's Tests:

1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

E. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

F. Preliminary Operation:
1. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

G. Operational Tests:
1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants.
2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.
3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.
4. Control systems shall be completely operable with settings properly calibrated and adjusted.
5. Rotating equipment shall be in dynamic balance and alignment.
6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.

H. Pre-Occupancy Building Purge:
1. Prior to occupancy, ventilate the building on 100 percent outside air, 100 percent exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C’s prior to occupancy.
2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.

3.17 DEMONSTRATION AND TRAINING

A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.

2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
   a. Listing of Owner-designated personnel completing training, by name and title.
   b. Name and title of training instructor.
   c. Date(s) of training.
   d. List of topics covered in training sessions.
4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 23 00 50

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Balancing Air Systems:
      a. Constant-volume air systems.
      b. Variable-air-volume systems.
   2. Balancing Hydronic Piping Systems:
   3. Balancing Domestic Water Piping Systems.

1.2 RELATED REQUIREMENTS

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

1.3 REFERENCES AND STANDARDS

A. Associated Air Balance Council (AABC)
   1. National Standards for Total System Balance, latest edition.

B. National Environmental Balancing Bureau (NEBB)
   1. Procedural Standards for Testing and Balancing of Environmental Systems, latest edition.

1.4 DEFINITIONS

A. The intent of this Section is to use the standards pertaining to the TAB specialist engaged to perform the Work of this Contract, with additional requirements specified in this Section. Contract requirements take precedence over corresponding AABC or NEBB standards requirements. Differences in terminology between the Specifications and the specified TAB organization standards do not relieve the TAB entity engaged to perform the Work of this Contract of responsibility from completing the Work as described in the Specifications.

B. Similar Terms: The following table is provided for clarification only:

Similar Terms		
Contract Term	AABC Term	NEBB Term
TAB Specialist	TAB Agency	NEBB Certified Firm
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems
TAB Field Supervisor	Test and Balance Engineer	Test and Balance Supervisor

C. AABC: Associated Air Balance Council.

D. NEBB: National Environmental Balancing Bureau.

E. TAB: Testing, adjusting, and balancing.

F. TAB Organization: Body governing practices of TAB Specialists.

G. TAB Specialist: An entity engaged to perform TAB Work.

1.5 ACTION SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. LEED Submittals:
1. Air-Balance Report for Prerequisite IEQ 1: Documentation of work performed for ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
2. TAB Report for Prerequisite EA 2: Documentation of work performed for ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
1. Provide list of similar projects completed by proposed TAB field supervisor.

2. Provide copy of completed TAB report, approved by mechanical engineer of record for a completed project with similar system types and of similar complexity.

C. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
   1. Submit examinations report with qualifications data.

D. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

E. Interim Reports. Submit interim reports as specified in Part 3. Include list of system conditions requiring correction and problems not identified in Contract Documents examination report.

F. Certified TAB reports.
   1. Provide three printed copies of final TAB report. Provide one electronic file copy in PDF format.

G. Sample report forms.

H. Instrument calibration reports, to include the following:
   1. Instrument type and make.
   2. Serial number.
   3. Application.
   4. Dates of use.
   5. Dates of calibration.
      a. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if so recommended by instrument manufacturer and be checked for accuracy prior to start of work.

1.7 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Certified TAB reports, for inclusion in Operation and Maintenance Manual.

1.8 QUALITY ASSURANCE

A. Independent TAB Specialist Qualifications: Engage a TAB entity certified by AABC or NEBB.
   1. The certification shall be maintained for the entire duration of TAB work for this Project. If TAB specialist loses certification during this period, the Contractor shall immediately notify the Architect and submit another TAB specialist for approval. All work specified in this Section and in other related Sections performed by the TAB specialist shall be invalidated if the TAB specialist loses certification and shall be performed by an approved successor.

B. To secure approval for the proposed TAB specialist, submit information certifying that the TAB specialist is either a first tier subcontractor engaged and paid by the Contractor, or is engaged and paid directly by the Owner. TAB specialist shall not be affiliated with any other entity participating in Work of this Contract, including design, furnishing equipment, or construction. In addition, submit evidence of the following:
   1. TAB Field Supervisor: Full-time employee of the TAB specialist and certified by AABC or NEBB.
      a. TAB field supervisor shall have minimum 10 years supervisory experience in TAB work.
   2. TAB Technician: Full-time employee of the TAB specialist and who is certified by AABC or NEBB as a TAB technician.
      a. TAB technician shall have minimum 4 years TAB field experience.

C. TAB Specialist engaged to perform TAB work in this Project shall be a business limited to and specializing in TAB work, or in TAB work and Commissioning.

D. TAB specialist engaged to perform TAB work shall not also perform commissioning activities on this Project.

E. Certified TAB field supervisor or certified TAB technician shall be present at the Project site at all times when TAB work is performed.
   1. TAB specialist shall maintain at the Project site a minimum ratio of one certified field supervisor or technician for each non-certified employee at times when TAB work is being performed.

F. Contractor shall notify Architect in writing within three days of receiving direction resulting in reduction of test and balance scope or other deviations from Contract Documents. Deviations from the TAB plan shall be approved in writing by the mechanical engineer of record for the Project.

G. TAB Standard:
   1. Perform TAB work in accordance with the requirements of the standard under which the TAB agencies' qualifications are approved unless Specifications contain different or more stringent requirements:
      a. AABC National Standards for Total System Balance, or
      b. NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
   2. All recommendations and suggested practices contained in the TAB standard are mandatory. Use provisions of the TAB standard, including checklists and report forms, to the extent to which they are applicable to this Project.
   3. Testing, adjusting, balancing procedures, and reporting required for this Project, and not covered by the TAB standard applicable to the TAB specialist engaged to perform the Work of this Contract, shall be submitted for approval by the design engineer.

H. TAB Conference: Meet with Architect and mechanical engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the project requirements. Require the participation of the TAB field supervisor. Provide seven days' advance notice of

scheduled meeting time and location. TAB conference shall take place at location selected by Architect offices of Capital.

1. Agenda Items:
   a. The Contract Documents examination report.
   b. The TAB plan.
   c. Coordination and cooperation of trades and subcontractors.
   d. Coordination of documentation and communication flow, including protocol for resolution tracking and documentation.
2. The requirement for TAB conference may be waived at the discretion of the mechanical engineer of record for the Project.

I. Certify TAB field data reports and perform the following:
   1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
   2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

J. TAB Report Forms: Use standard TAB specialist's forms approved by Architect.

K. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

L. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

M. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.9 WARRANTY

A. Provide workmanship and performance warranty applicable to TAB specialist engaged to perform Work of this Contract:
   1. AABC Performance Guarantee.
   2. NEBB Quality Assurance Program.

B. Refer to Division 01 Specifications for additional requirements.

1.10 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

C. Coordinate TAB work with work of other trades.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contract Documents Examination Report:
   1. TAB specialist shall review Contract Documents, including plans and specifications. Provide report listing conditions that would prevent the system(s) from operating in accordance with the sequence of operations specified, or would prevent accurate testing and balancing:
      a. Identify each condition requiring correction using equipment designation shown on Drawings. Provide room number, nearest building grid line intersection, or other information necessary to identify location of condition requiring correction.
      b. Proposed corrective action necessary for proper system operation.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.
   1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Report conditions requiring correction discovered before and during performance of TAB procedures.

J. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures. TAB plan shall be specific to Project and include the following:
   1. General description of each air system and sequence(s) of operation.
   2. Complete list of measurements to be performed.
   3. Complete list of measurement procedures. Specify types of instruments to be utilized and method of instrument application.
   4. Qualifications of personnel assigned to Project.
   5. Single-line CAD drawings reflecting all test locations (terminal units, grilles, diffusers, traverse locations, etc.
   6. Air terminal correction factors for the following:
      a. Air terminal configuration.
      b. Flow direction (supply or return/exhaust).
      c. Effective area of each size and type of air terminal.
      d. Air density.

B. Complete system-readiness checks and prepare reports. Verify the following:
   1. Permanent electrical-power wiring is complete.
   2. Automatic temperature-control systems are operational.
   3. Equipment and duct access doors are securely closed.
   4. Balance, smoke, and fire dampers are open.
   5. Isolating and balancing valves are open and control valves are operational.
   6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
   7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
   1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
   1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
   2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation," Section 23 07 16 "HVAC Equipment Insulation," Section 23 80 00 Heating, Ventilating, and Air Conditioning."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Test each system to verify building or space operating pressure, including all stages of economizer cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.

C. Except as specifically indicated in this Specification, Pitot tube traverses shall be made of each duct to measure airflow. Pitot tubes, associated instruments, traverses, and techniques shall conform to ASHRAE Handbook, HVAC Applications, and ASHRAE Handbook, HVAC Systems and Equipment.
   1. Use state-of-the-art instrumentation approved by TAB specialists governing agency..
   2. Where ducts' design velocity and air quantity are both less than 1000 fpm/CFM, air quantity may be determined by measurements at terminals served.

D. Test holes shall be placed in straight duct, as far as possible downstream from elbow, bends, take-offs, and other turbulence-generating devices.

E. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

F. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

H. Verify that motor starters are equipped with properly sized thermal protection.

I. Check dampers for proper position to achieve desired airflow path.

J. Check for airflow blockages.

K. Check condensate drains for proper connections and functioning.

L. Check for proper sealing of air-handling-unit components.

M. Verify that air duct system is sealed as specified in Section 23 31 13 "Metal Ducts." Section 23 80 00 “Heating, Ventilating, and Air Conditioning.”

N. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

O. Automatically operated dampers shall be adjusted to operate as indicated in Contract Documents. Controls shall be checked for proper calibration.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure total airflow.
      a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow. Alternative methods shall be examined for determining total CFM, i.e., Pitot-tube traversing of branch ducts, coil or filter velocity profiles, prior to utilizing airflow values at terminal outlets and inlets.
   2. Measure fan static pressures as follows to determine actual static pressure:
      a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet.
      c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
      d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
   3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
      a. Report the cleanliness status of filters and the time static pressures are measured.
   4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
   5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
   6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
   7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Check operation of relief air dampers. Measure total relief air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust relief air dampers to provide 100 percent relief in economizer mode. Ensure that relief dampers close completely upon unit shutdown.

C. Check operation of outside air dampers. Measure total outside air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust outside air dampers to provide 100 percent outside air in economizer mode. Ensure that outside air dampers close completely upon unit shutdown.

D. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
   1. Measure airflow of submain and branch ducts.
      a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
   2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
   3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

E. Measure air outlets and inlets without making adjustments.
   1. Measure terminal outlets using a direct-reading digital backflow compensating hood. Use outlet manufacturer's written instructions and calculating factors only when direct-reading hood cannot be used due to physical obstruction or other limiting factors. Final report shall indicate where values listed have not been obtained by direct measurement.

F. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
   1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents, if included.
   2. Adjust patterns of adjustable outlets for proper distribution without drafts. Terminal air velocity at five feet above finished floor shall not exceed 50 feet per minute in occupied air conditioned spaces.

G. Do not overpressurize ducts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Comply with applicable requirements for constant-volume air systems in addition to those listed below.

B. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point

airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

C. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
   1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
   2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
   3. Measure total system airflow. Adjust to within indicated airflow.
   4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
   5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
      a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
   6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
      a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
   7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
   8. Record final fan-performance data including optimum operating static control set point.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
   1. Manufacturer's name, model number, and serial number.
   2. Motor horsepower rating.
   3. Motor rpm.
   4. Efficiency rating.
   5. Nameplate and measured voltage, each phase.
   6. Nameplate and measured amperage, each phase.
   7. Starter manufacturer’s name, model number, size, type, and thermal-protection-element rating.
      a. Starter strip heater size, type, and rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
   1. Measure and record the operating speed, airflow, and static pressure of each fan.
   2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
   3. Check the condition of filters.
   4. Check the condition of coils.
   5. Check the operation of the drain pan and condensate-drain trap.
   6. Check bearings and other lubricated parts for proper lubrication.
   7. Report on the operating condition of the equipment and the results of the measurements taken. Report conditions requiring correction.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
   1. New filters are installed.
   2. Coils are clean and fins combed.
   3. Drain pans are clean.
   4. Fans are clean.
   5. Bearings and other parts are properly lubricated.
   6. Conditions requiring correction noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
   1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
   2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
   3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
   4. Balance each air outlet.

3.9 GENERAL PROCEDURES FOR PLUMBING SYSTEMS

A. Measure pressure drop across each backflow preventer assembly at design flows.

B. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
   1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
      a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Architect Owner Construction Manager Commissioning Authority and comply with requirements in Section 22 50 00 “Plumbing Equipment Section 22 11 23 "Domestic Water Pumps."
   2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
      a. Monitor motor performance during procedures and do not operate motors in overload conditions.
   3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
   4. Report flow rates that are not within range given in article, Tolerances.

C. Set calibrated balancing valves, if installed, at calculated presettings.

D. Measure flow at all stations and adjust, where necessary, to obtain first balance.
   1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

E. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

F. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
   1. Determine the balancing station with the highest percentage over indicated flow.
   2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
   3. Record settings and mark balancing devices.

G. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

H. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

I. Check settings and operation of each safety valve. Record settings.

3.10 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent and minus 0 percent.
2. Air Outlets and Inlets: Plus 5 percent and minus 5 percent.
3. Multiple outlets within single room: Plus 5 percent and minus 0 percent for total airflow within room. Tolerance for individual outlets within a single room having multiple outlets shall be as for “Air Outlets and Inlets.”
    a. Room shall be balanced to create pressure relationship (positive, negative, or neutral) with adjacent spaces as indicated on Drawings. Maintain airflow differentials between supply, return, and exhaust indicated on Drawings.
4. Heating-Water Flow Rate: Plus or minus 10 percent.
5. Cooling-Water Flow Rate: Plus or minus 10 percent.

B. Set plumbing systems water flow rates within plus or minus 10 percent.

3.11 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Interim Reports: Prepare periodic lists of conditions requiring correction and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.12 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing field supervisor. Report shall be co-signed by the Contractor, attesting that he has reviewed the report, and the report has been found to be complete and accurate.
2. The certification sheet shall be followed by sheet(s) listing items for which balancing objectives could not be achieved. Provide explanation for failure to achieve balancing objectives for each item listed.
3. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:
   1. Title page.
   2. Name and address of the TAB specialist.
   3. Project name.
   4. Project location.
   5. Project Performance Guaranty
   6. Architect's name and address.
   7. Engineer's name and address.
   8. Contractor's name and address.
   9. Report date.
   10. Signature of TAB supervisor who certifies the report.
   11. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
   12. Summary of contents including the following:
      a. Indicated versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from the Contract Documents.
   13. Nomenclature sheets for each item of equipment.
   14. Data for terminal units, including manufacturer's name, type, size, and fittings.
   15. Test conditions for fans and pump performance forms including the following:
      a. Settings for outdoor-, return-, and exhaust-air dampers.
      b. Conditions of filters.
      c. Cooling coil, wet- and dry-bulb conditions.
      d. Face and bypass damper settings at coils.
      e. Fan drive settings including settings and percentage of maximum pitch diameter.
      f. Inlet vane settings for variable-air-volume systems.
      g. Settings for supply-air, static-pressure controller.
      h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
   1. Quantities of outdoor, supply, return, and exhaust airflows.
   2. Duct, outlet, and inlet sizes.
   3. Terminal units.
   4. Balancing stations.
   5. Position of balancing devices.

E. Air distribution outlets and inlets shall be shown on keyed plans with designation for each outlet and inlet matching designation used in Contract Documents and TAB test reports. Room numbers shall be included in keyed plans and test reports. Where multiple outlets and inlets are installed within a single room, a designation shall be assigned and listed for each outlet and inlet in addition to room number.

F. Test Reports – General:
   1. All test reports containing air or liquid flow data shall record flow values prior to system adjustment in addition to required data listed for each test report.

G. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
   1. Unit Data:
      a. Unit identification.
      b. Location.
      c. Make and type.
      d. Model number and unit size.
      e. Manufacturer's serial number.
      f. Unit arrangement and class.
      g. Discharge arrangement.
      h. Sheave make, size in inches, and bore.
      i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
      j. Number, make, and size of belts.
      k. Number, type, and size of filters.
   2. Motor Data:
      a. Motor make, and frame type and size.
      b. Horsepower and rpm.
      c. Volts, phase, and hertz.
      d. Full-load amperage and service factor.
      e. Sheave make, size in inches, and bore.
      f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
   3. Test Data (Indicated and Actual Values):
      a. Total air flow rate in cfm.
      b. Total system static pressure in inches wg.
      c. Fan rpm.
      d. Discharge static pressure in inches wg.
      e. Filter static-pressure differential in inches wg.
      f. Preheat-coil static-pressure differential in inches wg.
      g. Cooling-coil static-pressure differential in inches wg.
      h. Heating-coil static-pressure differential in inches wg.
      i. Outdoor airflow in cfm.
      j. Return airflow in cfm.
      k. Relief airflow in cfm.
      l. Outdoor-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
      m. Return-air damper position.
      n. Relief-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.

H. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
   1. Unit Data:
      a. System identification.
      b. Location.

c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):
   a. Total air flow rate in cfm.
   b. Entering-air temperature in deg F.
   c. Leaving-air temperature in deg F.
   d. Air temperature differential in deg F.
   e. Entering-air static pressure in inches wg.
   f. Leaving-air static pressure in inches wg.
   g. Air static-pressure differential in inches wg.
   h. Low-fire fuel input in Btu/h.
   i. High-fire fuel input in Btu/h.
   j. Manifold pressure in psig.
   k. High-temperature-limit setting in deg F.
   l. Operating set point in Btu/h.
   m. Motor voltage at each connection.
   n. Motor amperage for each phase.
   o. Heating value of fuel in Btu/h.

I. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
   1. Unit Data:
      a. System identification.
      b. Location.
      c. Coil identification.
      d. Capacity in Btu/h.
      e. Number of stages.
      f. Connected volts, phase, and hertz.
      g. Rated amperage.
      h. Air flow rate in cfm.
      i. Face area in sq. ft.
      j. Minimum face velocity in fpm.
   2. Test Data (Indicated and Actual Values):
      a. Heat output in Btu/h.
      b. Air flow rate in cfm.
      c. Air velocity in fpm.
      d. Entering-air temperature in deg F.

e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

J. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
2. Motor Data:
a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

K. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

L. Air-Terminal-Device Reports:
1. Unit Data:
a. System and air-handling unit identification.

b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):
a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

M. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
1. Unit Data:
a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.
2. Test Data (Indicated and Actual Values):
a. Air flow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

N. Instrument Calibration Reports:
1. Report Data:
a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.13 INSPECTIONS

A. Initial Inspection:
1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

2. Check the following for each system:
   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure water flow of at least 5 percent of terminals.
   c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
   d. Verify that balancing devices are marked with final balance position.
   e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:
   1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
   2. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.
   3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
   4. If rechecks yield measurements that differ from the measurements documented in the final report by more than 10 percent, the measurements shall be noted as "FAILED."
   5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
   1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
   2. If the second final inspection also fails, Owner may contact the TAB specialists' governing organization for remedial action by the governing organization under the workmanship and performance warranty. See article, Warranty.
   3. If remedial action is not provided by the TAB specialists' governing organization in a timely manner, Owner may contract the services of another TAB specialist to complete the TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB specialists' final payment.

D. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

T-24 COMMISSIONING
OF HVAC
Section 23 08 00
Project #23-34-026

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for commissioning of HVAC systems for Title 24 (T-24) compliance.

B. Scope: Commissioning Coordinator shall complete the building systems commissioning requirements of the California Energy Code, as applicable to Project. It is not the intention of Project specifications to require duplication in testing.
   1. T-24 commissioning activities may be coordinated with Contractor tests and TAB work specified in technical Sections.
   2. T-24 commissioning activities may be coordinated with LEED and CHPS program commissioning activities, as applicable to Project.

1.2 RELATED REQUIREMENTS

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

B. The requirements of this Section apply to all Sections of Division 23.

C. In the event of conflict between requirements of Division 01 Title 24 commissioning specifications and this Section, Division 01 requirements shall prevail.

1.3 REFERENCES

A. 2022 California Energy Code.

B. 2022 California Energy Code and Building Energy Efficiency Standards Reference Appendices.

C. 2022 Building Energy Efficiency Standards Nonresidential Compliance Manual.

1.4 DEFINITIONS

A. Commissioning Coordinator: General Contractor, or an entity engaged by the General Contractor to perform T-24 commissioning.

B. Covered Processes: Process equipment for which there are listed requirements in the California Energy Code.

C. OPR: Owner's Project Requirements.

D. TAB: Testing, Adjusting, and Balancing.

1.5 SUBMITTALS (FOR RECORD ONLY)

A. Submit the following:
   1. Commissioning Plan.
   2. Systems Manual.
   3. Commissioning Report.
   4. Certificates of Installation.
   5. Certificates of Acceptance.

B. Above items for inclusion in closeout documents submitted to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 TEST INSTRUMENTS

A. Commissioning Coordinator shall supply test instruments. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if recommended by instrument manufacturer, and be checked for accuracy prior to start of work.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES

A. Architect/Engineer:
   1. Performs construction observation. Provides construction observation reports.
   2. Reviews and approves Commissioning Plan, Systems Manual, and Commissioning Report.
   3. Assists in problem resolution.

B. Commissioning Coordinator:
   1. Coordinates commissioning process.
   2. Develops Commissioning Plan.
   3. Schedules and conducts functional testing. Completes Certificates of Acceptance.
   4. Assembles Systems Manual.
   5. Schedules and conducts systems operations training. Verifies systems operations training completion.

C. HVAC Subcontractor: Assists in functional testing.

D. Electrical Subcontractor: Assists in functional testing.

E. Controls Subcontractor: Assists in functional testing.

F. TAB Subcontractor: Assists in functional testing.

G. Equipment Manufacturers/Vendors:
   1. Performs Check, Test, and Start of equipment and systems, as required by Project technical Sections.
   2. Provides systems and equipment documentation required to complete functional testing and assemble Systems Manual.

3.2 COMMISSIONING PLAN

A. Commissioning Coordinator shall author the code-required Commissioning Plan. The Commissioning Plan shall address HVAC systems for which commissioning is required. The Commissioning Plan shall be updated by Commissioning Coordinator throughout the construction process. The Commissioning Plan shall contain the following:
   1. General Project Information: Commissioning Coordinator shall obtain general Project information from Project architectural Drawings.
   2. Commissioning Goals:
      a. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
      b. Verify and document proper integrated performance of equipment and systems utilizing functional testing for mechanical system acceptance, as required by the California Energy Code.
      c. Verify that Systems Manual documentation is complete.
      d. Verify that operating personnel are trained to enable them to operate, monitor, adjust, and maintain HVAC systems in an effective and energy-efficient manner.
   3. Commissioning Coordinator shall compile the following information and include in Commissioning Plan:
      a. An explanation of original design intent: Commissioning Coordinator shall obtain copies of the OPR and BOD for the Project.
      b. Equipment and systems to be tested, including the extent of tests: Test 100 percent of a given type of installed equipment having associated Acceptance Requirements.
         1) Refer to forms MCH-01-E on Drawings for systems to be commissioned.
         2) Covered Processes: In addition to systems listed in MCH-01-E on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
            a) Parking garage ventilation systems.
            b) Compressed air systems.
            c) Type 1 Kitchen exhaust systems.
      c. Functions to be tested: Refer to 2022 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
      d. Conditions under which the test shall be performed.

e. Measureable criteria for acceptable performance: Refer to 2022 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
f. Commissioning team information:
   1) Refer to Project information on architectural Drawings for design team participants. Commissioning Coordinator shall add subcontractor information to provided design team information and include in Commissioning Plan.
g. Commissioning process activities, schedules, and responsibilities. Plans for the completion of functional performance testing, systems operations training, and commissioning report.

3.3 CERTIFICATES OF INSTALLATION

A. Commissioning Coordinator shall complete applicable Certificates of Installation forms.

3.4 FUNCTIONAL TESTING REQUIREMENTS

A. Contractor shall complete the applicable Acceptance Requirements for Code Compliance contained in the California Building Energy Efficiency Standards. Refer to T-24 compliance forms on Drawings for systems having Acceptance testing requirements. Contractor shall perform Acceptance tests and complete the appropriate “Certificates of Acceptance.” Contractor shall engage certified HERS Rater to verify duct leakage rate for duct systems indicated on T-24 compliance forms on Drawings as requiring duct leakage rate testing. For additional duct leak testing requirements, refer to Section 23 80 00, “Heating, Ventilating, and Air Conditioning,” Article, “Ductwork Sealing and Leak Testing.”
   1. Covered Processes: In addition to systems listed on T-24 compliance forms on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
      a. Parking garage ventilation systems.
      b. Compressed air systems.
      c. Type 1 Kitchen exhaust systems.

3.5 SYSTEMS MANUAL

A. Commissioning Coordinator shall assemble Systems Manual in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications, including Section 01 79 00, Demonstration and Training, and commissioning specifications.

3.6 SYSTEMS OPERATIONS TRAINING

A. Commissioning Coordinator shall provide systems operations training in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division

01 specifications, including Section 01 79 00, Demonstration and Training, and commissioning specifications.

3.7 COMMISSIONING REPORT

A. Commissioning Coordinator shall complete Commissioning Report in accordance with the requirements of the California Energy Code and Division 01 commissioning specifications.

END OF SECTION 23 08 00.13

DEDICATED
OUTDOOR AIR UNITS
Section 23 74 33
Project #23-34-026

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged Outdoor Air Unit.

B. Heat Exchanger.

C. Refrigeration Components.

D. Unit Operating Controls.

E. Electrical Power Connections.

1.2 RELATED DOCUMENTS

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

B. Section 23 00 50, Basic Mechanical Materials and Methods.

1.3 REFERENCES

A. NFPA 90 A & B – Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems ETL Listed and Labeled ANSI/ASHRAE 15 – Safety Code for Mechanical Refrigeration.

B. Standard for Safety, Heating and Cooling Equipment – Third Edition, UL 1995 CSA C22.2 236-05.

C. ANSI/ASHRAE/IESNA 90.1 – Energy Standard for New Buildings except Low Rise Residential Buildings.

D. ANSI Z21.47/UL 1995 – Unitary Air Conditioning Standard for Safety Requirements.

E. ANSI/NFPA 70-1995 – National Electric Code.

F. International Fuel Gas Code.

1.4 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.

C. Submit shop drawings including overall dimensions as well as installation, operation and service clearances. Indicate lift points and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.

D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

1.5 DELIVERY AND STORAGE

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting of units.

B. Protect units from physical damage. Leave factory shipping covers in place until Installation.

1.6 WARRANTY

A. Provide all parts warranty for one year from start-up or 18 months from shipment, whichever occurs first. Heat exchanger shall have a 10-year warranty.

PART 2 - PRODUCTS

2.1 GAS FIRED EQUIPMENT

A. All gas-fired equipment shall be listed for use as a gas appliance.

B. All units shall comply with the emissions requirements of the Air Quality Management District (AQMD) in which they are to be installed.

2.2 SUMMARY

A. The contractor shall furnish and install packaged outdoor air unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   1. iAire
   2. Desert-Aire
   3. AAON

2.3 GENERAL DESCRIPTION

A. Provide factory assembled single packaged outdoor rooftop mounted, electrically controlled gas heating and electric cooling unit. Unit(s) shall consist of an insulated, weather-tight metal cabinet, downturn outdoor air intake with metal mesh filter assembly, evaporator coil, condensate drain pan, hot gas reheat coil, indirect gas heater, supply air blower assembly and an electrical control center. All specified components and internal accessories shall be factory installed.

2.4 UNIT CONTRUCTION

A. Materials: Formed, single wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
   1. Outside casing: galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have a baked enamel finish.
   2. Internal assemblies: galvanized (G90) steel except for motor supports which shall be minimum14 gauge galvanized (G90) steel.

B. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
   1. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
      a. Thickness: 1/2 inch (50 mm)
      b. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.

C. Access Panels: Unit shall be equipped with insulated removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of galvanized G90 steel or painted galvanized steel.

D. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and a belt or direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125-inch-thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.

E. Evaporator Coil: Evaporator coil shall be AHRI certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of circuited configuration, permitting independent operation of either compressor without conflict with the other compressor.

F. Control Panel Connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.

G. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be non-corrosive composite.

H. Reheat Coil with factory installed modulating hot gas reheat valve, shall be of the copper tube / aluminum fin design and shall be located downstream of the evaporator coil.

I. Indirect gas furnace:
   1. Shall be ETL certified as a component of the unit.
   2. Shall have an integral combustion gas blower.
   3. Shall be ETL certified for installation downstream of a cooling coil.
   4. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
   5. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported by a minimum of two fabricated assemblies that support the tubes and also permit expansion and contraction of the tubes.
   6. Furnace control shall be modulating.

J. Packaged DX System: unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit. Condenser fan motors shall be three phase type 56 frame, Open Air Over and Shaft Up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be hermetic scroll-type modulating using an automatic pressure regulator. device for modulation of compressor capacity and to help prevent icing of the evaporator coil under low load conditions. The refrigeration circuit shall be equipped with liquid line filter drier, metering device, manual reset high-pressure and low-pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.

K. Capacity Modulation: automatic pressure regulators (APR) shall be used to modulate capacity of the first stage only.

L. Packaged DX Control and Diagnostics: The packaged DX system shall be controlled by an onboard microprocessor based digital controller (DDC) that indicates both owner-supplied settings, unit status and fault conditions that may occur. The DDC shall be programmed for discharge air control or space control.

M. Blower section construction: Supply air blower shall be forward curved, belt drive type. Blowers hall include neoprene pad isolation.

N. Filters: Filters shall be MERV 13 minimum.

O. Ratings are to be established in accordance with AMCA 210, “Laboratory Methods of Testing Fans for Rating.”

2.5 UNIT CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors. This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

B. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable.

C. Variable Frequency Drive (VFD): Unit shall have factory installed variable frequency drive for modulation of the supply air blower assembly. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

2.6 FANS AND MOTORS

A. Refer to Section 23 00 50, Basic HVAC Materials and Methods, article, Electric Motors, for additional requirements.

B. Indoor Fan shall belt drive, factory installed and wired to on-board Variable Frequency Drive and shall be equipped with slide out service access.

C. All fan motors shall be permanently lubricated and / or have thermal overload protection.

D. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.

E. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

2.7 MODULATING INDIRECT GAS FIRED HEATING SYSTEM

A. Completely Assembled, factory installed heating system shall be integral to the unit and approved for use, downstream from refrigerant cooling coils.

B. The unit shall have fully modulating, indirect gas fired heat. The heating section will have high turndown burners firing into individual stainless steel tubular heat exchangers. The heat exchangers shall be constructed of type 409 or optional type 304 stainless steel, capable of draining internal condensate.

C. Gas burner safety controls shall include controls for the proving of combustion air prior to ignition, and continuous flame supervision.

D. Timed freeze-stat shall monitor heat output and shall discontinue all heating attempts and or unit operation in the event that the heating section fails to ignite or fails to maintain programmed supply air temperature within range.

E. Include built in thermal over-temperature protection.

F. Limit Controls: High Temperature limit controls will shut off gas flow in the event of excessive temperatures resulting from restricted indoor air flow, loss of indoor air flow or flame roll-out.

2.8 EVAPORATOR CONDENSER AND REHEAT COILS

A. Evaporator and hot gas reheat coils shall be constructed of copper tubes mechanically bonded to aluminum fins. Micro-channel coils shall not be acceptable in these positions.

B. Coils shall be leak tested at the factory to ensure pressure integrity. The evaporator, condenser, and reheat coils shall be pressure and leak tested.

C. The condenser coil shall be copper tubes mechanically bonded to aluminum fins.

D. To prevent re-hydration of condensate from the evaporator coil, the hot gas reheat coil face, and the evaporator coil face shall be separated.

2.9 REFRIGERANT CAPACITY CONTROL

A. Units with scroll compressors shall be equipped with capacity control device on the lead circuit to modulate compressor capacity, and prevent evaporator frosting or freezing.

B. The capacity control device set-point shall be factory set, and field adjustable to maintain desired suction pressure, and compressor discharge pressure.

C. Compressors that pulse refrigerant as a means of capacity control will not be acceptable.

PART 3 - EXECUTION

3.1 ROOF MOUNTED EQUIPMENT

A. Mount and anchor equipment in strict compliance with drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

B. Examine rough-in for roof mounted equipment to verify actual locations of piping and duct connections prior to final equipment installation.

C. Verify that piping to be installed adjacent to roof mounted equipment allows service and maintenance.

D. Verify that gas piping will be installed with sufficient clearance for burner removal and service.

E. Install ducts to termination at top of roof curb and install heavy duty rubber gaskets on supply and return openings and on full perimeter of curb, or as required for an airtight installation, prior to setting unit on curb.

F. Cover roof inside each roof mounted air conditioning unit, heat pump unit, and heating and ventilating unit roof curb with 2-inch-thick, 3-pound density fiberglass insulation board.

G. Connect supply and return air ducts to horizontal discharge roof mounted equipment with flexible duct connectors specified elsewhere in these Specifications.

H. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

END OF SECTION 23 74 33

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Roof mounted air conditioning units.
2. Heating and ventilating units.
3. Fans.
4. Kitchen exhaust hood – type 1.
5. Kitchen exhaust hood – type 2.
6. Louvers.
7. Air inlets and outlets.
8. Filters.
9. Dampers.
10. Ductwork.
11. Insulation.

1.2 RELATED REQUIREMENTS

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

B. Section 23 00 50, Basic HVAC Materials and Methods.

C. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

D. Section 23 09 23, Direct Digital Control (DDC) System for HVAC.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, weight, corner or mounting point weights, furnished specialties and accessories; and installation and start-up instructions. Product data shall include applicable product listings and standards. Refer to Section 23 00 50, Basic HVAC Material and Methods for additional requirements.
1. Upon approval of submittal, provide manufacturer’s installation and operating instructions to the Project inspector for the following:
a. Fire dampers, smoke dampers, and combination smoke-fire dampers.
b. Type 1 kitchen exhaust field applied grease duct enclosures.

C. Engineering Data: Submit fan curves and sound power level data for each fan unit. Data shall be at the scheduled capacity. Data shall include the name of the rating agency or independent laboratory.

1.4 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Roof Curb Data: For roof mounted equipment where combined weight of equipment unit and roof curb or rail exceeds 400 pounds, submit calculations from manufacturer for roof curbs proving compliance with the seismic requirements of the California Building Code, and ASCE 7-10. Manufacturer shall certify that roof curbs are suitable for use indicated on Drawings and in Specifications for the seismic design category indicated in structural Contract Documents. Calculations shall be stamped and signed by a State of California registered structural engineer.

C. Economizer Fault Detection and Diagnostics (FDD) System Data: For all air-cooled unitary direct-expansion units equipped with an economizer, provide data for third-party supplied California Energy Commission certified FDD controller, documenting compliance with the requirements of California Building Energy Efficiency Standards. Provide evidence of certification.

D. Record of pre-installation meeting.

E. Coordinated Layouts: Submit coordinated layouts. For requirements refer to article, Coordinated Layouts, in this Section.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts list for each piece of equipment, control, and accessory; including "trouble-shooting guide," in Operation and Maintenance Manual.

C. Record Drawings: Submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets in accordance with requirements of Division 01.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Belts: One set(s) for each belt-driven unit.
   2. Provide one complete set(s) of filters for each filter bank.

1.7 COORDINATED LAYOUT

A. Coordinated layouts are required to amplify, expand and coordinate the information contained in the Contract Documents.

B. Provide minimum 1/4 inch equals one foot scaled coordinated layout drawings showing plan and pertinent section or elevation views of piping, ductwork, equipment, accessories, and electrical systems. Drawings shall be reproducible and work of each trade represented shall be fully coordinated with structure, other disciplines, and finished surfaces. Drawings shall be presented on a single size sheet. Coordinated layout drawings shall have title block, key plan, north arrow and sufficient grid lines to provide cross-reference to design Drawings.
   1. Provide a stamp or title block on each drawing with locations for signatures from all contractors involved, including but not limited to the General, HVAC, Plumbing, Fire Protection, and Electrical contractors. Include statement for signature that the contractor has reviewed the coordinated layout drawings in detail and has coordinated the work of his trade.
   2. Show on drawings the intended elevation of all ductwork in accordance with the following example:
      a. B.O.D. = 9'-0"
         OFFSET UP 6"
         B.O.D. = 9'-6"
   3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the coordinated layouts. Architect will not be responsible for identifying deviations from the original Contract Documents.

C. Since scale of contract drawings is small and all offsets and fittings are not shown, Contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall not be in excess of 2 to 1 unless approved by the engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least one quarter of the building ductwork.

D. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.

1.8 QUALITY ASSURANCE

A. Design Criteria:
   1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture. All gas-fired equipment shall be UL, ETL or CSA listed.
   2. Supply all equipment and accessories in accordance with requirements of applicable national, state and local codes.
   3. All items of a given type shall be products of the same manufacturer.
   4. Scheduled equipment performance is minimum capacity required.
   5. Scheduled electrical capacity shall be considered as maximum available.

6. Scheduled gas BTU input shall be considered as maximum available.

1.9 FIELD CONDITIONS

A. Interruption of Existing Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services according to requirements indicated:
   1. Notify Architect no fewer than two days in advance of proposed interruption of services.
   2. Do not interrupt services without Architect's written permission.

1.10 WARRANTY

1. Air Conditioning Unit, Roof-Mounted:
   a. Compressor shall have a five-year warranty.
2. Heating and Ventilating Unit: Heat exchanger shall have minimum 10-year warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.2 GAS FIRED EQUIPMENT

A. All gas-fired equipment shall be listed for use as a gas appliance.

B. All units shall comply with the emissions requirements of the Air Quality Management District (AQMD) in which they are to be installed.

2.3 AIR CONDITIONING UNIT, ROOF-MOUNTED

A. Provide factory assembled single packaged outdoor rooftop mounted, electrically controlled gas heating and electric cooling unit, rated in accordance with ARI Standards 210/240 or 340/360, and ETL or UL listed and labeled, classified in accordance with UL 1995. Provide refrigerant charge R-410A, all internal wiring, piping, controls, and special features required prior to field startup. Design unit to conform to the following:
   1. California NOx emission requirements.
   2. ASHRAE 15.
   3. ASHRAE 90.1.
   4. Insulation, adhesive, and all materials exposed to air stream shall meet NFPA 90A requirements for flame spread and smoke generation.

5. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).

B. Unit shall be rated in accordance with ARI sound standards 270 or 370.

C. Unit shall be ETL or UL tested and certified in accordance with ANSI Z21.47 Standards as a total package.

D. Roof curb shall be designed to conform to NRCA Standards.

E. Unit shall be designed and manufactured in accordance with ISO 9001.

F. For unit sizes applicable to Energy Star program, units shall be Energy Star qualified.

G. Cabinet:
1. Provide galvanized steel unit cabinet, bonderized and coated with a baked enamel finish.
2. All airstream interior surfaces shall be insulated with a minimum 1/2 inch thick, 1.5 lb density cleanable insulation. Insulation shall be encapsulated with panel design or have sealed edges.
3. Cabinet panels shall be hinged with integrated non-corrosive hinges. Provide hinged access panels for the filter, compressors, evaporator fan, and control box/ heat section areas. Each panel shall have multiple latches and handles. Each external hinged access panel shall be double-wall construction and permanently attached to the rooftop unit.
4. Return air filters shall be accessible through a dedicated hinged access panel.
5. Fork lift slots and rigging holes shall be provided in unit base rails. Base rails shall be minimum 16 gauge.
6. Unit shall have an integral sloped condensate drain pan, providing minimum 3/4 in.-14 NPT connections for horizontal drain configuration. Provide unit with alternate vertical thru-the-bottom drain connection when furnished as standard for units sizes scheduled on Drawings. See Drawings for drain configuration. Pan shall be removable for cleaning and maintenance. All drain pans shall conform to ASHRAE 62.1 self-draining provisions.
7. Unit shall have standard side and alternate field or factory installed thru-the-bottom power and control wiring connection capability. Thru-the-bottom electrical connections shall use manufacturer's approved water-tight connection method.
8. Unit shall be field convertible to, or factory furnished with, horizontal air discharge, as applicable for unit sizes as scheduled on Drawings.

H. Fans:
1. Centrifugal supply air blower (evaporator fan) shall have sealed, permanently lubricated ball bearings, or rigid pillow block bearings, as supplied as standard equipment for unit sizes scheduled on Drawings. Units supplied with pillow block bearings shall be furnished with accessible lubricant fittings. Provide belt-driven double inlet fan wheel, centrifugal type with forward curved blades and adjustable sheaves. Multiple speed direct drive motors may be utilized when supplied as standard equipment for efficiency

and electrical requirements as scheduled on the Drawings. Fan wheel shall be steel, with corrosion resistant finish, dynamically balanced.

2. Condenser fans shall be of the direct-driven propeller type, with corrosion-resistant aluminum blades. Fans shall be dynamically balanced and discharge air upwards. Induced-draft blower shall be of the direct-driven, single inlet, forward-curved, centrifugal type, made from aluminized steel with a corrosion-resistant finish and shall be dynamically balanced.
3. Induced draft fan shall be of the direct driven, single inlet, forward-curved centrifugal type. Fan wheel shall be steel, with corrosion resistant finish, dynamically balanced.

I. Motors:
1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection.
2. Evaporator fan motor shall have permanently lubricated, sealed bearings and inherent automatic-reset thermal overload protection or manual reset calibrated circuit breakers.
3. Totally enclosed condenser-fan motor shall have permanently lubricated, sealed bearings, and inherent automatic-reset thermal overload protection.
4. Induced-draft motor shall have permanently lubricated sealed bearings and inherent automatic-reset thermal overload protection.
5. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

J. Compressor:
1. Fully hermetic, scroll type with internal high-pressure and temperature protection.
2. Factory installed rubber shock mounted and internally spring mounted for vibration isolation.
3. Compressor Anti-Recycle Timer: Compressor shall be prevented from restarting for a minimum of five minutes after shutdown, with manufacturers installed compressor cycle delay.

K. Coils:
1. Standard evaporator and condenser coils shall have aluminum plate fins mechanically bonded to seamless internally finned copper tubes with all joints brazed.
2. Units shall have face-split type evaporator coils.
3. For units with single compressor, condenser coils shall be single slab, single pass design. For dual compressor units, condenser coils shall be single slab, 2 pass design.
4. Evaporator coils shall be leak tested at minimum 150 psig, and pressure tested at minimum 450 psig.
5. Condenser coils shall be leak tested at minimum 150 psig, and pressure tested at minimum 650 psig.

L. Heating Section:
1. Induced-draft combustion type with direct-spark ignition system and redundant main gas valve with 2-stage capability on all 3-phase units.
2. Heat Exchanger:
3. Burners shall be of the in-shot type constructed of aluminum-coated steel.

4. All gas piping shall enter the unit at a single location. Gas entry shall be through side or bottom of unit. See Drawings for gas entry location. When bottom gas entry is utilized, unit shall be furnished with field installed conversion kit, arranged so that gas shut-off valve is accessible from the roof.
5. All factory-installed orifices are for operation up to 2,000 feet of altitude. For altitudes between 2,000 feet and 7,000 feet, a factory certified kit shall be furnished for field installation.
6. Units shall be suitable for use with natural gas or propane. Provide field-installed propane conversion kit as required, see schedule on Drawings.
7. The integrated gas controller board shall include gas heat operation fault notification using an LED (light-emitting diode).
8. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high-temperature limit switch. Fault indication shall be made using an LED.
9. The integrated gas controller board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high-temperature limit switch.
10. The LED shall be visible without removal of control box access panel.
11. Gas burner tray shall be removable for maintenance.
12. Heating section shall be insulated with foil-faced fiberglass insulation.

M. Refrigerant Components:
   1. Each refrigerant circuit shall include:
      a. Balanced port thermostatic expansion valve (TXV) with removable power element.
      b. Solid core refrigerant filter driers with pressure ports.
      c. Refrigerant pressure gage ports and connections on suction, discharge, and liquid lines.

N. Filter Section:
   1. Standard filter section shall accommodate 2 inch deep filters. Filters shall conform to the “Air Filters” Article in this Specification Section.
   2. Filter section shall use standard size filters.

O. Controls:
   1. Unit shall be complete with self-contained low voltage fuse protected control circuit. Refer to Section 25 50 00, if included, and equipment schedule, sequence of operation and control diagram on Drawings for additional requirements.
   2. When third party direct digital controls with an Energy Management System will be utilized, provide electro-mechanical controls with 24V thermostat interface.
   3. When stand-alone thermostat operation is utilized, provide electro-mechanical controls with 24V thermostat interface or provide microprocessor controls.
   4. When stand-alone thermostat operation is utilized for single-zone VAV units, provide microprocessor controls.. Units shall have factory mounted supply fan variable frequency drives.
   5. When third party direct digital controls with an Energy Management System will be utilized for single zone VAV units, provide microprocessor controls with BACnet or LON interface. Units shall have factory mounted supply fan variable frequency drives.
   6. Electro-mechanical controls shall include the following, as a minimum:

a. Service run test capability.
b. Provide compressor minimum run time (3 minutes) and minimum off time (5 minutes).
c. Economizer control.
d. Unit shall have 35° F low ambient cooling operation.
e. Time delay relay.

7. Microprocessor controls shall include the following, as a minimum:
   a. User diagnostic interface.
   b. Unit control with standard suction pressure transducers and condensing temperature thermistors.
   c. Shall provide a 5° F temperature difference between cooling and heating set points to meet ASHRAE 90.1 energy standard.
   d. Service run test capability.
   e. Shall accept input from a CO2 sensor (indoor).
   f. Configurable alarm light shall be provided which activates when certain types of alarms occur.
   g. Provide compressor minimum run time (3 minutes) and minimum off time (5 minutes).
   h. Service diagnostic mode.
   i. Economizer control.
   j. Unit shall have 0° F low ambient cooling operation.
   k. Time delay relay.

P. Safeties:
1. Unit shall incorporate a solid-state compressor lockout that provides optional reset capability at the space thermostat, should any of the following safety devices trip and shut off compressor:
   a. Compressor lockout protection provided for either internal or external overload.
   b. Low-pressure protection.
   c. Freeze protection (evaporator coil).
   d. High-pressure protection (high pressure switch or internal).
   e. Compressor reverse rotation protection.
   f. Loss of charge protection.
   g. Start assist on singe-phase units.
2. Supply-air sensor shall be located in the unit and detect both heating and cooling operation.
3. Induced draft heating section shall be provided with the following minimum protections:
   a. High-temperature limit switch.
   b. Induced-draft motor speed sensor.
   c. Flame rollout switch.
   d. Flame proving controls.
   e. Redundant gas valve.
4. Phase Protection: Provide unit-mounted “SymCom,” or equal, Motor Saver three phase voltage monitor, model 201A or equal, adjustable voltage range for each unit, install per manufacturer's recommendations, mount in NEMA 3R enclosure if exposed to the weather.
   a. Units shall provide the following features:

1) Low voltage fault trip and reset.
2) Voltage unbalance/phasing fault trip and reset.
3) High voltage fault trip and reset.
4) Transient Protection (Internal).
5) Automatic restart.

b. Provide each unit with 600V socket, “SymCom” model OT08, or equal.

Q. Operating Characteristics:
1. Unit shall be capable of starting and running at 125° F ambient outdoor temperature per maximum load criteria of ARI Standards 210 or 360.
2. Unit will operate in cooling down to an outdoor ambient temperature of 35° F.
3. Unit shall be provided with fan time delay to prevent cold air delivery in heating mode.

R. Electrical Requirements:
1. All unit power wiring shall enter unit cabinet at a single location. Both unit side and bottom power entry provisions shall be provided. Refer to Drawings schedule for thru-the-bottom power wiring requirement.

S. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1. Carrier Corporation.
2. Trane Inc.
3. Johnson Controls, Inc.

T. Provide the following additional features and equipment:
1. Roof Curb: Formed galvanized steel with wood nailer strip capable of supporting entire unit weight. Provide 3 inch wide bottom flange.
2. Provide heavy-duty 18 gauge expanded metal coil guard grille to protect all surfaces of the condensing coil. Coil guard by Micrometl, Canfab, or equal.
3. Modulating Power Exhaust Economizer: Micrometl, Canfab, or equal. Integrated type capable of simultaneous economizer and compressor operation.
   a. Provide self-contained outdoor rooftop system, mounted directly to the return air compartment of the HVAC packaged equipment. Provide differential dry bulb economizer control system and a factory programmed, fully programmable variable frequency drive package controlled by a differential pressure transmitter, mounted directly to the return air compartment of the HVAC packaged equipment. Design the system to continuously maintain space pressure, and provide capability of introducing up to 100 percent outdoor air.
      1) Economizer control system shall be certified as meeting the requirements for Fault Detection and Diagnostics (FDD) in the California Building Energy and Efficiency Standards.
   b. Provide outside differential pressure tubing termination with hex style pneumatic filter-muffler, minimum filtration 40 microns, 53 SCFM maximum at 100 psi, as manufactured by McMaster-Carr, or equal.
   c. Provide hinged cabinet access doors and include latches to provide a tool-less entry for servicing.
   d. Provide door lock on the power exhaust cabinet to meet ETL safety requirements.

e. Outdoor air intake dampers shall be low leak not to exceed 3 percent at 1 inch wg pressure differential and include stainless steel side seal and neoprene edge seal. Arrange dampers to close upon loss of power.
f. Provide belt driven exhaust blowers, double inlet, forward-curved centrifugal type. Provide gravity backdraft damper at fan outlet.
g. Provide fully programmable factory programmed variable frequency drive (VFD) package for each fan, driven by 4 to 20 mA signal from a differential pressure transmitter. Pressure transmitters shall measure 0 - 0.1 in wg. Install room sensor tubing with sensor tube termination installed within the room.
    1) Where direct digital controls are utilized, provide Belimo, or equal, damper actuator, complete with spring return and all controls required to make the system fully operational.
    2) Where stand-alone controls are utilized, provide Belimo, or equal, damper actuator, complete with spring return and all controls, including logic module, required to make the system fully operational.

4. Gas Flue Extensions:
    a. Provide at all locations where gas flue outlet will be within 10 feet of an adjacent building forced air inlet, or mechanical unit air intake, and where indicated on Drawings.
5. Other features, accessories, and equipment scheduled on Drawings.

U. Replenish for a period of one year without cost to the Owner all refrigerant and oil required to maintain the proper levels.

V. Owner Training: Manufacturer shall provide two initial on-site 4-hour training sessions for Owners' maintenance personnel. Manufacturer shall provide one 4-hour follow-up training session to be scheduled by Owner within one year of the date of the final initial training session. Training session agenda shall be as follows:
1. First session: Equipment.
2. Second session: Controls.
3. Follow-up session: Agenda by Owner.

2.4 HEATING AND VENTILATING UNIT

A. Provide factory assembled packaged rooftop mounted, electrically controlled heating and make-up air unit, ETL or UL listed and labeled, consisting of cabinet, supply fan, filters, and indirect-fired gas furnace. Provide all internal wiring, piping, controls and special features required prior to field startup. Design unit to conform to the following:
1. ANSI Z83.8/CSA 2.6.
2. NFPA 54.
3. ASHRAE 90.1.
4. Insulation, adhesive, and all materials exposed to airstream shall meet NFPA 90A requirements for flame spread and smoke generation.
5. Unit casing shall be capable of withstanding 1000-hour salt spray exposure per ASTM B117 (scribed specimen).
6. Roof curb shall be designed to conform to NRCA Standards.

B. Cabinet: Double-wall G90 galvanized steel panels, minimum 18 gauge, rigidly formed and supported by minimum 16 gauge galvanized steel channel base with rigging holes. Cabinet shall be fully weatherized for outdoor installation, and provided with the following:
   1. Finish: Air-dried enamel.
   2. Cabinet insulation: Minimum 1" thick fiberglass duct liner, complying with ASTM C 1071, Type II, applied on all unit sections.
   3. Access Panels: Hinged, double-wall with cam-lock fasteners. Insulate access panels exposed to airstream equal to unit cabinet insulation. Provide access panels at furnace, fan motor, filter and control areas.
   4. Provide with integral curb cap and matching roof curb. Roof curb shall be formed galvanized steel with wood nailer strip, capable of supporting entire unit weight. Provide 3 inch wide bottom flange.

C. Blower: Double width, double inlet centrifugal type fan, statically and dynamically balanced. Blower motor shall be single speed, open drip proof, and energy efficient. Motor bearings shall be permanently lubricated ball bearing or pillow block type. Blower and motor shall be vibration isolated.
   1. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.
   2. Drive: V-belt drive with matching fan pulley and adjustable motor sheaves and belt assembly. Linked blower belts will not be accepted.

D. Heating Section: CSA certified for use with natural gas, 80 percent minimum thermal efficiency. Heating section may be integral to blower cabinet or be provided as separate section. Provide with the following features:
   1. Modulating gas valve, capable of turndown to minimum 25 percent of gas input value scheduled on Drawings.
   2. Stainless steel burner assembly.
   3. Combustion air vent fan: Direct drive centrifugal type.
   4. Electronic discharge temperature controller. Control interface shall be LCD screen with indicating lights. Default display shall be actual discharge temperature.
   5. Direct spark ignition with non-standing pilot.
   6. 409 Stainless steel tubular heat exchanger.
   7. Controls and Safeties: All burner controls factory wired to terminal blocks, complete with 24 V transformer. Provide the following:
      a. High temperature limit control with automatic reset.
      b. Ignition with 100 percent timed lockout.
      c. Pressure switch to lock out gas valve on failure of combustion air blower.
      d. Gas Train: Regulated, redundant, 24 V AC gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shut off, and manual shut off.
      e. Purge-period timer shall automatically delay burner ignition and bypass low-limit control and provide pre-purge and post-purge cycle.

E. Filter Section
   1. Standard filter section shall accommodate 2 inch deep filters. Filters shall conform to the "Air Filters" Article in this Specification Section.
   2. Filter section shall use standard size filters.

3. Velocity shall not exceed 550 FPM.

F. Mixing Box: Inlet air control shall allow for 100 percent OA and 100 percent return air with mixed air controller and warm-up (ASHRAE Cycle III). Standard configuration shall be bottom return with rear outside air intake. Provide galvanized outside air hood with bird screen and rain baffles. Omit outside air hood when evaporative cooling module is utilized. When economizer operation is indicated in the sequence of operations, provide dry bulb economizer controller.

G. Dampers:
1. Outdoor-Air and Return Air Damper: Galvanized steel, opposed-blade dampers with vinyl blade seals and stainless steel jamb seals.
2. Damper Operator: Direct coupled, multi-position electronic type with spring return or fully modulating electronic type as required by control sequence indicated on Drawings.

H. Downturn Plenum: Provide downturn plenum if required for vertical supply air discharge. See Drawings for unit air discharge configuration. Plenum shall be of materials, construction and finish equal to that described for unit cabinet.

I. Controls:
1. Factory-wired, fuse protected control transformer, connection for power supply and field-wired unit to remote control panel. Refer to Section 25 50 00, if included, and equipment schedule, sequence of operation and control diagram on Drawings for additional requirements.
2. When utilizing stand-alone thermostat controls: Manufacturer provided remote surface-mounted or recessed control panel shall contain potentiometer for setting minimum outside air quantity. Refer to Drawings for location and type of control panel. Remote control panel and potentiometer not required for direct digital control. Remote control panel shall have the following additional features:
    a. Switches:
        1) On-off-auto fan switch.
        2) Heat-vent-cool switch.
    b. Status lights:
        1) Supply fan operation indicating light.
        2) Blower on.
        3) Heat/main valve on.
    c. Thermostat with over-ride.
3. When utilizing direct digital control: Provide factory installed application-specific controller and damper actuators compatible with the direct digital control system. Unit manufacturer shall coordinate with controls contractor to ensure compatibility. Controller shall have the following functions:
    a. Provide start and stop interface relay, and relay to notify DDC system of alarm condition. Provide the following alarms, as a minimum:
        1) Supply fan status.
        2) Heat status.
        3) Freeze alarm.
    b. Provide hardware interface or additional sensors as follows:

1) Room temperature.
2) Discharge air temperature.
3) Furnace operating.
4) Return air temperature.
5) Outdoor air temperature.
6) Heater output (0-100 percent).
7) Modulating damper output or VFD control (0-100 percent).

J. Evaporative Cooling Module: When scheduled on Drawings, provide evaporative cooling module with pump and water metering system. Evaporative cooling module shall be wired and mounted to the base unit at the factory. Provide the following:
   1. Cabinet: 300 series stainless steel with finish equal to that described for unit cabinet. Cabinet may be galvanized steel when internal cooling module is of all stainless steel construction. Cabinet shall include louvered intake and 2 inch aluminum mesh filters.
   2. Water reservoir: 300 series stainless steel. Overflow and drain connections in the drain pan bottom to be 1/2 inch diameter pipe or standard hose thread.
   3. Pump: Submersible, centrifugal sump pump with inlet strainer, balancing valve located in pump discharge, thermally protected, fan cooled motor with moisture-proof windings.
   4. Media: Media shall be 12 inch thick GlasDek by Munters Corporation, or equal, cross-fluted pad material of large fibers bonded together by inorganic, non-crystalline fillers and conforming to UL900, Class 2 rating. Pads will have less than .25 inches water column air pressure drop at 550 fpm face velocity when wet and develop a saturation efficiency of not less than 90 percent.
   5. Water hammer arrestor (furnished by piping contractor).
   6. Antifreeze protection kit to lock-out evaporative cooling module and drain supply line at a manually selected outside air temperature.
   7. Water Metering System:
      a. Microprocessor-based water metering system: Provide timer, solenoid valve, and water distribution piping to apply the water supply to the media in response to outside air dry bulb and wet bulb temperatures. Remote thermostat shall open water supply valve to maintain dry-bulb temperature in space. Timer shall activate thermostat circuit.

K. Electrical: All unit power wiring shall enter the unit at a single location, standard side or alternate bottom. Single-point connection shall include evaporative cooler module. See unit schedule on Drawings for thru-the-bottom wiring requirement.

L. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include the following, or equal:
   1. Greenheck Fan Corporation.
   2. Reznor-Thomas & Betts Corporation; Mechanical Products Division.

M. Owner Training: Manufacturer shall provide one initial on-site 4-hour training session for Owners' maintenance personnel. Manufacturer shall provide one 2-hour follow-up training session to be scheduled by Owner within one year of the date of the final initial training session.

2.5 FANS

A. All fans shall be Air Moving and Control Association Inc. (AMCA) labeled.

B. Provide self-aligning, enclosed ball bearings, accessible for lubrication unless specified otherwise.

C. Provide variable speed switch for all direct drive fans.

D. Roof Mounted:
   1. Direct or V-belt Drive: Provide one-piece heavy-duty ventilator housings, one piece heavy gauge spun aluminum construction, with weatherproof assembly and integral weather shield. Mount ventilators on curbs furnished by the fan manufacturer. Install with fan assembly level.
   2. Fan wheels shall be centrifugal design, statically and dynamically balanced. Tip speed, rpm and motor horsepower shall not exceed listing in manufacturer's catalog for unit specified.
   3. Fans shall have integral factory formed base and one piece spinning without welding. Housings shall be provided with wiring channel and are to be of the direct discharge design. Motor and fan assembly shall be on vibration isolating mounts. Fans shall have capacity, speeds and motor sizes as shown.
   4. Provide the following accessories:
      a. Gravity backdraft dampers.
      b. Aluminum bird screen with a minimum of 85 percent free area.
      c. Adjustable motor pulley.
      d. Provide grease collection tray for kitchen exhaust fans.
      e. Provide ventilated roof curb for kitchen exhaust fans where exhaust duct is mounted within rated shaft.
      f. Provide hinge kit for kitchen hood exhaust fans.

E. Fan Drives:
   1. Drive Design: The design horsepower rating of each drive shall be at least 1.5 times, single belt drives 2 times, the nameplate rating of the motor with proper allowances for sheave diameters, speed ratio, arcs of contact and belt length.
   2. Provide variable speed drives, Dayco, Browning, Woods, or equal. Allow for replacement of fan and motor drives and belts as required to suit the balance requirements of the project.
   3. Select variable speed drives to allow an increase or decrease of minimum of ten percent of design fan speed.

F. Motors:
   1. Motors of 25 HP and less shall have adjustable pitch sheaves; sheaves on motors above 25 HP may be non-adjustable. Change, at no extra cost to Owner, the non-adjustable sheaves to obtain desired air quantities.
   2. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

G. Sheaves: Sheaves shall be cast or fabricated, bored to size or bushed with fully split tapered bushings to fit properly on the shafts. All sheaves shall be secured with keys and set screws.

H. Belts:
1. All belts shall be furnished in matched sets.
2. Belts shall be within 1 degree 30 minutes of true alignment in all cases.

I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. American Coolair Corporation.

J. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.6 KITCHEN EXHAUST HOOD – TYPE 1

A. Furnish packaged pre-manufactured ventilator, constructed of stainless steel, complete with baffles and lights. Unit shall be equal to that specified in equipment schedule.

B. Each ventilator shall be a high velocity type grease extractor.
1. Centrifugal grease extraction efficiency of 90 percent to be accomplished without the use of filters, cartridges, or constant running water. (Verify with hood selected)

C. Compensating ventilators shall not be of the short-circuiting type. Furnish integral front face discharge for up to 80 percent make-up air of the exhausted air.

D. Construction: The ventilator shall be of all stainless steel construction not less than 18 gauge, Type 304, number 4 finish. The assembly at joints and seams shall be liquid tight and all exposed external welds shall be ground and polished to match the original finish of the metal. All unexposed surfaces shall be constructed of minimum 18 gauge galvanized steel, including but not limited to duct, plenums, framing and brackets. Provide stainless steel closure panels as required for a complete finish, satisfactory to the Architect.

E. Filters: Grease Filters shall be manufactured in accordance with UL 1046.

F. Approvals: Ventilators to be listed or recognized by ICBO (refer to Research Report 2064), NSF, UL and in accordance with all recommendations of NFPA's Standard #96.

G. Fire Suppression System:
1. Fire suppression system shall be listed and labeled as conforming to NFPA 17A and UL 300, current edition.
2. Furnish wet chemical system to protect the hood, exhaust duct and cooking appliances against fire. The system shall be installed by an authorized distributor in accordance

with NFPA 96, NFPA 17A, UL listings, and the requirements of authorities having jurisdiction.

3. The system shall be manually operable at the release. The system shall contain a fusible link series detector system for automatic actuation of the system. Actuation of the system shall provide automatic mechanical gas valve line shutoff. Provide manual operation, with local actuation at the tank enclosure.
4. System shall consist of suppressant, pressurizing cartridge, Schedule 40 piping and nozzles. Provide system with fresh cartridge. Provide stainless steel enclosure for cartridge, regulated release mechanism, regulator and all other material required for operation of the system.
5. System shall be Ansul R102, Kidde, or equal. Provide multiple system if required.
6. Upon completion of the installation of the fire suppression system a test of the system shall be conducted in the presence of the enforcing agency.

H. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.7 KITCHEN EXHAUST HOOD – TYPE 2

A. General:
1. Furnish ventilator hood of size and qualities as indicated on plans, the ventilator shall be of all stainless steel construction not less than 18 gauge, Type 304, Number 4 finish.
2. Furnish condensate hoods with full perimeter welded condensate collecting gutter with 1/2 inch NPT stainless steel drain fitting.

B. Approvals: Ventilators to be listed or recognized by ICBO (Research Report 2064), NSF, UL, and in accordance with all recommendations of NFPA-96.

C. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.8 LOUVERS

A. Louvers shall be minimum 16 gauge steel with Bonderite and Epon gray primer and 1/2 inch square mesh, 16 gauge galvanized steel screen on the inside. Louvers shall be Airolite #609, Arrow United Industries, or equal, with 4 inch louver depth.

2.9 AIR INLETS AND OUTLETS

A. Except as otherwise indicated, provide manufacturer's standard inlets and outlets where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Ceiling, wall or floor Compatibility: Provide inlets and outlets with border styles that are compatible with adjacent ceiling, wall or floor systems, and that are specifically manufactured to fit into ceiling, wall or floor module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of air outlet and inlet.

C. Refer to Schedule on Mechanical Drawings for details of inlets and outlets to be used.

2.10 AIR FILTERS

A. Provide MERV 8 disposable pleated media type. Refer to specific equipment Articles for filter depth and for exceptions to this specification. Filters shall conform to the following:
   1. Standards:
      a. ASHRAE Standard 52.2-2007.
      b. Underwriters Laboratories: U.L. 900, Class 2.
   2. Construction:
      a. Media: Synthetic or cotton-synthetic blend with radial pleats.
      b. Media Frame: High wet-strength beverage board.
      c. Media Support: Welded wire or expanded metal grid bonded to air leaving side of the media.
   3. Performance: 2” deep filter shall have a maximum initial air resistance of 0.31 inches w.g.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   1. Camfil Farr, Inc., model 30/30.
   2. Flanders Corporation, model 40 LPD.

C. Temporary (Construction Period) Filters:
   1. Install new temporary filters in all units that have filter systems installed. Temporary filters shall match the permanent filters that are specified for the units. Replace filters as needed, in accordance with manufacturer’s directions, in order to provide protection for the unit prior to occupancy by the Owner.
   2. If air handling units are operated during construction of the project, install temporary filters directly over each return air inlet. Filters shall match the permanent filters that are specified for the units. Select size of filter to completely cover the frame of the return air inlet, and tape filters firmly in place to eliminate any construction debris from entering the duct system or unit. Remove the temporary filters upon completion of the work and repair all damaged paintwork.

D. Spare Filters:
   1. Furnish two new, complete sets of filter cartridges for each filter bank on completion and acceptance of the work. Install one set of filters in units (prior to final air balance). Provide units designed to accommodate washable, permanent filters with one washable, permanent filter.

2.11 DAMPERS

A. Backdraft Dampers: Ruskin CBD2, counterbalanced, Nailer Industries, or equal.

B. Manual Air and Balance Dampers: Provide dampers of single blade type or multi-blade type constructed in accordance with SMACNA, "HVAC Duct Construction Standards," except as noted herein.
   1. Rectangular Ductwork:
      a. Single damper blades may be used in ducts up to 10 inches in height. Dampers shall be 16 gauge minimum. Provide self-locking regulators, equal to Ventlok 641. Provide end bearings equal to Ventlok 607 at each damper. Provide continuous solid 3/8 inch square shafts.
      b. Multiple blade dampers shall be equal to Ruskin CD35 Standard Control Damper. Maximum width for multiple damper blades for use in rectangular duct shall not exceed 6 inches.
      c. Where duct velocity may be expected to exceed 1500 fpm, provide Ruskin CD-50, or equal, low leakage dampers with airfoil blades.
   2. Round Ductwork:
      a. Single damper blades may be used in ducts up to 12 inches in diameter. Provide multiple blade opposed blade dampers, with connected linkage, for ductwork larger than 12 inches in diameter.
      b. Damper blades for round ductwork shall be 20 gauge steel for ducts up to 12 inches diameter and 16 gauge steel for dampers larger than 12 inches damper. Provide self-locking regulators, equal to Ventlok 641, Durodyne, or equal for operation of dampers. Provide end bearings equal to Ventlok 607 and provide continuous solid 3/8 inch square shafts.
   3. Where ductwork is externally insulated, provide self-locking regulators equal to Ventlok 644, Durodyne, or equal for rectangular ductwork, and Ventlok 637, Durodyne, or equal for round ducts.

C. Fire Dampers and Combination Fire/Smoke Dampers:
   1. Fire dampers and combination fire/smoke dampers shall be listed and approved by the California State Fire Marshal. Installation shall conform to the manufacturer's UL approved installation instructions.
      a. Fire dampers shall be UL 555 classified and labeled as dynamic fire dampers approved for wall and floor installation. They shall ship from the manufacturer as an assembly with a minimum 20-gauge factory installed sleeve. Sleeve length shall suit the requirements of the wall construction. Each dynamic fire damper/sleeve assembly shall ship complete with factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dynamic fire dampers for vertical installation must consist of a single section on sizes up to 33" x 36" and a single section on sizes up to 24" x 24" for horizontal installation. 1-1/2 hour dynamic fire dampers shall be Ruskin DIBD20, Pottorff, or equal. 3 hour dynamic fire dampers shall be Ruskin DIBD230, Pottorff, or equal.
      b. Fire dampers for high pressure/velocity systems where velocities exceed 2000 fpm and/or 4" w.g. pressure fire damper shall be Ruskin FD60, Pottorff, or equal

c. Fire dampers for ceiling installation shall be UL 555C classified and labeled as ceiling dampers. They shall be provided with a thermal insulating blanket to fit the inlet or outlet condition if required by the application. Ceiling dampers shall be Ruskin CFD 2, 3, 4 or 5. Ceiling dampers for ceilings constructed of wood shall have UL tested in design L501 and shall be Ruskin CFD7, Pottorff, or equal.

d. Combination fire/smoke dampers. Dampers shall be UL classified and labeled as Leakage Class I Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall be warranted to be free from defects in material and workmanship for a period of 5 years after date of shipment. Damper/actuator assembly shall be tested to full open and full close at minimum 2000 fpm 250° F heated air and 4" w.g. with airflow in both directions. (Specified select: 250° / 350°, 2000 fpm/3000 fpm). Each damper shall be equipped with "controlled closure" quick detect heat actuated release device to prevent duct and HVAC component damage resulting from instantaneous damper closure. Release device shall be EFL type and shall allow reset from outside the sleeve after moderate temperature exposure. (Replacement type fusible links not acceptable.)

e. Two position combination fire smoke dampers shall be equipped with one or more factory installed, direct coupled, 120 volt, single phase, electric actuator for energize open – fail close operation. Dampers with multiple actuators shall be factory wired with single point connection at the EFL heat release devise for connection to poser. Damper actuator shall include minimum one-year energized hold open (no cycles) and spring return (fail) close reliability. Damper/actuator shall include minimum 20,000 full open-full close cycle performances.

f. Modulating combination fire smoke dampers shall be equipped with one or more factory installed contact for modulating signal connection. Damper/actuator shall include minimum 100,000 full open-full close cycle performances with spring return (fail) close on loss of power.

g. Round combination fire smoke dampers up to 24" diameter shall be true round type with minimum 20 gauge galvanized steel designed for lowest pressure drop and noise performance. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. Blade seals shall be silicone edge designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17 inches minimum length and factory "roll formed" one-piece angles with pre-punched holes. Dampers shall be Ruskin FSDR25, Pottorff, or equal.

h. Round (larger than 24" diameter) or rectangular combination fire smoke dampers shall include roll-formed structural hat channel frame, reinforced at the corners, formed from a single piece of minimum 16 gauge equivalent thickness formed from single piece galvanized steel. Bearings shall be stainless steel turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17" minimum length and factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dampers shall be Ruskin FSD60, Pottorff, or equal.

i. 3-hour rated combination fire smoke dampers shall be Ruskin model FSD60-3, Pottorff, or equal.

j. All FSD60 type dampers shall be AMCA licensed and shall bear the AMCA Seal for Air Performance. AMCA certified testing shall verify pressure drop does not exceed .03" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper.

k. Wall type fire/smoke damper:
   1) Combination fire/smoke dampers for use in the wall of exit corridors shall be classified and labeled as Leakage Class II Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall meet the requirements for combination fire/smoke dampers in paragraph 3 above except AMCA certified testing shall verify pressure drop does not exceed .07" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper and blades shall be single skin galvanized steel 10 gauge minimum with 3 longitudinal grooves for reinforcement. Dampers shall be Ruskin FSD36, Pottorff, or equal.
   2) Front access combination fire/smoke dampers shall meet all the requirements for combination fire/smoke dampers in paragraph 3 above except pressure drop requirement. In addition the dampers shall be constructed so that actuators and all accessories are accessible from the grille side. Actuators and accessories shall be housed within an integral cabinet on the side of the damper frame and shall not be installed in the air stream in front of the damper. The damper sleeve shall be minimum 14" and flanged to accept a steel framed grille. The sleeve shall be covered with fire resistant material. Dampers shall be Ruskin FSD60FA, Pottorff, or equal.

l. Ceiling type fire/smoke damper for tunnel type corridor construction: Combination fire/smoke dampers for use in the corridor ceiling of tunnel type corridor construction shall be UL classified and labeled as Corridor Damper. Dampers shall meet the requirements of paragraph 4a above except pressure drop testing does not require AMCA certification. Dampers shall be Ruskin FSD36C, Pottorff, or equal.

m. Fusible links shall have temperature rating approximately 50° F above normal maximum operating temperature of the heat producing appliance.
   1) If project requires re-openable fire/smoke dampers, provide Ruskin 165 ° F / 350° F TS150, NCA or equal. The TS150 firestat replaces the EFL and allows the damper to be re-opened from remote location up to 350 ° F. TS150 shall include full open and full closed damper position contacts for interface with remote position indication panel.
   2) Each fire/smoke damper shall be equipped with "controlled closure" quick detect heat actuated release device to prevent duct and HVAC component damage. Release device shall allow easy reset after moderate temperature rise outside the sleeve. Heat release device shall be the Ruskin EFL, NCA or equal.
   3) Unless the system is using a validation control system, each fire/smoke damper shall be equipped with a control panel including blade position indicator lights and a key operated switch. The panel cover shall be oversized for flush mount into the wall or ceiling and shall have a brushed look. Control panel shall be Ruskin MCP2, Pottorff, or equal.

2. All actuators used for smoke dampers or combination fire/smoke dampers shall have a cycle time requirement of not more than every twelve months and shall be rated for continuous "0n" duty and shall be provided with internal spring return. Actuators shall be equipped with pilot light, remote key test switch, end switch and circuitry to activate pilot light on remote key (test) switch located in corridor ceiling adjacent to damper. Electric motors shall be Invensys MA-250, MA-253, Honeywell H2000, or equal.

D. Where required to suit the size of damper required, provide manufacturers standard UL Classified mullions, arranged to support multiple dampers. Assembly shall be of minimum 16 gauge galvanized steel, complete with all accessory caps and framing members required for installation.

2.12 DUCTWORK

A. Construct and install sheet metal ductwork in accordance with the California Mechanical Code for 2 inches static pressure for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.
   1. Where not in conflict with the California Mechanical Code, construct and install all sheet metal ductwork in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible). Where applicable for HVAC work, construct and install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.
   2. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances as approved by the Architect at no extra cost to the Owner.
   3. Gauges, joints and bracing shall be in accordance with the California Mechanical Code.
   4. Provide beading or cross breaking for all ductwork inside building. Provide cross breaking for ductwork exposed to weather.
   5. At the contractor's option, ductwork may be fabricated using the Ductmate, Nexus, Quickduct, Transverse Duct Connection (TDC), Pyramid-Loc duct connection systems, or equal. Fabricate in strict conformance with manufacturer's written installation instructions and in accordance with California Mechanical Code.
      a. Seal flanged ends with pressure sensitive high density, closed cell neoprene or polyethylene tape gasket, Thermo 440, or equal.
      b. Provide metal clips for duct connections, except at breakaway connections for fire dampers and fire smoke dampers. Provide corner clips at each corner of duct, through bolted, at all locations except at breakaway connections for fire dampers and fire smoke dampers. Where used on locations exposed to weather, provide continuous metal clip at top and sides of duct, with 1 inch overhang for top side.

B. Design and installation standards:
   1. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) for all work in this section.
   2. NFPA Compliance: Comply with ANSI/NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," and ANSI/NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
   3. California Mechanical Code.

C. Duct sizes indicated are external sizes.

D. Galvanized Sheet Steel: Lock-forming quality, ASTM A924 and ASTM A653, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
   1. Provide mill certification for galvanized material at request of the Project Inspector.

E. Duct Sealants:
   1. Sealant shall have a VOC content of 250 g/L or less.
   2. Sealant shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
   3. Provide one part, non-sag, synthetic latex sealant, formulated with a minimum of 68 percent solids. Sealant shall comply with ASTM E84, Surface Burning Characteristics.
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
         1) Design Polymerics, model DP1010.
         2) Polymer Adhesive Sealant Systems Inc, model Airseal #11.
         3) McGill Airseal, LLC.

F. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.

G. Duct Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, straps, trim, and angles for support of ductwork.

H. Rectangular Duct Fabrication:
   1. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.
      a. SMACNA HVAC Duct Construction Standards
      b. California Mechanical Code
   2. Fabricate ducts for 2 inch pressure class with minimum duct gauges and reinforcement as follows, except as otherwise noted:

Table A

Duct Dimension	Minimum Gauge	Joint Reinforcement Per CMC
Through 12"	26	Not Required
13" through 18"	24	Not Required
19" through 30"	24	C/4
31" through 42"	22	E/4
43" through 54"	22	F/2

55" through 60"	20	G/4
61" through 84"	20	I/2
85" through 96"	20	J/2
Over 96"	18	K/2

3. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. Turning vanes shall be E-Z Rail II, Durodyne, or equal.
4. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper. Refer to Paragraph "DAMPERS" for damper requirements.
5. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

I. Rectangular Internally Insulated Duct Fabrication:
   1. Provide internal duct lining where indicated on the Drawings, with a minimum of 10'-0" length in each direction from the fan, fan casing, or unit casing. Line all transfer ducts.
      a. Where ductwork is exposed to weather or outside the building insulation envelope, provide 2 inch thick, 1-1/2 pound density internal lining with matte facing, with an R-Value of 8.0 minimum.
      b. Where ductwork is within the building insulation envelope, lining shall be 1" thick, 1-1/2 pound density, with R-value of 4.2 minimum.
      c. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
      d. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).
      e. Cement duct liner in place with nonflammable, non-hardening duct adhesive. Seal all raw edges of insulation inside ductwork with adhesive, including longitudinal liner edges.
      f. Provide metal nosing at all locations where liner is preceded by unlined metal.
      g. Provide sheet metal weld pins and washers or clinch pins and washers on all ductwork on 12 inch intervals with the first row within 3 inches of the leading edge

of each piece of insulation and within 4 inches of corners. No use of adhesive mounted pins will be considered.

1) Install clinched pin fasteners with properly adjusted automatic fastening equipment. Manual installation will not be considered.
2) Install weld pins with properly adjusted automatic fastening equipment. Installation shall not damage the galvanized coating on the outside of the duct.

h. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.

i. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

Manufacturer:	Product:
Johns Manville	Linacoustic RC
CertainTeed Corporation	ToughGard
Fosters Adhesive	85-62
Swifts Adhesive	7336

J. Round and Oval Ductwork Fabrication:

1. Round and oval duct and fittings shall be spiral lockseam or longitudinal seam as indicated in table below. Provide couplings to join each length of duct.
   a. At contractors' option, round or oval ductwork may be utilized in place of rectangular ductwork shown on Drawings, provided available space allows installation of round or oval ductwork without compromising space required for installation of products and systems of other trades.
      1) Round or oval ductwork utilized in place of rectangular ductwork shown on Drawings shall be sized to have a static pressure loss equivalent to rectangular duct shown on Drawings.
      2) Unlined round or oval duct shall not be utilized in place of rectangular internally lined ductwork shown on Drawings.
2. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Provide two-piece, die-stamped, 45-degree to 90-degree elbows for sizes up to 12 inches; five-piece, 90-degree elbows for sizes 12 inches and above; conical tees; and conical laterals. All reducers shall be placed after a tap has been made on the duct main. Reducers shall be long-taper style.

3. Round Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 653 by the following methods and in minimum gauges listed.

Diameter	Minimum Gauge	Method of Manufacture
Up to 14"	26	Spiral Lockseam
15" to 23"	24	Spiral Lockseam
24" to 36"	22	Spiral Lockseam
37" to 50"	20	Spiral Lockseam
51" to 60"	18	Spiral Lockseam
Over 60"	14	Longitudinal Seam

4. Provide locked seams for spiral duct; fusion welded butt seam for longitudinal seam duct.
5. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous welds along seams at exposed ducts. Provide spot weld bonded seams at concealed ducts.

Diameter	Minimum Gauge
3" to 36"	20
38" to 50"	18
Over 50"	16

6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

K. Round Internally Insulated Duct and Fittings: Where ductwork is exposed to weather or outside the building insulation envelope, construct with outer pressure shell, 2 inch thick (Minimum R-value = R-8) insulation layer, and perforated inner liner. Where ductwork is within the building insulation envelope, construct with outer pressure shell, 1 inch thick (minimum R-value = R4.2) insulation layer, and perforated inner liner. Construct shell and liner of galvanized sheet steel complying with ANSI/ASTM A 653, of spiral lockseam construction (use longitudinal seam for over 59 inches), in minimum gauges listed in table below. Where installed exposed in the conditioned space: duct and fitting outer pressure shell shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value = R-4.2), and perforated inner liner.

Nominal Duct Diameter	Outer Shell	Inner Liner
3" TO 12"	26 gauge	24 gauge
13" TO 24"	24 gauge	24 gauge
25" to 34"	22 gauge	24 gauge
35" to 48"	20 gauge	24 gauge
49" to 58"	18 gauge	24 gauge
Over 59"	16 gauge	20 gauge

1. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous weld along seams of outer shell at exposed ducts. Provide spot weld bonded seams at concealed ducts.

Nominal Duct Diameter	Outer Shell	Inner Liner
3" to 34"	20 gauge	24 gauge
36" to 48"	18 gauge	24 gauge
Over 48"	16 gauge	24 gauge

2. Inner Liner: Perforate with 3/32 inch holes for 22 percent open area. Provide metal spacers welded in position to maintain spacing and concentricity.
3. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
4. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).
5. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.
6. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Sheet Metal Div., McGill AirFlow, LLC., Acousti-k27
   b. Semco Duct and Acoustical Products, Inc.
   c. Air Systems Manufacturing, Inc. - Las Vegas

L. Duct Access Doors:
1. Duct Access: Provide hinged access door in rectangular ducts for access to fire dampers, control equipment, etc. Access door size shall be duct diameter wide by duct

diameter high for all ducts under 24 inches. Ducts over 24 inches in diameter shall have 24-inch by 18-inch access doors. Minimum size access doors shall be 6 inches by 6 inches.

2. Provide hinged style access doors for round ductwork, NCA Manufacturing, Inc., Model AD-RD-87, Pottorff Series 60, or equal. Access doors shall be 16 gauge galvanized steel with continuous piano hinge. Locks shall be plated steel strike and catch. Provide 1" x 3/8" Polyethylene "Perma Stik" gasket all around door.

M. Flexible Air Ducts:
   1. Provide exterior reinforced laminated vapor barrier, fiberglass insulation, encapsulated spring steel wire Helix, and impervious, smooth, non-perforated interior vinyl liner. Individual lengths of flexible ducts shall contain factory fabricated steel connection collars.
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
         1) C.A. Schroeder, Inc., Cal Flex model 2PMJ.
         2) ThermaFlex model M KC.
   2. Factory made air ducts shall be approved for the use intended and shall conform to the requirements of UL 181 and NFPA 90A. Each portion of a factory-made air duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with UL 181, Class 1. Ducts shall be UL listed Class 1, maximum 25/50 smoke and flame spread and shall be installed in accordance with the terms of their listing and the requirements of SMACNA HVAC Duct Construction Standards (Metal and Flexible). Factory-made air ducts shall have the following minimum R-values: R-6.0 for ductwork installed within the building insulation envelope, R-8.0 for ductwork installed outside the building insulation envelope.
   3. Flexible ductwork shall be maximum of 5 feet long, and shall be extended to the fullest possible length, in order to minimize pressure drop in the duct.
   4. Flexible ducts shall be selected for minimum of 6 inch positive static pressure and minimum of 1 inch negative static pressure.

N. Kitchen Exhaust Ducts (Type 1):
   1. Fabricate kitchen exhaust ducts and supports used for removal of smoke and grease-laden air from cooking equipment of 16 gauge minimum black steel where concealed and of 18 gauge minimum Type 304 stainless steel where exposed. At Contractor's option, 18 gauge minimum Type 304 stainless steel may be used where concealed. Finish exposed stainless steel with Number 4 finish. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with SMACNA "HVAC Duct Construction Standards" and ANSI/NFPA 96 "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations."
   2. Kitchen Exhaust Duct Access Panels:
      a. Provide listed duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:
         1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.

2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.
3) Minimum Pressure rating: 10 inches wg., positive or negative.

b. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1) Ductmate Industries, Inc.
2) 3M.
3) Flame Gard, Inc.

3. Field-Applied Grease Duct Enclosure:
a. Thermal Ceramics Firemaster FastWrap XL, or equal, field-applied grease duct enclosure listed in accordance with ASTM E 2336.

O. Kitchen Exhaust Ducts (Type 2):
1. Cooking Equipment Exhaust Ducts:
a. Fabricate kitchen exhaust ducts and supports used for removal of vapor, heat and odors from cooking equipment of 16 gauge minimum black steel where concealed and of 18 gauge minimum Type 304 stainless steel where exposed. At Contractor's option, 18 gauge minimum Type 304 stainless steel may be used where concealed. Finish exposed stainless steel with Number 4 finish. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with SMACNA "HVAC Duct Construction Standards" and ANSI/NFPA 96 "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations."
2. Dishwasher Exhaust Ducts:
a. Fabricate dishwasher exhaust ducts and supports used for steam removal from dishwasher of 18 gauge minimum 304 stainless steel. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with California Mechanical Code, SMACNA "HVAC Duct Construction Standards," and ANSI/NFPA 96 "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations."
3. Duct Access Panels:
a. Provide duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:
1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.

P. Flexible Connectors:
1. Materials: Flame-retardant or noncombustible fabrics. Coatings and adhesives shall comply with UL 181, Class 1, with flame spread index of 25 or less, and smoke-developed index of 50 or less.
2. Metal-Edged Connectors: Factory fabricated with a fabric strip 3 inches wide attached to two strips of 3-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
3. Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

a. Minimum Weight: 26 oz./sq. yd.
b. Tensile Strength: Minimum 475 lbf/inch in the warp and minimum 375 lbf/inch in the filling.
c. Service Temperature: Minus 50 to plus 200 deg F.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
   a. Ductmate Industries, Inc., model Proflex.
   b. Ventfabrics, Inc., model Ventlon.

2.13 PIPE JOINING MATERIALS

A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated
      a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.
   2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.
   3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.

C. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.14 INSULATION MATERIALS

A. General:
   1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
   2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
   3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
   4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
   5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
   6. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

B. Insulation Materials:

1. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Provide 2-inch wide stapling and taping flange.
    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
        1) CertainTeed Corporation.
        2) Johns Manville.
        3) Knauf Insulation.
        4) Owens Corning.

2.15 FIELD APPLIED JACKETS:

A. PVC Jacket and Factory Fabricated Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming.
    1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    2. Johns Manville, model Zeston, with Zeston 2000 fitting covers.
    3. Proto Corporation, model LoSmoke.

B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
    1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
        a. Childers Brand; H. B. Fuller Construction Products.
        b. ITW Insulation Systems; Illinois Tool Works, Inc.
        c. RPR Products, Inc.
    2. Finish and thickness are indicated in field-applied jacket schedules.
    3. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
    4. Factory-Fabricated Fitting Covers:
        a. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        b. Tee covers.
        c. Flange and union covers.
        d. End caps.
        e. Beveled collars.
        f. Valve covers.
        g. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.16 TEMPERATURE CONTROL SYSTEM

A. Refer to Section 23 09 23, Direct Digital Control System for HVAC.

PART 3 - EXECUTION

3.1 ROOF MOUNTED EQUIPMENT INSTALLATION

A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

B. Examine rough-in for roof mounted equipment to verify actual locations of piping and duct connections prior to final equipment installation.

C. Verify that piping to be installed adjacent to roof mounted equipment allows service and maintenance.

D. Verify that gas piping will be installed with sufficient clearance for burner removal and service.

E. Install gas flue extensions. Attach gas flue extensions to unit according to unit manufacturers' installation instructions. Terminate gas flue extensions with lowest discharge opening at height compliant with requirements of California Mechanical Code, based on final unit location.

F. Install ducts to termination at top of roof curb and install heavy duty rubber gaskets on supply and return openings and on full perimeter of curb, or as required for an airtight installation, prior to setting unit on curb.

G. Cover roof inside each roof mounted air conditioning unit, heat pump unit, and heating and ventilating unit roof curb with 2 inch thick, 3 pound density fiberglass insulation board.

H. Connect supply and return air ducts to horizontal discharge roof mounted equipment with flexible duct connectors. Provide G 90 galvanized steel weather hood over flexible connections exposed to the weather. Weather hood minimum gauge shall be per PART 2 article, Ductwork, Table A.

I. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

3.2 FAN INSTALLATION

A. Provide access doors for fans or motors mounted in ductwork.

B. Mount all fans as detailed on Drawings and in compliance with CBC standards.

C. Fan motors mounted in air-stream to be totally enclosed.

D. Completely line supply, return or exhaust fan cabinets with 1 inch thick, 3/4 pound density acoustic insulation securely cemented in place.

E. Roof fans shall be mounted level.

F. Provide heavy-duty rubber gasket between exhaust fan mounting flange and roof curb, or as required for an airtight installation.

3.3 AIR INLETS AND OUTLETS INSTALLATION

A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.

B. Unless otherwise indicated on Drawings, provide rectangular galvanized steel plenum on top of each diffuser and ceiling return for connection to ductwork. Line plenum with internal insulation as indicated for lined ductwork. Size plenum to allow full opening into air terminal. Plenum sheet metal gauge shall be equal to gauge for rectangular equivalent of the branch duct serving the air inlet or outlet.

C. Ceiling-mounted air inlets, outlets, or other services installed in T-Bar type ceiling systems shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.
   1. Air inlets, outlets, or other services weighing not more than 56 pounds shall have two No. 12 gauge hangers connected from the terminal or service to the structure above. These wires may be slack.
   2. Support air inlets, outlets, or other services weighing more than 56 pounds directly from the structure above by approved hangers. Provide 4 taut 12 gauge wires each, attached to the fixture and to the structure above. The 4 taut 12 gauge wires, including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.
   3. Secure air inlets and outlets to main runners of ceiling suspension system with two No. 8 sheet metal screws at opposing corners.

D. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Paint exposed mounting screws to match the material being secured.

E. Air inlets and outlets shall match all qualities of these specified including appearance, throw, noise level, adjustability, etc.

3.4 TEMPORARY FILTERS

A. Provide temporary filters for fans that are operated during construction; after construction dirt has been removed from the building install new filters at no additional cost to the Owner. In addition to temporary filters at filter location, provide temporary filters on all duct openings which will operate under a negative pressure.
   1. Filters used for temporary operation shall be the same as permanent filters for the application. Filters used for duct openings may be 1 inch thick pleated media disposable type.

3.5 DAMPER INSTALLATION

A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.

B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide an opposed blade balancing damper in each zone supply duct. Provide an access panel or Ventlok flush type damper regulator on ceiling or wall for each concealed damper.

C. Install fusible link fire dampers full size of duct at points where shown or required.

D. Provide 18 inch x 12 inch minimum hinged access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2 inch high red letters.
   1. Provide Ventlok Series 100, Durodyne, or equal access doors with hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2 inch thick doors, #260 heavy-duty up to 2 inch thick doors and #310 heavy-duty for greater than 2 inch thick doors. Provide #260 hinges on all hinged and personnel access doors; include gasketing.

3.6 DUCTWORK INSTALLATION

A. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling. Where possible, install ductwork to clear construction by 1/4 inch minimum, except at air inlets and outlets. Where ductwork will not clear construction, secure duct firmly to eliminate noise in the system.

B. Duct Joints: Install duct sealers, pop rivets or sheet metal screws at each fitting and joint. Duct sealer shall be fire retardant. Sheet metal screw for joints shall be minimum #10 size galvanized.

C. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw
For ducts with P/2 over 73"	3/8"x 1-1/2" lag screw

D. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger
For duct with P/2 larger than 120"	NOT ALLOWED

E. Install concrete inserts for support of ductwork in coordination with formwork as required to avoid delays in work.

F. Upper connection to manufactured truss construction must comply with truss manufacturers published requirements and Structural Engineers requirements.

G. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct plus insulation with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2 inches.

H. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed. Angles shall be attached to overhead construction in a manner so as to allow a minimum of 2 inches of movement in all directions with no bending or sagging of the angle.
   1. Except where modified in individual paragraphs of this Section, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap over at bottom of duct.
   2. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw at top of duct and one screw into strap at bottom of duct.

I. Installation of Flexible Ductwork:
   1. Provide flexible ducts with supports at 30 inch centers with 2 inch wide, 26 gauge steel hanger collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets.
      a. Supports shall be in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible).
      b. Flexible duct bends shall be not less than 1-1/2 duct diameter bend radius.
   2. Make connections to rigid duct and units with Panduit style draw band at inner liner material, and a second draw band over the outer vapor barrier material.
   3. Make connection to duct with spin-in fittings, with air scoop and balance damper.

J. Installation of Kitchen Exhaust Ducts (Type 1):
   1. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease.
   2. Slope duct a minimum of 2 percent to drain grease back to the hood.

3. Provide for thermal expansion of ductwork through 2000 ◦F temperature range.
4. Install listed grease duct access panel assemblies at each change of direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, and as indicated on Drawings. Locate access panel on top or sides of duct. Locate panel so that edge of opening is not less than 1-1/2 inch from all outside edges of the duct or welded seams. For large horizontal ducts, install 20 inch by 20 inch access panel for personnel entry at maximum intervals of 20 feet.
5. Install listed grease duct access panel assemblies in accordance with the terms of their listings and the manufacturers' instructions. Access panels shall be labeled with the words: "Access Panel – Do Not Obstruct."
6. Fabricate ducts with continuous welds for grease-tight construction.
7. Grind welds to provide smooth surface free of burrs, sharp edges and weld splatter. When welding stainless steel with a No. 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to removed discoloration caused by welding.
8. Cover grease exhaust duct with two layers of 1-1/2 inch thick field-applied grease duct enclosure. Install grease duct enclosure in accordance with manufacturer's instructions and listing requirements.

K. Installation of Kitchen Exhaust Ducts (Type 2):
1. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease.
2. Slope duct a minimum of 1 percent to drain back to the hood or dishwasher connection.
3. Install duct access panel assemblies at each change of direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, and as indicated on Drawings. Locate access panel on top or sides of duct. Locate panel so that edge of opening is not less than 1-1/2 inch from all outside edges of the duct. For large horizontal ducts, install 20 inch by 20 inch access panel for personnel entry at maximum intervals of 20 feet.
4. Fabricate ducts with continuous welds for water-tight construction.
5. Grind welds to provide smooth surface free of burrs, sharp edges and weld splatter. When welding stainless steel with a No. 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to removed discoloration caused by welding.
6. Fabricate ducts for dishwasher exhaust with seams on top of duct, and with minimum joints.
7. Access panels shall be labeled with the words: "Access Panel – Do Not Obstruct."

3.7 PIPE JOINTS AND CONNECTIONS

A. General:
1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Welded Pipe:
1. Make up with oxyacetylene or electric arc process.

2. All welding shall conform to the American Standard Code for Power Piping ASME B-31.1. When requested by the Architect, furnish certification from an approved testing agency or National Certified Pipe Welding Bureau that the welders performing the work are qualified.
3. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
4. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

C. Flexible Connections:
1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Anchor piping securely on the system side of each flexible connection.

3.8 INSULATION AND FIELD-APPLIED JACKET INSTALLATION

A. General:
1. The term "piping" used herein includes pipe, air separators, valves, strainers and fittings.
2. Test insulation, jackets, and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723, ASTM E84, or NFPA 255.
3. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
4. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, ductwork, and equipment.
5. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.
6. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
7. Install insulation with longitudinal seams at top and bottom of horizontal runs.
8. Install multiple layers of insulation with longitudinal and end seams staggered.
9. Keep insulation materials dry during application and finishing.
10. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
11. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
12. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
13. For piping, ductwork, and equipment, with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

14. Repair all damage to existing pipe, duct and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.
15. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
    a. Install insulation continuously through hangers and around anchor attachments.
    b. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
    c. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
    d. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

B. Piping Insulation Installation:
    1. General:
        a. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
        b. Provide removable insulation covers for items requiring periodic service or inspection.
        c. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation.
        d. Provide pre-formed PVC valve and fitting covers for indoor piping.
        e. Provide factory-fabricated aluminum valve and fitting covers for outdoor piping.
        f. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
    2. Below-Ambient Services Including Chilled Water Supply and Return and Refrigerant Piping:
        a. Insulate valves and irregular surfaces to match adjacent insulation and cover with two layers of woven glass fiber cloth saturated in Foster Sealfas 30-36, 3M, or equal, extending 3 inches over the adjoining pipe insulation. Finish with a coat of Foster Sealfas 30-36, 3M, or equal. The 3 inch wide SSL end laps furnished with the insulation shall be adhered over the end joints. Seal entire surface of insulation vapor tight, including joints and ends of PVC or aluminum fitting covers.
        b. Variable refrigerant flow (VRF) heat pump systems: Insulation for VRF system refrigerant piping shall be installed according to VRF unit manufacturer’s instructions.
    3. PVC Jacket Installation:
        a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

4. Aluminum Jacket Installation:
   a. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.

C. Duct Insulation Installation:
   1. General:
      a. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied. Material exposed within ducts or plenum shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.
      b. Duct insulation applied to the exterior surface of ducts installed outside the building insulation envelope shall meet minimum R-value of R-8 at 3 inches thickness and 3/4 pound per cubic foot density.
      c. Duct insulation applied to the exterior surface of ducts installed within the building insulation envelope shall meet minimum R-value of R-4.2 at 1-1/2 inches thickness and 3/4 pound per cubic foot density.
   2. Mineral Fiber Blanket Installation:
      a. Insulate all unlined concealed supply and return ducts with fiberglass duct wrap, manufactured as a blanket of glass fibers factory laminated to a reinforced foil/kraft vapor retarding facing. Provide 2 inch stapling and taping flange. Wrap insulation entirely around duct and secure with outward clinching staples on 6 inch centers. Provide mechanical fasteners at maximum 18 inch centers for all bottoms of duct which are greater than 24 inches. Lap all insulation joints 3" minimum. Insulate ducts installed tight against other work before hanging in place. Seal all seams, both longitudinal and transverse, and all staple and mechanical fastener penetrations of facing with scrim backed foil tape or recommended sealant, to provide a vapor tight installation.
   3. PVC Jacket Installation:
      a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
         1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.9 DUCTWORK SEALING AND LEAK TESTING

A. All ductwork shall receive a Class A seal.

B. Seal airtight all joints and seams, including standing seams and manufactured joints and seams, of all supply, return and exhaust ducts except those exposed in conditioned space.

C. Leakage Classes:

Pressure Class	Leakage Class	
	Round Duct	Rectangular Duct
2"W.G. or less	8	16
4"W.G. or greater	2	4

D. All duct systems (supply, return, outside air intake, and exhaust), except those identified on compliance forms on Drawings as requiring Acceptance Testing per the requirements of the California Energy Code, shall be tested in accordance with the requirements of SMACNA "HVAC Air Duct Leakage Test Manual." Test pressure shall be equal to the pressure class of the duct. For additional duct leak testing requirements, refer to Section 23 08 00.13, "Title 24 Commissioning of HVAC."

3.10 TEMPERATURE CONTROL SYSTEM INSTALLATION

A. Provide thermostats where indicated on drawings. All wiring shall be in conduit. Provide all relays, transformers and the like to render the control system complete and fully operable. All control conduit to be rigid steel type.

3.11 EQUIPMENT START-UP

A. Initial start-up of the systems and pumps shall be under the direct supervision of the Contractor.

B. Equipment start-up shall not be performed until the piping systems have been flushed and treated and the initial water flow balance has been completed.

C. It shall be the responsibility of the Contractor to assemble and supervise a start-up team consisting of controls contractor, start-up technician, and test and balance contractor; all to work in concert to assure that the systems are started, balanced, and operate in accordance with the design.

D. After start-up is complete, instruct the Owner's personnel in the operation and maintenance of the systems. Obtain from the Owner's representative a signed memo certifying that instruction has been received.

E. For additional requirements, refer to article, Check, Test and Start Requirements, in Section 23 00 50, Basic HVAC Materials and Methods.

3.12 TESTING AND BALANCING

A. For testing and balancing requirements, refer to Section 23 05 93, Testing and Balancing for HVAC.

3.13 CLEANING AND PROTECTION

A. As each duct section is installed, clean interior of ductwork of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or where ductwork is to be painted.

B. Strip protective paper from stainless steel ductwork surfaces, and repair finish wherever it has been damaged.

C. Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until connections are to be completed.

D. As each internally lined duct section is installed, check internal lining for small cuts, tears, or abrasions. Repair all damage with fire retardant adhesive.

3.14 EQUIPMENT MOUNTING

A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

3.15 INDOOR DUCT INSULATION SCHEDULE

A. Minimum R-Value = R-4.2.

B. Supply and Return Ducts: Mineral Fiber Blanket, 1-1/2 inches thick, 0.75 lb/cu. ft.

3.16 OUTDOOR DUCT INSULATION SCHDULE.

A. Refer to article, Ductwork, for internal duct lining. Provide 2 inches thick internal duct lining where indicated on Drawings.

B. Refer to article, Ductwork, for double-wall ductwork with interstitial insulation.

3.17 INDOOR FIELD-APPLIED DUCT JACKET SCHEDULE

A. Insulated ducts in concealed spaces: None.

B. Insulated ducts in exposed unconditioned spaces: PVC, 20 mils thick.

END OF SECTION 23 80 00

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for the electric work. These requirements apply to all sections of Division 26.

B. Provide electrical materials, equipment, services, rentals, labor and testing to complete the installation and testing of the electrical work specified in the Construction Documents.

1.02 GENERAL REQUIREMENTS

A. No exposed conduit or surface raceway, except in Mechanical yard or equipment rooms, shall be permitted without written approval from the Engineer.

B. Multi-wire branch circuits shall not be permitted. Provide a dedicated neutral for all branch circuits requiring a neutral.

C. Provide shop drawings, materials, labor and testing for all work not explicitly shown or specified in the Constructions Documents but is still required to be completed in order to have a complete and functioning system or facility as specified. Review the bid documents carefully and identify all areas in the constructions documents which require shop drawings and include them in the bid. For example, if an emergency generating system is specified with a remote tank and fuel transfer system and the interconnection wiring of the fuel transfer system was not explicitly included in the Construction Documents, then it is the Contractor's responsibility to provide shop drawings, services (e.g., structural engineer services), materials and labor necessary to complete and test the fuel transfer system so that specified Emergency Generating System meets codes requirements and functions as intended. This also includes but is not limited to mounting details, vendor supplied systems such as UPS, digital lighting, Telecom Systems, Audio Visual, Fire Alarm, etc. Shop drawings shall be submitted to the Engineer for review and approval. Shop drawings will be stamped in accordance with code and plan review requirements.

D. Provide a UL label or evidence of UL listing for all electrical material, unless the material is of a type for which a label or listing service is not provided.

1.03 CODE COMPLIANCE

A. Perform all work in accordance with the following codes:

1. California Electrical Code 2022
2. California Building Code 2022
3. California Fire Code 2022
4. California Mechanical Code 2022
5. California Plumbing Code 2022
6. California Building Standards Administrative Code 2022

7. California Green Building Standards Code 2022

8. California Energy Code 2022

9. All Applicable State and Local Codes and Regulations

1.04 PERMITS, FEES AND INSPECTIONS

A. Obtain all permits that are required for the work.

B. Call for all local building department inspections.

C. Obtain approvals from local building inspector prior to final observation by Engineer.

D. Advise Engineer, one week prior to:

1. Installation of underground work. Obtain Engineer's approval prior to backfill. The Engineer may direct uncovering of any work not so approved.

2. Start of interior rough-in work.

3. Installation of switchboards and motor control centers.

1.05 STANDARDS

A. Comply with the current applicable standards of the listed agencies for electrical materials and installation.

B. Underwriters Laboratories, Inc. (UL): Provide a UL label or evidence of UL listing for all electrical material, unless the material is of a type for which a label or listing service is not provided.

C. National Electrical Manufacturer's Association (NEMA).

D. American National Standards Institute (ANSI).

E. American Society for Testing Materials (ASTM).

F. Insulated Power Cable Engineers Association.

G. Certified Ballast Manufacturer's Association.

H. Institute of Electrical and Electronic Engineers (IEEE).

1.06 SUBMITTALS

A. Provide submittals for items specified in individual sections of Division 26 0000, in accordance with the requirements of Division 1.

B. Procedure: Submit under provisions of Section 01 3000 - Administrative Requirements and Section 01 6000 - Product Requirements.

C. Provide submittals for items listed documenting compliance with specification requirements.

1. Materials and Services

2. Contractor prepared Acceptance Test Procedures for Engineering review and approval.

3. Acceptance Test Results

4. Shop drawings

5. Operation and Maintenance Manual, in accordance with Section 01 7800 - Closeout Submittals.

6. Record Drawings, in accordance with Section 01 7800 - Closeout Submittals.

7. Other- Submittals required elsewhere in the Construction Documents.

1.07 MATERIALS AND SUBSTITUTIONS

A. Provide new material of the quality specified and satisfactory to the Engineer.

1. Provide major equipment which is the product of a manufacturer who has, for a period of not less than five years been in successful manufacture of similar equipment to that specified and who has a catalog covering ratings and specifications of proposed equipment.

1.08 DRAWINGS AND SPECIFICATIONS

A. Data given herein and on the plans are exact as could be secured, but their absolute accuracy is not guaranteed. Plans and specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels and other data will be governed by the structures. The contractor shall provide a layout plan of all electrical equipment showing actual dimensions and working clearances. The contractor is responsible for ensuring that all electrical equipemt will fit and no working clearances are exceeded.

B. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the Owner.

C. Layouts of equipment, accessories, and wiring systems are diagrammatic but follow these as closely as possible. Examine Architectural, Structural, and Mechanical and other drawings, noting all conditions that may affect this work. Report conflicting conditions to the Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without so reporting the matter, he does so, on his own responsibility and shall alter work if directed by the Engineer at his own expense.

D. The right is reserved to make minor changes in locations of equipment and wiring systems shown, providing the change is ordered before conduit runs and/or work directly connected to same is installed and no extra materials are required.

1.09 UTILITY COORDINATION

A. Coordinate with the electric utility company and the telephone company whenever necessary, to determine service equipment requirements, conduit and backfill requirements, electric metering requirements and other requirements to provide complete utility services, adequate to supply the electrical and communication system(s) indicated. Provide materials that are specified in Division 26 in addition to conforming to utility company requirements.

B. Include in bid, all work required by the utility companies. All work required for utility services shall be in accord with contract documents, specifications, drawings and as required by the utility companies.

C. Use extreme caution when digging to avoid buried electrical cables.

1. Before digging, call:

2. (800) 642-2444

1.10 HOMERUNS AND MAXIMUM NUMBER OF CIRCUITS

A. 120 VAC, 20 A circuit- Maximum of (9) #12 conductors in conduit (assume ambient temp for 120 Deg F, 90 Deg C wire). Homeruns may combine branch circuits by using a maximum of (20) # 10 conductors in 1.25” minimum diameter conduit.

1.11 CUT OVER

A. Prepare, submit and implement the cut over procedure. Provide all necessary materials, equipment, services, and rentals (e.g., generators, UPS, ATS) for the cut over. No disruption in power or any interference with Operations is permitted without Owner's approval. Have cut over coordination meetings with all necessary participants (Owner, Engineers, Vendors, Subcontractors) at least before preparing the cut over procedure and before conducting the approved procedure. Additional meetings may be required (e.g., resolve start up issues).

1.12 SUPERVISION

A. Provide adequate and competent supervision. Maintain complete control of the project execution and complete liability for the materials and work until the job is completed and accepted by the Owner.

1.13 MANUFACTURER'S INSTRUCTION

A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified.

B. Notify the Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.14 WORKMANSHIP

A. Firmly and permanently secure in place all electrical equipment to the structure so that it is level, plumb, and true with the structure and other equipment. Installation methods shall be as recommended by the National Electrical Contractors' Standard of Installation, except

when methods specified or shown on the plans differ. The minimum installation standards shall be as required by the Codes.

1.15 PROTECTION

A. Protect all equipment and materials required for the performance of this work from damage by the elements, vandalism, or work during construction.

1. Do not subject the work and materials of other trades to damage during execution of the work in this division of the specifications.

1.16 COORDINATION WITH OTHER TRADES

A. Coordinate with other trades and promptly transmit all information required by them. Coordinate the sequence of construction with other trades to ensure that all work proceeds with a minimum of interference and delay. Perform all work that requires relocation due to negligence or absence of regard for the work of other trades.

1.17 EXAMINATION OF SITE

A. Examine the site prior to bid to determine existing site conditions that may affect the work. No allowance will be allowed for any extra work required due to a failure to recognize, or negligence to discover conditions prior to bid.

1.18 STRUCTURAL REQUIREMENTS

A. Secure all anchors for electrical equipment in a manner that will not decrease the structural value of any structure to an unsafe level. Inform the Engineer of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in the project.

1.19 IDENTIFICATION

A. Install nameplates on electrical equipment including:

1. Individual circuit breakers on switchboards, distribution panelboards and motor control centers.

2. Motor starters.

3. Pilot lights, selector switches, overload resets, timers and other pilot control devices.

4. Panelboards, switchboards, transformers, control cabinets and other major equipment.

5. Disconnect switches, time switches, contactors, relays and other miscellaneous equipment enclosures.

6. Light switches for which the control functions are not evident.

7. Provide labeling on receptacles and light switches which describe the source panel and circuit number. Use clear adhesive label with typed text. Example, "EH-3", that is panel "EH" circuit 3.

B. Describe item, control function of sequence or operation on each nameplate, as applicable.

C. Fabricate nameplates of laminated phenolic plastic, black front and back with white core. Bevel edges. Engrave through outer layer to produce white letters and numerals. For control pilot devices, engraved metallic plates, filled with enamel, are acceptable. Fasten nameplates to equipment with No. 4 Phillips, round head, cadmium steel, self-tapping screws.

1.20 TESTS AND REPORTS

A. Perform routine insulation-resistance, continuity, equipment settings and rotation tests for all affected distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein. Prepare inspection and test reports for all equipment as specified herein and submit to the Electrical Engineer for review and approval. Submit at least two weeks before the planned testing. Perform these inspections and test prior to or as part of system Acceptance Testing. Examples include:

1. Grounding systems, for resistance to earth. Provide additional grounding electrodes if main service or separately derived system ground resistance exceed 5 ohms.

2. Motor circuits with motor disconnected, for resistance to ground.

3. Control circuits for resistance to ground.

4. Lighting circuits, for resistance to ground.

5. Power feeders, for resistance to ground.

6. Switchboards, Motor Control Centers for resistance to ground.:

7. Main bus, power and control circuits, for resistance to ground.

    a. Check connection; tighten if necessary.

    b. Operation of each device.

    c. Set relays and trip settings in accord with the Engineer's directions.

    d. Check thermal overload heaters for size and reset operation.

8. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500-volt "Megger".

9. Set circuit protective devices to provide proper long-time, short-time and ground-fault tripping coordination

10. Coordinate phase rotation of all motors with installer to ensure proper direction of rotation. List motor data:

    a. Item of equipment.

    b. Nameplate data.

c. Overload heater catalog number and rating.

1.21 DEMONSTRATIONS:

A. After testing and final inspection, demonstrate operation of all affected systems and equipment to Engineer and Owner.

B. Arrange date of test with Owner.

C. Advise the manufacturers' representative to be present when required.

D. Instruct Owner's personnel in operation, adjustment and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

1.22 GUARANTEE:

A. Guarantee the electrical work against defects in work or materials for one year after filing of Notice of Completion.

B. Undertake repairs within 24 hours after notice from the Owner.

C. If the operation of the electrical system fails to conform to Division 26 requirements, approved submittals, or operation and maintenance manuals, the Owner may operate the electrical system without liability to Owner. Repair or replace defective or unsatisfactory equipment or systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EQUIPMENT MOUNTING SEISMIC CRITERIA

A. Brace or anchor all electrical equipment to resist a horizontal force acting in any direction using the criteria of Section 1613A and 1615A, 2022 California Building Code, Title 24, Part 2.

B. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the electrical and structural engineers.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This specification defines the seismic design criteria to be used for the design of equipment anchorage and seismic bracing for electrical equipment/components. This section provides guidelines and limitations for supporting all electrical items from the building structure, and for seismic bracing for all such items.

B. The Contractor is responsible for engaging the services of a qualified licensed professional engineer in the state of California with a minimum 5 years of experience in structural seismic design to provide the analysis, calculations, seismic bracing, and installation details for equipment and equipment anchorage, skids and frames in accordance with specified criteria and applicable codes. The Contractor's engineer is to provide construction support during the equipment installation for any field problem that may arise during construction. The Contractor is required to design support and bracing for items for which the contract documents do not provide specific attachment, support, and bracing.

C. Unless the item is classified by the owner as essential, seismic bracing and restraint may be waived for the following.

1. Anchorage for equipment with operating weighs less than 400 pounds and is supported at 4 feet or less above the floor.

2. Temporary or movable equipment when rolling/sliding is prevented and is not subject to tipping.

3. Equipment weighing less than 20 pounds supported on vibration isolators.

4. Equipment weighing less than 20 pounds suspended from the floor or roof or mounted to walls.

5. Verification and investigation on Item C.2, whether the equipment will be tipped over under the code required seismic forces using R=1.0 and 60% of the operating weight, shall be performed by a qualified engineer per Paragraph 1.01B.

D. Seismic bracing is not required for the following items:

1. All electrical conduits less than 2.5 inches inside diameter, unless racked together.

2. All conduits mounted less than 12" from hanger anchorage.

E. Design and install all support and bracing systems except as noted. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure

1.02 RELATED REQUIREMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

B. Section 26 05 03: Seismic Certification of Equipment and Non Structural Components.

1.03 REFERENCES

A. California Building Code (CBC), with local amendments where the project is located.

B. American Society of Civil Engineers (ASCE), ASCE 7, Minimum Design Loads for Buildings and Other Structures,

C. American Society of Heating and Ventilating and Air Conditioning (ASHRAE), HVAC Applications, Latest Edition, Seismic and Wind Restrain Design

1. The lateral force equations in ASCE 7, as appropriate, should be used to determine the lateral seismic force. The force calculations found in these standards are based on a previous code provision that may not comply with the latest ASCE 7.

D. American Society of Mechanical Engineers (ASME), including addendum through the latest edition

E. Structural Engineers Association of California, Recommended Lateral Force Requirements and Commentary, Latest Edition

F. Seismic Restraint Manual Guidelines for Mechanical Systems, Latest Edition (SMACNA)

1.04 SYSTEM DESCRIPTION

A. Site Criteria: Obtain the required parameters from the Structural Specifications/Structural Engineer of Record.

B. Design Requirements

1. All electrical equipment/devices, attachments and supports shall be designed to withstand the specified seismic loads and comply with the latest ASCE 7 seismic design detailed requirement for strength and displacement.

2. Equipment design is solely the responsibility of the equipment supplier. The equipment shall be designed so the strength and anchorage of the internal and external components or equipment piping exceed that of the forces used to restrain and to anchor the equipment to the supporting structure. Guidance as to which pieces of equipment and parts require seismic design can be found in the commentary section of SEAOC Recommended Lateral Force Requirements and Commentary, specifically Section C107. Equipment with flexible and /or cantilevered lateral system shall be avoided.

3. Seismic design parameters as defined by the latest ASCE 7.

a. Rp for anchorage shall consider the ductility and the embedment depth of the anchor.

b. Additional factor for anchorage to cracked concrete and masonry structure shall be applied as required by codes.

4. Components and Equipment Supported by Structures

a. The lateral force is to be applied at the center of mass of the component and can act in any lateral direction.

5. Seismic restraint for electrical system is to be designed per the latest ASCE 7 - seismic design requirements.

C. Connection Requirements

1. Component attachments are to be welded, bolted, or otherwise positively connected without consideration of frictional resistance resulting from gravity loads. Do not weld on any joists or beams without written approval from Structural Engineer.

2. Attachments to concrete shall be made with anchors suitable for cyclical loads. Expansion or chemical anchors not rated for Seismic Design Category “D”, “E” & “F” shall not be used for seismic anchorage.

3. Powder driven fasteners shall not be used for tension load applications.

4. Friction clips shall not be used for anchorage.

5. Welded plate washers with standard holes shall be used at bolted connections with oversized holes on the base plate.

6. Unless the base sheet metal is reinforced with stiffeners and is designed to take the bending from the uplift forces, oversized plate washers shall be used at bolted connection through the base sheet metal

7. Isolators must be designed to withstand the seismic loads. Provide snubbers if the isolator cannot withstand the specified load and see below for the design force.

8. Components mounted on vibration isolator system shall have a bumper restraint or a snubber in each horizontal direction. The design force is to be taken as 2Fp unless the nominal clearance (air gap) between the frame and restraint is equal or less than 0.25”.

D. Refer to structural drawings for material specifications of structure. If no structural drawings are available, assume 3000 psi concrete and ASTM A36 steel for attachment design and confirm these values with Structural Engineer before proceeding with the design

1.05 SUBMITTALS

A. Calculations and Drawings.

1. Submit structural calculations and a separate drawing stamped and signed by the California Licensed Professional Engineer in good standing. The calculations and drawings shall include the following information as minimum:.

a. Empty weight

b. Operating weight

c. Center of mass in plan

d. Center of mass in elevation

e. Seismic vertical, lateral, and overturning loads

f. Load combinations in accordance with applicable codes

g. Anchor bolt brand, type, size, embedment depth in concrete, grip distance, and locations, including specific drilling and special inspection requirement

h. Installation sequence if it requires specific sequence to fasten the anchorage

2. Coordination drawings to demonstrate interface with adjacent systems including location and space required for seismic bracing and anchorage.

3. Furnish certification letter in the calculations stating the design of the equipment components and anchorage comply with the seismic design requirement per ASCE 7 13.2.2.a. and applicable local building codes.

B. Installing contractor to submit following reports to Structural Engineer and Building Official

1. Bolt inspection reports for field installed bolts for structural components including the location of the test, date of the test, bolt diameter, and recorded torque.

2. Reports covering other structural activities requiring inspection in accordance with the applicable local building codes.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Furnish all substructures and fasteners required to comply with the limitations given below. Use materials as specified in the various sections and as appropriate to the use.

B. All exterior materials: Hot dipped galvanized or stainless steel.

PART 3 - EXECUTION

3.01 GUIDELINES & LIMITATIONS

A. Coordinate with the Structural Engineer of Record for criteria.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Provide electrical materials, installation and testing for the interior improvements in Culinary Lab at Venture Academy.

1.02 DESCRIPTION

A. This section describes requirements for wire and cable.

1.03 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.04 REFERENCE STANDARDS

A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

1.05 SUBMITTALS

A. Provide submittals for items listed documenting compliance with specification requirements.

B. Product Data:

1. Electrical Materials: Manufacturer’s current published catalog sheets, and samples of product as required.

PART 2 - PRODUCTS

2.01 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of CEC.

B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.

C. Provide conductors and cables with lead content less than 300 parts per million.

D. Provide new conductors and cables manufactured not more than one year prior to installation.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

F. Comply with NEMA WC 70.

G. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

H. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

I. Conductors and Cables Installed Exposed in accessible above ceiling space (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

J. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

K. Minimum Conductor Size:

1. Branch Circuits: 12 AWG. Compensate size for voltage drop as required by governing codes.

2. Control Circuits: 14 AWG.

L. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

3. Color Code:

a. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

b. 480Y/277 V, 3 Phase, 4 Wire System:

1) Phase A: Brown.

2) Phase B: Orange.

3) Phase C: Yellow.

4) Neutral/Grounded: Gray.

c. Equipment Ground, All Systems: Green.

2.02 WIRE AND CABLE

A. Conductor: Insulated copper, individual conductors, 98 percent conductivity, stranded.

1. Power conductors, #12 AWG, minimum to 750 MCM, stranded.

2. Control conductors #14 AWG, minimum to #10 AWG, stranded.

B. Insulation:

1. Rated 600 volts as follows:

2. THHN/THWN-2

Item	Size	Insulation Type
Branch Circuits (except wet locations)	#12 to #4/0	THHN/THWN-2
Underground Branch Circuits	#12 to #4/0	XHHW-2 or THWN-2
Fixture Taps	#12	XHHW-2 or THHN/THWN-2
Feeders (except wet locations)	#12 to #4/0	THHN/THWN-2
	To #750 MCM	USE-2, or XHHW-2
Underground Feeders	#12 to #750 MCM	XHHW-2
Grounding	All	THHN/THWN-2
Control Interconnect	#14 to #10	THHN/THWN-2
Control Cabinets	#14	THHN/THWN-2

2.03 WIRE CONNECTIONS

A. Connect wire to binding post screw, stud, bolt or bus as follows:

1. #10 AWG and smaller conductors, compression type, nylon, self-insulated grip spade lugs, T & B "Sta-Kon", Buchanan "Termend", Panduit "Pan-Term", or equal.

2. #8 AWG to #750 MCM copper conductors, solderless lug type connectors, with hex-head or allen type compression set screws with configuration to suit application, T & B "Locktite", Burndy "QA", OZ Type "XL" or "XLH", or equal.

B. Conductor Taps: #8 through #4 copper conductors, split-bolt, Kearney.

C. Splice wire as follows:

1. #10 AWG and smaller conductors, twist-on solder-less, insulated spring connectors, 3M "Scotchloks", T & B "Piggys" or equal.

2. #8 AWG to #750 MCM copper conductors, two-way connectors, OZ type "XW", Burndy

or equal.

3. In underground pull-boxes, cast resin epoxy, Scotch.

D. Size, install and tighten wire terminal and splice connectors in accordance with manufacturer's recommendations.

2.04 TAPE

A. Wire Splices: Vinyl plastic electrical tape, 8.5-mil and 4.0-mil, Scotch 33.

B. Conduit Wrapping: 10-mil vinyl wrapping tape, Manville, Minnesota Mining and Manufacturing Company.

2.05 WIRING ACCESSORIES

A. Identify conductors with self-adhesive vinyl cloth markers, sized to fit the conductor insulation, with machine printed black marking, W.H. Brady, Thomas and Betts, or equal.

PART 3 EXECUTION

3.01 INSULATED CONDUCTORS AND CABLE

A. Exercise extreme care when pulling conductors and cable into conduits to avoid kinking, twisting, nicking or scratching of the insulation or the placement of extreme stress on the conductors or cable. When required, utilize UL approved pulling compounds to assist in pulling conductors.

B. Color code conductors by phase sequence A-B-C when looking into the front of the equipment from left-to-right, top-to-bottom or front-to-back. Provide conductors with the appropriate phase color or mark conductors with a minimum of 6 inches of phase tape on ends connected to terminals. Phase code conductors as listed:

Voltage	Phase A	Phase B	Phase C	Neutral	Ground
120/208	Black	Red	Blue	White	Green
277/480	Brown	Orange	Yellow	Gray	Green

C. Identify all conductors with their respective circuit numbers at all boxes and terminals.

D. For medium voltage cables, do not exceed manufacturer's recommendations for maximum allowable pulling force. Where wire and cable-pulling compound is used, use UL listed compounds only. In all cases, limit pulling tension to the following:

1. Applied to Conductors: 0.008 pounds per circular mil of conductor cross sectional area.

2. Applied to Nonmetallic Jacket: 1,000 pounds, but not exceeding pulling force specified above for conductor.

E. Connections:

1. Use twist-on solder-less connectors for splicing receptacle and lighting circuits #10 AWG wire size and smaller.

2. Splice #12 and #10 AWG stranded conductors with compression connectors.

3. Terminate conductors at motors with bolted connections, insulated with plastic tape.

4. For conductor taps #8 through #4 AWG, provide split bolt service connectors.

5. For splices larger than #10 AWG, insulate and smooth the splice with insulation putty, tape with one half-lapped layer of 8.5-mil vinyl plastic electrical tape and two half-lapped layers of 7.0-mil vinyl plastic electrical tape.

6. Use cast resin epoxy splices for splices in underground pullboxes.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2022.

B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

C. CEC - California Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.03 SUMMARY

A. This section describes requirements for grounding of the power and communications systems.

1.04 DESCRIPTION

A. Provide all equipment and materials for a complete grounding system.

1. Power System Grounding.

2. Communications System Grounding.

3. Electrical Equipment and Raceway Grounding and bonding.

1.05 RELATE REQUIREMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

1.06 REFERENCE STANDARDS

A. National Electrical Manufacturers Association (NEMA).

B. American National Standards Institute (ANSI).

1.07 SUBMITTALS

A. Submit a complete set of marked-up record drawings to indicate installed location of system grounding electrode connections, and routing of grounding electrode conductor.

B. Submit certified test results stating ground resistance from service neutral at service entrance and separately derived systems.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 05 19:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or

exothermic welded connections for accessible connections.

2.03 ACCEPTABLE MANUFACTURERS

A. Thomas and Betts Appleton, Raco, Oz Gedney, Blackburn, or approved equal.

2.04 MATERIALS

A. Ground Rods: Copper encased steel, 5/8 inch diameter, minimum length - 8 feet.

B. Ground Clamp: Water pipe connection, bronze two piece with serrated jaws, lug sized for grounding electrode conductor.

C. Connectors, Compression Type: Bronze or Copper, pretreated with conductive paste, sized for conductor to which applied.

D. Connectors, Exothermic Weld Type: Powder actuated weld. Bond made through exothermic reaction producing molten copper from premixed copper oxide and aluminum powder. Form bond in mold or crucible.

2.05 COMMUNICATIONS GROUNDING SYSTEM

A. All intermediate distribution frame (IDF) and main distribution frame (MDF) rooms shall have a Telecommunication Ground Bus Bar installed. Refer to drawings for specific size and assembly.

B. The telecommunication service entrance MDF, shall have a minimum of a #2 AWG conductor with green outer sheath installed to the Telecommunication Ground Bus Bar located in the room.

C. Except where specifically indicated otherwise, all facility MDFs shall have a minimum of a #4 AWG conductor with green outer sheath installed to the Telecommunication Ground Bus Bar located in each room.

D. Except where specifically indicated otherwise, all facility IDFs shall have a minimum of a #6 AWG conductor with green outer sheath installed to the Telecommunication Ground Bus Bar located in each room.

2.06 GENERAL BRANCH CIRCUITS GROUNDING

A. All grounding conductor wire shall be insulated green copper conductors.

B. All conduit bushings shall be grounding type.

C. All grounding connections shall be made with solderless lugs and nonferrous hardware.

2.07 CONDUIT BANK GROUNDING

A. Provide a size 4/0 AWG bare copper grounding conductor for each of the campus utility distribution conduit banks shown on drawings. Install this grounding conductor within the ground floor slab and parallel to the respective conduit bank.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with CEC or provide ground plates.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.

2. Indoor Installations: Unless otherwise indicated, install with 4 inches (100 mm) of top of rod exposed.

D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches (750 mm).

E. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

F. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Perform inspection in accordance with Section 01 4000.

B. Inspect and test in accordance with NETA STD ATS except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 EXISTING GROUND SYSTEM

A. Test and inspect existing building ground. Replace damaged and corroded parts and pieces. Also replace parts wich do not confirm to this specifications.

B. Provide additional ground rod(s) it existing ground test exceed 5 ohms.

3.05 GENERAL BRANCH CIRCUITS AND FEEDERS

A. All conduit systems, equipment housings, material housings, junction boxes, cabinets, motors, ducts, wireways, cable trays, light fixtures, portable equipment and all other conductive surfaces shall be solidly grounded in accordance with the California Electrical Code to form a continuous, permanent and effective grounding system.

B. Install a separate green grounding conductor in all conduits, including feeder, branch circuit, and flexible; both metallic and non-metallic. The conduit systems shall not be used as the system equipment grounds. Size all grounding conductors per CEC Article 250 unless a larger ground is indicated on the drawings.

C. All panelboards, junction boxes, pullboxes, wireways and equipment enclosures shall be bonded to the conduit systems.

D. All building expansion joints shall be bonded.

E. Isolated ground receptacles shall have both an isolated ground conductor and a separate equipment grounding conductor.

3.06 MOTOR CIRCUITS

A. All motor circuits shall have a ground wire pulled with the phase conductors. The ground wire shall be extended from the panel ground bus and shall be bonded at all junction boxes, pullboxes, disconnect switches, controllers, motor connection boxes, and motor frames. Each motor with a Variable Frequency Drive (VFD) controller shall have a dedicated grounding conductor. Ground these motors back through the VFD controller as recommended by the drive manufacturer to eliminate radio frequency interference. Also, the wiring between the VFD controller and the motor shall be in a dedicated conduit.

3.07 SEPARATELY DERIVED SOURCES

A. All secondary neutrals for the 120/208 volt wye services of dry type transformers shall be grounded to building steel. Connection shall be made with cable sized according to Table 250-94(a) of the California Electrical Code. Extend separately derived insulated ground to the transformer in rigid steel conduit.

3.08 EQUIPMENT ROOM GROUND TERMINAL BAR

A. Mount bar by anchors and bolts using 1-1/2 inch long segments of 1/2 inch rigid conduit as spacer between bar and wall. Use a minimum of two supports, 18 inches on center. Connect all grounding electrode system conductors, system enclosure ground bus, and other indicated electrode systems to the terminal bar. Each telecom/his room shall have a ground bar with a minimum of six lugs or screws. Interconnect telecom/his ground bars to building steel with No. 6 AWG insulated copper conductor.

3.09 FLEXIBLE RACEWAY GROUNDING

A. Install a ground conductor inside all flexible raceways (e.g. flexible steel, liquid tight). Bond the conductor to the enclosure or ground bus in the nearest box or access on either side of the flexible section. Size conductor as specified, indicated or required by code, whichever is larger.

3.10 GENERAL GROUNDING REQUIREMENTS

A. All ground connectors shall be bronze of the clamp type. All clamp accessories such as bolts, nuts, and washers shall also bronze to assure a permanent corrosion-resistant assembly. Connector shall be as manufactured by Burndy Engineering Company, Ilsco Corporation, or equal. Make connections easily accessible for inspection, underground or concealed in floors or walls.

B. All ground cable splices, joints, and connections to ground rods shall be made with an exothermic welding process which shall provide a weld with current-carrying capacity not less than that of the conductors welded. Soldered connections shall not be used.

C. All ground wire shall be insulated, unless otherwise indicated on the Drawings, extra flexible stranded copper cables. Grounding cables installed in earth shall be laid slack.

D. Neutrals throughout the system shall be solidly grounded.

E. Lighting and power panelboards shall be grounded by connecting a grounding conductor to the grounding stud and to the incoming and outgoing feeder conduits grounding bushings. Each grounding-type bushing shall have the maximum ground wire accommodation available in standard manufacturer for the particular conduit size. Connection to the bushing shall be with wire of this maximum size.

F. The equipment for the fire protection alarm system shall have its grounding terminal connected to the ground lug on the panelboard serving the system by means of a #6 green coded insulated conductor, run in 3/4 inch steel conduit, utilizing a ground clamp.

END OF SECTION

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2011.

D. MFMA-4 - Metal Framing Standards Publication; Metal Framing Manufacturers Association; 2004.

E. California Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 SUMMARY

A. Provide electrical materials, installation and testing for the remodeling in Culinary Lab at Ventura Academy.

1.03 DESCRIPTION

A. This section describes requirements for supporting devices.

1.04 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.05 SUBMITTALS

A. Provide submittals for items listed documenting compliance with specification requirements.

B. Product Data:

1. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 - PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.

2. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated, where applicable.

3. Do not use products for applications other than as permitted by CEC and product listing.

4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

   a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

   b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: Two-hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Comply with MFMA-4.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

2.02 SUPPORTING DEVICES

A. Conduit Supports:

1. Straps, one hole galvanized or cadmium plated iron, T & B, Efcor, Appleton, or equal.

2. Clamp backs, nest backs, galvanized iron or cadmium-plated steel, Efcor, OZ, Steel City, or equal. Plumbers perforated strap, not acceptable.

3. Hanger Rod, 3/8-inch, minimum galvanized all-thread rod.

B. Conduit Racks:

1. Framing Channel, steel, hot-dip galvanized or electroplated, Kindorf, Unistrut, Superstrut, or equal.

2. Channels attached to building or structure surfaces, 14 gauge, 1-5/8 inches wide by 13/16 inches deep. Other channels, 12 gauge minimum, 1-5/8 inches wide by 1-5/8 inches deep, minimum.

3. Construct racks to limit deflection to 1/360 of span.

4. Load on trapeze, rod type hangers, concrete inserts and beam clamps, not to exceed 700 pounds per hanger. Provide rigid frames if load exceeds 700 pounds per hanger.

C. Outlet Boxes

1. Attach device boxes with adjustable bar type hangers screw fastened to two stud/ceiling joists on both sides of box.

D. Anchor Methods:

1. Hollow masonry anchors.

2. Solid masonry, malleable iron expansion anchors or preset inserts.

3. Metal surfaces, machine screws, bolts or welded studs.

4. Wood surfaces, wood screws.

5. Concrete surfaces or self-drilling anchors.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. This section describes requirements for conduit raceways.

1.02 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

B. Section 26 05 26: Grounding and Bonding.

C. Section 26 05 02: Supporting from Building Structure

D. Section 26 05 29: Hangers and Supports for Electrical Systems

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI):

1. C80.1Specification for Rigid Steel Conduit, Zinc Coated
2. C80.3Specification for Electrical Metallic Tubing, Zinc Coated

B. National Electrical Manufacturers Association (NEMA):

1. TC 2 Electrical Plastic Tubing (EPT), Conduit (EPC-40 and EPC-80) and Fittings

C. Underwriters Laboratories, Inc. (UL):

1. 1242 Intermediate Metal Conduit

D. Federal Specifications:

1. WW-C-581E Conduit, Metal Electrical Conduit. Steel, Zinc Coated

1.04 SUBMITTALS

A. Procedure: Submit under provisions of Section 01 3000 - Administrative Requirements and Section 01 6000 - Product Requirements.

B. Provide submittals for items listed documenting compliance with specification requirements.

1. Product Data:
2. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 - PRODUCTS

2.01 RACEWAYS

A. Rigid Steel Conduit:

1. ANSI C80.1, minimum size 3/4 inch.

2. Threaded fittings, galvanized.

3. Locknuts, 3/4 inch to 1-1/2 inch, heavy nut steel.

4. Locknuts, 1-1/2 inch and larger, malleable iron.

5. Insulated bushings, malleable iron, plastic or nylon insert, OZ "IBC" series, Efcor "56" series, Appleton "GIB" series or equal.

6. Three-piece conduit couplings, malleable iron, T & B "Erickson", Appleton "EC" series, OZ "4" series, or equal.

B. Intermediate Metal Conduit (IMC):

1. Conform to UL 1242 and Federal Specification WW-C-581E, minimum size 3/4 inch.

2. Fittings: As specified for rigid steel conduit.

C. Electrical Metallic Tubing (EMT):

1. Galvanized rolled steel ANSI C80.3.

2. Fittings to 2 inch, rain-tight compression gland, steel, plated with zinc or cadmium, for wet locations and setscrew steel for dry locations.

3. Couplings, to 2 inch:

a. Compression type: OZ "6050S" series, T & B "5120" series, Efcor "760" series, or equal.

b. Setscrew type: OZ "5050S" series, Steel City "TK121" series, Efcor "730" series, or equal.

4. Connectors, insulated throat:

a. Compression type: OZ "7050 ST" series, T & B "5123" series, Efcor "750B" Series, or equal.

b. Setscrew type: OZ "4050 ST" series, Steel City "TC721" series, Efcor "720B" Series, or equal.

5. Couplings, 2-1/2 inch to 4 inch, set-screw, four screw, steel plated with zinc or cadmium, OZ "5250S" series, T & B "5042" series, Efcor "736" series, or equal.

6. Connectors, 2-1/2 inch to 4 inch, insulated throat, set-screw, two screw, plated with

zinc or cadmium, Appleton "TW250 SI" series, Efcor "726B" series, or equal.

7. Adapter, EMT to rigid steel, zinc or cadmium plated malleable iron, OZ, T & B, Efcor, or equal.

8. Maximum size, 2 inch, except for Telephone, 4 inch.

D. Flexible Metal Conduit:

1. Fabricate from galvanized steel strip, minimum size 1/2 inch.

2. Connectors, T & B "Tite Bite", with insulated throat, or equal.

3. Length, no greater than 6 feet. Allow slack for movement of connected equipment.

E. Liquid-tight Flexible Metal Conduit:

1. Fabricate from galvanized steel strip, jacketed with PVC, minimum size 1/2 inch.

2. Straight connectors, cadmium plated steel or malleable iron, insulated throat and neoprene sealing ring, OZ "4Q-IT" series, T & B "5330" series, Efcor "11-B" series, or equal.

3. Angle connectors, cadmium plated steel or malleable iron, insulated throat and neoprene sealing ring, OZ, T & B, Efcor, or equal, comparable to straight connectors.

4. Hardware, cadmium plated steel.

5. Length, no greater than 6 feet. Allow slack for movement of connected equipment.

F. PVC Conduit:

1. Schedule 40, NEMA TC2, Type II underground installation.

a. Minimum size, 1 inch.

b. Elbows, Schedule 40, encased in concrete for sizes 2-inch and larger.

c. Extensions above grade, rigid steel (exposed), EMT (concealed indoors).

d. Adapters, PVC to rigid steel, threaded plastic.

PART 3 - EXECUTION

3.01 INSTALLATION

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

B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

C. Conduit Support:

1. Secure and support conduits in accordance with CEC and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Connections and Terminations:

1. Use suitable adapters where required to transition from one type of conduit to another.

2. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.

3. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

E. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.

6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.

8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

F. Conduit Movement Provisions: Where conduits are subject to thermal expansion, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. Where conduits are subject to seismic movement, provide 6 feet max. flex conduit with grounding fittings on each end bonded with #6 green wire. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection (seismic expansion joint).

G. Condensation Prevention: Where conduits cross barriers between areas of potential

substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.

2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with CEC.

3.02 ABOVE GROUND RACEWAY SYSTEMS

A. Install all wiring in raceways. Install raceway systems, including conduits, hangers and support channels parallel or perpendicular to structural members in accordance with Section 26 05 29 Hangers and Supports for Electrical Systems and 26 05 02 Supporting from Building Structures. Coordinate location of raceway systems with other Divisions prior to commencing installation.

B. Rigid Steel Conduit: Suitable for use in all locations.

C. Intermediate Metal Conduit: As specified for rigid steel.

D. Electrical Metallic Tubing: Suitable for use in concealed dry locations, not in concrete, masonry, or underground, and suitable exposed, minimum 8 feet above finished floor.

E. Flexible Metal Conduit: Suitable for connection of recessed lighting fixtures, motors or other devices requiring flexible connections in dry locations.

F. Liquid-Tight Flexible Metal Conduit: Suitable for connection of motors and equipment in damp or wet locations.

G. Conduit Supports:

1. Support all conduits at intervals per Chapter 3 of the CEC for the selected raceway type (not to exceed 10-feet).

2. Support individual conduits with conduit hangers or clamp back and nest back, if required for entrance into the equipment.

3. Support multiple conduits, 2 or more in parallel, with framing channel and pipe clamps.

4. Spring steel fasteners may be used to fasten electrical metallic tubing to individual hanger wires, minimum #12 AWG, specifically used for hanging conduit, nothing else.

H. Conduit Bends:

1. Provide no more than (3) 90-degree conduit bends or the equivalent number of smaller

radius bends in any conduit run between boxes or equipment.

2. Length of run: 400-feet maximum less 100-feet for each equivalent 90 degree bend.

3. Fabricate bends and offsets with a hickey or conduit bender designed specifically for use with the type of conduit to be bent, or use factory made bend.

4. Radius of Bends: Conduits 2" inside diameter or less the inside bend radius shall be at least 6 times the diameter. Conduits greater than 2" diameter the inside bend radius shall be at least 10 times the conduit diameter.

I. Cap conduits during construction to prevent entrance of foreign material.

J. Provide conduit-sealing bushings at conduit penetrations through exterior walls to seal against fluid and gas pressure around the conduit.

K. Fit all conduits that enter the enclosure of a switchboard, distribution panel, or motor control center with an insulated grounding bushing.

L. Install pull ropes in all empty conduits, #12 AWG in conduits 1 inch and smaller and 3/16 inch polypropylene rope in conduits 1-1/4 inch and larger.

3.03 UNDERGROUND RACEWAY SYSTEMS

A. Install all wiring in raceways. Coordinate location of raceway systems with other Divisions prior to commencing installation. Provide excavation, clearances from other utilities, encasing, trenching, boring, backfill, compaction, patching, per Division 31 Site Preparation. Provide conduits per drawings.

B. EXCAVATING AND BACKFILLING

1. Excavate and backfill as required for installation of electrical work. Maintain all warning signs, barricades, flares and lanterns as required by the Safety Orders and local ordinances.

2. Excavation: Dig trenches straight and true to line and grade, with bottom clear of any rock points. Support conduit for entire length on undisturbed original earth. Backfill: All backfill material shall be local material free of rubble, rubbish or vegetation. Trenches shall be backfilled and compacted to 90% of maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.

3. Minimum Coverage (depth) - Per CEC Table 300.5

4. Area of Influence- Do not install conduits parallel to building footings in the area of influence. See structural drawings and specifications for the area of influence and the methods that conduits can cross a footing.

5. Drain Slope- Underground conduit shall be installed such that a .125" per foot min. slope exists at all points of the run to allow drainange and prevent the accumulation of water. Provide a drain slope of greater than .125" per foot when extending conduit away from a building.

6. Provide underground warning tape along entire conduit length.

C. CUTTING AND PATCHING

1. Provide necessary cutting and patching required to accomplish the work of Division underground 26. Restore all surfaces, roadways, sod, walks, curbs, walls, existing underground installation, etc., cut by installations to original condition in an acceptable manner.

D. Conduit Bends:

1. Provide no more than (3) 90-degree conduit bends or the equivalent number of smaller radius bends in any conduit run between boxes or equipment.

2. Length of run: 400-feet maximum less 100-feet for each equivalent 90 degree bend.

3. Fabricate bends and offsets with a hickey or conduit bender designed specifically for use with the type of conduit to be bent, or use factory made bend.

4. Radius of Bends: Conduits 2" inside diameter or less the inside bend radius shall be at least 6 times the diameter. Conduits greater than 2" diameter the inside bend radius shall be at least 10 times the conduit diameter.

E. Rigid Steel Conduit: Suitable for use in all locations. Where used underground, wrap with no less than 2 layers of half-lapped 10 mil vinyl pipe wrapping tape, Manville, Minnesota Mining

F. PVC Conduit: Suitable for use underground, with a minimum of 18 inches of cover. Also suitable for use in concrete slabs (for healthcare facilities, use Schedule 80 PVC). Fabricate field bends with an approved thermal bender and jig. Maintain separation between conduits using plastic spacers specifically designed for the purpose.

G. Provide conduit-sealing bushings at conduit penetrations through exterior walls to seal against fluid and gas pressure around the conduit. Ducts shall be sealed to resist liguid and gas infiltration at all maintenance holes and building entrances.

H. Install pull ropes in all empty conduits, #12 AWG in conduits 1 inch and smaller and 3/16 inch polypropylene rope in conduits 1-1/4 inch and larger.

I. Fit PVC conduits that enter pullboxes and junction boxes with belled ends.

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 26 27 26 - Wiring Devices:

1. Wall plates.

1.02 REFERENCE STANDARDS

A. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).

B. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008 (Revised 2010) (ANSI/NEMA OS 1).

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

D. CEC - California Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

G. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

H. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.03 SUMMARY

A. Provide electrical materials, installation and testing for the interior improvements in Culinary Lab at Ventura Academy.

B.

1.04 DESCRIPTION

A. This section describes requirements for outlet boxes.

1.05 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.06 REFERENCE STANDARDS

A. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

B. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.

C. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2008.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

1.07 SUBMITTALS

A. Procedure: Submit under provisions of Section 01 3000 - Administrative Requirements and Section 01 6000 - Product Requirements.

B. Provide submittals for items listed documenting compliance with specification requirements.

C. Product Data:

1. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 - PRODUCTS

2.01 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by CEC and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.

4. Where box size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use suitable concrete type boxes where flush-mounted in concrete.

4. Use suitable masonry type boxes where flush-mounted in masonry walls.

5. Use raised covers suitable for the type of wall construction and device configuration

where required.

6. Use shallow boxes where required by the type of wall construction.

7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.

12. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA 250 Environment Type, Unless Otherwise Indicated:

3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.02 OUTLET BOXES

A. Construction: Deep drawn or fabricated interlocked flat pieces with welded tabs, electro-galvanized sheet steel with electro-galvanized hardware. Do not use sectional boxes.

B. Size: To accommodate the required number and sizes of conduits, wires, splices and devices but not smaller than the size indicated or specified.

C. Plaster Ring: Provide flush with wall or ceiling finish, except where otherwise indicated or specified.

D. Device Boxes: For single switches and receptacles, provide boxes not less than 4 inches square by 1-1/2 inches deep. For 2 devices, provide boxes not less than 4-11/16 inches square by 1-1/2 inches deep.

E. Telecommunications Boxes: No less than 4-11/16 inches square by 2 inches deep.

F. Special Mounting: In cabinets, tile, concrete block, brick, stone, wood or similar material, provide rectangular boxes with square corners and straight sides. For single devices, provide boxes 4 inches high by 2-1/2 inches wide by 3-3/8 inches deep. For 2 or more devices, provide multi-gang, non-sectional box with tile or masonry ring.

G. Lighting Fixtures: 4-inch octagon by 2-1/8 inch deep, minimum. Fit boxes for surface or pendant mounted fixtures with 3/8-inch malleable iron fixture stud.

H. Attach device boxes with adjustable bar type hangers screw fastened to two stud/ceiling joists on both sides of box.

2.03 PULL AND JUNCTION BOXES

A. General: For all pull and junction boxes over 300 cubic inches, provide code gauge, sheet steel boxes which meet NEMA 1 standards for panelboard and terminal cabinet box construction, with screw type covers.

B. Ground Lug: Weld, before finish is applied, a grounding pad drilled for two bolted grounding lugs or two ground studs on the box interior.

C. Finish: Apply rust inhibiting prime coat and 2 coats of baked enamel, standard factory gray.

D. Hardware: Cadmium plated steel screws.

PART 3 - EXECUTION

3.01 BOXES AND CABINETS

A. Place outlet boxes in a location as close to that shown on the plans as possible. Coordinate location of boxes with other Divisions.

B. Install wall mounted outlet boxes so that the distance from the centerline of the box to finished floor is as listed or indicated:

1. Receptacles, + 1 foot-6 inches

2. Telephone, + 1 foot-6 inches

3. Data, + 1 foot-6 inches

4. Switches, + 4 feet-0 inches

C. Install junction boxes with covers in concealed areas accessible after installation. Do not install junction boxes flush with finish walls or ceilings unless specifically approved by the Engineer.

D. Attach surface boxes with:

1. Steel or malleable iron expansion anchors in concrete or solid masonry.

2. Wood screws in wood.

3. Toggle bolts in hollow walls or masonry.

4. Machine screws, bolts or welded studs in steel.

E. Attach flush boxes with adjustable bar type hangers screw fastened to studs on both sides of the box.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.02 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2007.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2007.

C. NFPA 70E - Standard for Electrical Safety in the Workplace; National Fire Protection Association; 2018.

D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.03 DESCRIPTION

A. Extent of electrical identification work is as outlined by this specification.

B. Types of electrical identification work specified in this section include the following:

1. Buried cable warnings.

2. Electrical power, control and communication conductors.

3. Operational instructions and warnings.

4. Danger signs.

5. Equipment/system identification signs.

1.04 RELATED REQUIREMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

1.05 QUALITY ASSURANCE

A. California Electrical Code (CEC) Compliance: Comply with CEC as applicable to installation of identifying labels and markers for wiring and equipment.

B. Underwriters Laboratories, Inc. (UL) Compliance: Comply with applicable requirements of UL Standard 969, "Marking and Labeling Systems", pertaining to electrical identification systems.

C. American National Standards Institute (ANSI) Compliance: Comply with applicable requirements of ANSI Standard A13.1, "Scheme for the Identification of Piping Systems".

D. National Electrical Manufacturer's Association (NEMA) Compliance: Comply with applicable requirements of NEMA Standard No's WC-1 and WC-2 pertaining to identification of power and control conductors.

1.06 SUBMITTALS

A. Product Data: Submit manufacturer's data on electrical identification materials and products.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

PART 2 - PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Switchgear:

1) Use identification nameplate to identify load(s) served for each branch device.

b. Panelboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

c. Enclosed switches, circuit breakers, and motor controllers:

1) Identify voltage and phase.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

d. Enclosed Contactors:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).

4) Identify coil voltage.

5) Identify load(s) and associated circuits controlled. Include location.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

b. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.

3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

5. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.

a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches (76 mm) wide, painted in accordance with Section 09 9123 and 09 9113.

6. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.

a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).

b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not

operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

7. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.

2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

3. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

C. Identification for Raceways:

1. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet (6.1 m).

a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.

1) Color Code:

(a) Fire Alarm System: Red.

2) Field-Painting: Comply with Section 09 9123 and 09 9113.

3) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.

2. Use voltage markers or color coded boxes to identify systems other than normal power system.

a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.

1) Fire Alarm System: Red.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:

   a. Indoor Clean, Dry Locations: Use plastic nameplates.

   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.

3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.

4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

   a. Use only for indoor locations.

2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).

2. Legend:

   a. System designation where applicable:

      1) Fire Alarm System: Identify with text "FIRE ALARM".

   b. Equipment designation or other approved description.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

   a. System Designation: 1 inch (25 mm).

b. Equipment Designation: 1/2 inch (13 mm).

5. Color:

a. Normal Power System: White text on black background.

b. Fire Alarm System: White text on red background.

D. Format for Control Device Identification:

1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).

2. Legend: Load controlled or other designation indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch (5 mm).

5. Color: Black text on clear background.

E. Format for Fire Alarm Device Identification:

1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).

2. Legend: Designation indicated and device zone or address.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch (5 mm).

5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch (3 mm).

F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

C. Minimum Size:

1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).

3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

D. Legend:

1. Markers for Voltage Identification: Highest voltage present.

2. Markers for System Identification:

E. Color: Black text on orange background unless otherwise indicated.

2.05 NOT USED

2.06 FLOOR MARKING TAPE

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches (76 mm) wide, with alternating black and white stripes.

2.07 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:

2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

2.08 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide electrical identification products of one of the following (for each type marker):

1. Almetek,
2. Brady, W.H. Company,
3. Calipico Inc.,
4. Cole-Flex Corporation,
5. Direct Safety Company,
6. George-Ingraham Corporation,
7. Griffolyn Company,
8. Ideal Industries, Inc.,
9. LEM Products, Inc.,
10. Markal Company,
11. National Band and Tag Company,
12. Panduit Corporation,
13. Seton Name Plate Company,
14. Tesa Corporation,
15. Or equal.

2.09 ELECTRICAL IDENTIFICATION MATERIALS

A. Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, provide single selection for each application.

B. Color-Coded Plastic Tape:

1. Provide manufacturer's standard self-adhesive vinyl tape not less than 3 mils thick by 1-1/2 inches wide.

a. Colors: Unless otherwise indicated or required by governing regulations, provide orange tape.

C. Underground-Type Plastic Line Marker:

1. Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6 inches wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried cable.

D. Cable/Conductor Identification Bands:

1. Provide manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type, either pre-numbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap; numbered to show circuit identification.

E. Plasticized Tags:

1. Manufacturer's standard pre-printed or partially pre-printed accident-prevention and operational tags, of plasticized card stock with matte finish suitable for writing, approximately 3-1/4 x 5-5/8 inches, with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording, e.g., DANGER, CAUTION, DO NOT OPERATE.

F. Self-Adhesive Plastic Signs:

1. Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings; of sizes suitable for application areas and adequate for visibility, with proper wording for each application, e.g., 208V, EXHAUST FAN, RECTIFIER.

G. Colors: Unless otherwise indicated, or required by governing regulations, provide white signs with black lettering.

H. Baked Enamel Danger Signs:

1. General: Provide manufacturer's standard DANGER signs of baked enamel finish on 20-gauge steel; of standard red, black and white graphics; 14 x 10 inches size except where 10 x 7 inches is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording, e.g., HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH.

I. Engraved Plastic-Laminate Signs:

1. Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black face and white core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

2. Thickness: 1/8 inch, except as otherwise indicated.

3. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

2.10 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION

A. General Installation Requirements:

1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of CEC and OSHA.

2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.

3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

B. Conduit Identification:

1. Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by color-coded method, apply color-coded identification on electrical conduit in manner similar to piping identification. Except as otherwise indicated use white as coded color for conduit.

C. Box Identification:

1. After completion, using an indelible wide tip marker, indicate on the cover of each junction and pull box the designation of the circuits contained therein, i.e., A-1, 3, 5. Use a black marker for normal power circuits a red marker for critical circuits, an orange marker for life safety circuits, and a green marker for equipment circuits.

2. All junction and pull boxes for wiring systems above 600V shall be identified with high voltage warning labels installed every 20 linear feet in accordance with OSHA standards. All boxes shall also be painted red, see Section 09900 of the specifications.

3. All junction and pull boxes for the fire alarm system shall be painted red. All raceway for the fire alarm system shall be labeled "Fire Alarm" in red letters on intervals not to exceed ten feet.

D. Underground Cable Identification:

1. During back-filling/top-soiling of each exterior underground electrical, signal or communication conduits, install continuous underground-type plastic line marker, located directly over buried line at 6 to 8 inches below finished grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16 inches, install a single line marker.

2. Install line marker for every buried conduit.

E. Cable/Conductor Identification:

1. Apply cable/conductor identification, including voltage, phase and feeder number, on each cable/conductor in each box/enclosure/cabinet where wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project's electrical work. Refer to Section 16100 - Basic Materials and Methods of these specifications for color coding requirements.

F. Operational Identification and Warnings:

1. Wherever directed by the Owner's Representative, to ensure safe and efficient operation and maintenance of electrical systems, including prevention of misuse of electrical facilities equipment by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposed. Request a meeting with the Owner's Representative prior to substantial completion to coordinate warning requirements.

G. Danger Signs:

1. In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations identified by the Owner's Representative as constituting similar dangers for persons in or about project. Request a meeting with the Owner's Representative prior to substantial completion to coordinate danger sign requirements.

   a. High Voltage: Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power of voltages higher than 110-120 volts.

   b. Critical Switches/Controls: Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.

H. Equipment/System Identification:

1. Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including

communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2 inch high lettering, on 1-1/2 inch high sign (2 inch high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:

a. Electrical cabinets and enclosures.

b. Access panel/doors to electrical facilities.

c. Transformers.

d. Fire alarm control panel, battery cabinets, voice alarm system cabinets, and transponders.

2. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate. Identification of flush mounted cabinets and panelboards shall be on the inside of the device.

3. Panelboards, individually mounted circuit breakers, and each breaker in the switchboards, secondary unit substations, and distribution panels shall be identified with an engraved plastic laminate sign. Plastic nameplates shall be multicolored laminated plastic with faceplate and core as scheduled. Lettering shall be engraved minimum 1/4 inch high letters.

a. 208/120 volt normal power equipment shall be identified with green faceplate with white core.

b. 208/120 volt equipment branch power equipment shall be identified with blue faceplate with white core.

c. Equipment identification is to indicate the following:

1) Equipment ID abbreviation.

2) Voltage, phase, wires and frequency.

3) Emergency or other system.

4) Power source origination.

5) Example:

(a) Panel GLSH1

(b) 208/120V, 3 phase, 4 wire

(c) Fed by GLSD1

d. Submit complete schedule with the shop drawings listing all nameplates and information contained thereon.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work required under this section of the specifications consists of the electrical acceptance testing and inspections for all electrical systems and equipment installed or affected by this project. The Contractor shall prepare and submit to the Engineer for review and approval acceptance test procedures and inspection forms in accordance with this specification. A complete functional acceptance test shall be performed on all electrical systems and equipment to prove they perform as intended under all modes of operation. Testing specified in other sections is in addition to testing specified herein. Also the testing will demonstrate the electrical system and equipment operation to the Owner. All labor, materials, rentals, permits and testing equipment or other which is required shall be provided by the Contractor.

1.02 GENERAL

A. The Contractor shall prepare and submit to the Engineer for review and approval acceptance test procedures and inspection forms in accordance with this specification. Testing shall be performed by the Contractor, the manufacturer's representative, and/or a International Electrical Testing Association (NETA) testing company depending on the type of equipment or system being tested as follows:

1. CONTRACTOR

    a. Cables, Low-Voltage, 600-Volt Maximum

    b. Switches and Circuit Breakers, Air, Low-Voltage

    c. Fiber Optic Cable

    d. Lighting System

    e. Clock System

    f. Telecommunications System

    g. Grounding System

    h. Low Voltage (600 VAC maximum) Power Distribution System

    i. Instrument and Control System

2. MANUFACTURER'S REPRESENTATIVE

    a. Fire Alarm System

3. NETA

    a. Switchgear and Switchboard Assemblies (480VAC, 1000A or greater)

    b. Ground Fault Protection System

    c. Circuit Breakers

    d. Metering Devices

B. The Contractor shall prepare the test procedures and inspection forms and perform the specified testing and inspections, for the assigned equipment and systems above, as applicable to the equipment and systems installed or affected by the project. If the Contractor (including sub contractors) does not have the ability or qualifications to conduct the required tests then the Contractor will sub contract with a testing organization who does.

C. The Contractor shall engage in and pay for the services of the Manufacturer's Representative approved testing organizations to provide testing and inspection of the applicable electrical equipment and systems as listed above and specified in this section. The testing organizations may be an independent division or authorized representative of the manufacturer of the assembled products being tested. The Manufacturer's Representative will conduct startup testing and will be part of integrated system testing. If an outside testing organization is approved, a representative of the manufacturer shall be under contract by the testing company. The representative shall be present during all testing to insure that the testing is performed properly and that any deficiencies discovered are promptly corrected. The Manufacturer's Representative will assist in the preparation and performance of other test procedures and inspections such as integrated system testing (e.g., loss of power/ generator/ats/ups/annunciator integrated system test)

D. The Contractor shall engage in and pay for the services of a NETA Accredited Testing Company to provide testing and inspection applicable electrical equipment and systems as listed above and specified in this section. Also, the NETA testing contractor will conduct integrated system testing or other testing as required. NETA testing will be conducted per the current Standard for NETA Acceptance Testing Specification including test report preparation and submittals. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make a judgment on the serviceability of the specific equipment. Technicians shall be certified in accordance with the current ANSI/NETA ETT, Standard for Certification of Electrical Testing Personnel. Each on-site crew leader shall hold a current certification, Level III or higher, in electrical testing. The testing organization shall provide the following: A written record of all tests and a final report; All field technical services, tooling, equipment, instrumentation, and technical supervision to perform such tests and inspections; Specific power requirements for test equipment; Notification to the owner's representative prior to commencement of any testing; A written record of

all tests and a final report and a timely notification of any system, material, or workmanship that is found deficient based on the results of the acceptance tests. The NETA contractor will assist in the preparation and performance of other test procedures and inspections such as an acceptance testing of the integrated system (e.g., loss of power/generator/ATS/UPS/annunciator integrated system test)

E. Submit all test reports to the Owners Representative at least two weeks prior to the project final inspection for review.

1.03 SAFETY AND PRECAUTIONS

A. All parties involved must be cognizant of industry-standard safety procedures. This document does not contain any procedures including specific safety procedures. It is recognized that an overwhelming majority of the tests and inspections recommended in these specifications are potentially hazardous. Individuals performing these tests shall be qualified and capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved.

B. Safety practices shall include, but are not limited to, the following requirements:

1. All applicable provisions of the Occupational Safety and Health Act, particularly OSHA 29 CFR Part 1910 and 29 CFR Part 1926 including OSHA lockout procedures.

2. ANSI/NFPA 70E, Standard for Electrical Safety in the Workplace.

3. Applicable state and local safety operating procedures.

4. Owner's safety practices.

5. A safety lead person shall be identified prior to the commencement of work.

6. A safety briefing shall be conducted prior to the commencement of work.

7. All tests shall be performed with the apparatus de-energized and grounded except where otherwise specifically required to be ungrounded or energized for certain tests.

8. The testing organization shall have a designated safety representative on the project to supervise operations with respect to safety.

1.04 QUALITY ASSURANCE

A. The testing and inspection shall comply with all applicable sections of the following codes and standards:

1. American National Standards Institute - ANSI

2. American Society for Testing and Materials - ASTM

3. Association of Edison Illuminating Companies - AEIC

4. Institute of Electrical and Electronics Engineers - IEEE

5. Insulated Power Cable Engineers Association - IPCEA

6. International Electrical Testing Association - NETA Acceptance Testing Specifications

7. California Electrical Code - CEC

8. National Electrical Manufacturers Association - NEMA

9. National Fire Protection Association - NFPA

10. State and Local Codes and Ordinances

B. The inspection and testing shall comply with the project plans and specifications as well as with the manufacturer's drawings, instruction manuals, and other applicable data for the apparatus tested.

C. Review and Approval- All test reports, deficiencies and corrections, test results, shall be reviewed by the Engineer of Record.

1.05 DIVISION OF RESPONSIBILITY

A. Perform routine insulation-resistance, continuity, and rotation tests for all distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein.

B. Supply a suitable and stable source of electrical power to each test site. The testing firm shall specify the specific power requirements.

C. Notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.

D. Supply a complete set of electrical plans, specifications, and any pertinent change orders to the testing firm prior to commencement of testing.

E. Notify the Engineer and Owner's Representative prior to commencement of any testing.

F. Any system, material or installation which is found defective on the basis of acceptance tests shall be reported to the Owner's Representative.

G. The testing firm shall maintain a written record of all tests and, upon completion of project,

shall assemble and certify a final test report for review and approval by the Engineer of Record.

1.06 ACCEPTANCE TEST PROCEDURES

A. The Acceptance Test Procedure shall include the following sections:

1. Purpose of Test
2. References
3. Test Participants- Name/Company/Telephone Number and hand signed Initials
4. Equipment and Systems tested.
5. Description of test.
6. Acceptance Criteria
7. Initial Conditions/Prerequisites
8. Test Equipment and Calibration date
9. Test Procedure and Date of Test
10. Test Results-verification of passing acceptance criteria.
11. Deficiencies, Corrections and Re-test
12. Verification Systems and Equipment are returned to Operational Status
13. Conclusions and recommendations.
14. Appendix, including test forms.

B. Each piece of equipment shall be recorded in the test procedure listing the condition of the equipment as found and as left. Included shall be recommendations for any necessary repair or replacement parts. The test procedures shall indicate the name of the engineer who tested the equipment and the date of the test completion.

C. Inspection Reports may be in situ test reports prepared by manufacturer representatives such as startup test reports by, for example the UPS or Generator manufacturers' startup representative. The inspection reports shall indicate the name of the person who inspected the equipment and the date of completion.

D. The Acceptance Test Procedure shall be a step-by-step procedure to be followed verbatin

and initialed after each step's performance. The test shall include the listed sections above. The procedure shall be prepared on 8.5" x 11" paper. See Attachment 1 as an example.

1.07 TESTING INSTRUMENT TRACEABILITY

A. All applicable test instrumentation shall be currently calibrated within rated accuracy.

B. The accuracy shall be traceable to the National Bureau of Standards in an unbroken chain.

C. Instruments shall be calibrated in accordance with the following frequency schedule:

1. Field instruments: 6 months maximum.

2. Laboratory instruments: 12 months.

3. Leased specialty equipment: 12 months

D. Dated calibration labels shall be visible on all test equipment.

1.08 FINAL SETTINGS

A. The Contractor shall be responsible for implementing all final settings and adjustments of equipment in accordance with manufacturer's and/or Engineer's specified values. The Contractor shall be responsible to request any required setting values from the Engineer.

1.09 SUBMITTALS

A. At least two weeks prior to conducting testing, submit Acceptance Test Procedures and Inspection Reports for review and approval by the Electrical Engineer of Record. This includes the prepared test report outlined above including all systems and equipment to be tested (with the test results, deficiencies, and conclusions sections blank). The Contractor shall be responsible to integrate the testing by the Contractor, Manufacturing Representatives, and NETA testing organization. The NETA testing organization shall prepare the Testing Documents per the current NETA Acceptance Testing Specification and assist the Contractor in preparing an Integrated System Test. The Manufacturing Representative testing organization shall prepare their regular start up test plan and assist the Contractor in preparing an Integrated System Test. After review and approval the test report shall be executed.

B. At least two week prior to conduction testing, submit for review and approval by the Engineer the list of test participants and prove of their qualifications and demonstrate they have the necessary testing experience and training to conduct the test.

C. Record copies of the completed test report shall be submitted no more than 30 days after completion of the testing and inspection.

1.10 FAILURE TO MEET TEST

A. Any found defective on the basis of acceptance test shall be reported directly to the Engineer.

B. Contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory without additional cost to the Owner.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EQUIPMENT TO BE TESTED AN INSPECTED

A. The following equipment shall be tested in accordance with the scopes of work which follow and additional participation in other acceptance testing such as integrated system and functional testing. Acceptance test procedures and inspection reports shall be prepared, submitted and approved prior to performance of testing and inspections. The party responsible is identified in accordance with the following key: C = Contractor/Installer; M = Manufacturer; T = Testing Agency.

1. Molded Case Circuit Breakers - C
2. Fire Alarm System - M
3. Grounding System - C
4. Cables, Low Voltage, 600 Volts Maximum - C
5. Ground Fault Systems - C
6. Low Voltage Switchgear and Switchboards - T
7. Low Voltage Power Circuit Breakers and Insulated Case Circuit Breakers - T
8. Lighting Control System - C
9. Telecommunications Systems-C or M
10. Other Systems-C, M, T

3.02 INSPECTIONS

A. DRY TYPE TRANSFORMERS

1. Visual and Mechanical Inspection:

a. With case covers removed, inspect transformer core and coil assembly and enclosure interior. Cloth wipe and brush major insulating surfaces.

b. Check primary, secondary, and ground connections.

c. Check tap connections and tap changer.

d. Inspect all bolted connections. Torque wrench tighten or remake any questionable connections.

e. Inspect insulators, spacers, and windings.

f. Inspect for adequate electrical clearance.

g. Check base or support insulators, including vibration isolation supports.

h. Check accessory devices for condition and proper operation.

i. Verify that the transformers have been provided with adequate spacing for ventilation.

B. MOLDED CASE CIRCUIT BREAKERS

1. Visual and Mechanical Inspection:

a. Inspect cover and case, and check for broken or loose terminals.

b. Operate breaker to check operation.

c. Verify proper reporting of the events on the project equipment monitoring system

2. Electrical Tests (400 ampere frame and larger):

a. Insulation Resistance Test: Megger main poles of breaker pole-to-pole, from each pole to ground, and across the open contacts of each pole.

b. Contact Resistance Test: Ductor across main pole contacts with breaker closed and latched to check for good, low resistance contact.

c. Test overcurrent trip device and calibrate. Where primary injection testing is specified, test each pole of the breaker individually. Data shall be compared with manufacturer's published data.

1) All trip units shall be tested by primary injection.

2) Static overcurrent trip devices shall be tested per manufacturer's instructions.

3) Test for minimum pick-up current.

4) Apply 300% of pick-up current and measure time necessary to trip breaker (long time delay).

5) Where short time delay characteristics are provided, test short time pick-up and delay.

6) Test instantaneous trip by passing current sufficiently high to trip breaker instantaneously.

7) Where ground fault protection is provided, test ground fault pick-up and delay.

8) Check reset characteristics of trip unit.

9) Electrically test any auxiliary devices such as shunt trips, undervoltage trips, alarm switches, and auxiliary switches.

C. FIRE ALARM SYSTEM

1. Visual and Mechanical Inspection:

a. Inspect each device for physical damage.

b. Check for proper labeling of conductors.

c. Inspect all test switches for proper operation.

d. Inspect all system lamps and LED's for proper operation. Replace all non-operational equipment.

e. Check all cabinet doors latches and hinges for proper operation. Adjust, lubricate, and repair as required.

f. Verify proper reporting of the events on the project equipment monitoring system.

2. Electrical Tests: Test each individual circuit at panel with equipment connected for proper operation. Entire system shall test free from opens, grounds, and short circuits. Verify control circuit integrity: Field tests to verify component compliance with specifications, adjusting, calibrating, and setting circuit breaker, relays, timers, etc. Testing will include, but not be limited to the following:

a. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

b. Close each sprinkler system control valve and verify proper supervisory alarm at the FACP.

c. Verify activation of all flow switches.

d. Open initiating device circuits and verify that the trouble signal actuates.

e. Open and short signaling line circuits and verify that the trouble signal actuates.

f. Open and short indicating appliance circuits and verify that trouble signal actuates.

g. Ground all circuits and verify response of trouble signals.

h. Check presence and audibility of all alarm notification devices.

i. Check installation, supervision, and operation of all intelligent smoke detectors.

j. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

k. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

l. Check the integrity of the software program with the system in complete operation. Verify that each message reported is correct with respect to the signal received. All possible operating conditions and system troubles shall be tested. Rewrite software as required.

m. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

n. Close each sprinkler system control valve and verify proper supervisory alarm at the FACP.

o. Verify activation of all flow switches.

p. Open initiating device circuits and verify that the trouble signal actuates.

q. Open and short signaling line circuits and verify that the trouble signal actuates.

r. Open and short indicating appliance circuits and verify that trouble signal actuates.

s. Ground all circuits and verify response of trouble signals.

t. Check presence and audibility of all alarm notification devices.

u. Check installation, supervision, and operation of all intelligent smoke detectors.

v. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

w. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

x. Check the integrity of the software program with the system in complete operation. Verify that each message reported is correct with respect to the signal received. All possible operating conditions and system troubles shall be tested. Rewrite software as required.

D. GROUNDING SYSTEM

1. Visual and Mechanical Inspection:

a. Inspect wiring system outlet and junction boxes for proper grounding. Green grounding conductor shall be connected to outlet and junction boxes. Inspect a minimum of 5% of project boxes.

b. Verify connections of grounds for the secondary of separately derived grounding systems, i.e. at dry type transformers. Note type of connection, i.e. mechanical or exothermic.

c. Verify proper connection to all components of building service entrance grounding system. Note all system components which are interconnected and type of connection either mechanical or exothermic. Note depth of driven ground rods.

2. Electrical Tests (Small Systems):

a. Perform ground-impedance measurements utilizing the fall-of-potential method per ANSI/IEEE Standard 81 "IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System". Instrumentation utilized shall be specifically designed for ground impedance testing. Provide

sufficient spacing so that plotted curves flatten in the 62% area of the distance between the item under test and the current electrode.

b. Equipment Grounds:

1) Utilize two-point method of IEEE Std. 81. Measure between equipment ground being tested and known low-impedance grounding electrode or system.

3. Electrical Tests (Large Systems):

a. When sufficient spacing of electrodes described above is impractical, perform ground-impedance measurements utilizing either the intersecting curves method or the slope method. (Ref. Nos. 40 and 41 in IEEE Std. 81.)

b. Test Values:

1) The main ground electrode system impedance-to-ground should be no greater than five (5) ohms. Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.

E. CABLES - LOW-VOLTAGE - 600V MAXIMUM

1. Visual and Mechanical Inspection:

a. Inspect cables for physical damage and proper connection in accordance with single-line diagram.

b. Test cable mechanical connections to manufacturer's recommended values using a calibrated torque wrench.

c. Check cable color-coding with applicable specifications and National Electrical Code standards.

2. Electrical Tests:

a. Perform insulation-resistance test on each feeder on the riser diagram with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 1 minute.

b. Perform continuity test to insure proper cable connection.

c. Test Values:

1) Evaluate results by comparison with cables of same length and type. Investigate any values less than 50 megohms.

2) Provide a test report for each feeder which indicates the manufacturer's target values and actual test reading. Report shall indicated pass/fail for each feeder. Submit report to Owner's Representative for approval. Include test report in project maintenance manual.

d. Feeder Cables:

1) 600-volt feeder cables in the building and secondary service cables to the building shall be tested using a megohmmeter, to measure the insulation resistance of each conductor in the circuit.

2) Disconnect all equipment switches, relays, buswork, transformers, etc.) from the cable being tested.

3) Tests to be performed in a dry area.

4) Clean and dry cable ends with a cloth moistened with a suitable solvent.

e. Cable Values: Cable values shall be established and provided by the cable manufacturer. Provide target value insulation resistance (IR) in megohms, based on 1000 ft. at 60 Deg F.

f. Temperature Correction Factor: For temperatures above or below 60ºF, a correction factor may have to be applied to determine the true IR value. However, if the measured IR of the system is equal to or greater than the calculated value, a correction factor is not needed.

g. Correct insulation deficiencies which show and insulation resistance of less than one megohm.

h. Test conductors with power off and impress a voltage of not less than 500 volts D.C.

i. Perform continuity tests on all conductors.

F. GROUND-FAULT SYSTEMS (CEC 230-95)

1. Visual and Mechanical Inspection:

a. Inspect for physical damage and compliance with drawings and specifications.

b. Inspect neutral main bonding connection to assure:

1) Zero-sequence sensing system is grounded.

2) Ground-strap sensing systems are grounded through sensing device.

3) Ground connection is made ahead of neutral disconnect link on zero-sequence sensing systems.

4) Grounded conductor (neutral) is solidly grounded.

c. c.Inspect control power transformer to ensure adequate capacity for system.

d. Manually operate monitor panels (if present) for:

1) Trip test.

2) No trip test.

3) Nonautomatic reset.

e. Record proper operation and test sequence.

f. Set pickup and time-delay settings in accordance with the settings provided by the University's Representative.

g. Verify proper reporting of the events on the project equipment monitoring system.

2. Electrical Tests:

a. Measure system neutral insulation to ensure no shunt ground paths exist. Remove neutral-ground disconnect link. Measure neutral insulation resistance and replace link.

b. Determine the relay pickup current by current injection at the sensor and operate the circuit interrupting device.

c. Test the relay timing by injecting three hundred percent (300%) of pickup current, or as specified by manufacturer.

d. Test the system operation at fifty-seven percent (57%) rated control voltage, if applicable.

e. Test zone interlock systems by simultaneous sensor current injection and monitoring zone blocking function.

f. On multiple source, tie breaker, etc., systems, devise a simulation scheme that fully proves correct operation.

g. Test Parameters:

1) System neutral insulation shall be a minimum of one hundred (100) ohms, preferably one (1) megohm or greater.

2) Relay timing shall be in accordance with manufacturer's published time-current characteristic curves but in no case longer than one (1) second for fault currents equal to or greater than 3,000 amperes.

3) Relay pickup value shall be within +10% of setting and in no case greater than 1200A.

G. LOW VOLTAGE SWITCHBOARDS

1. Visual and Mechanical Inspection:

a. Verify that the enclosure interiors have been cleaned of accumulated dust, dirt, oil films, and other foreign materials.

b. Inspect all electrical and mechanical components for condition and any evidence of defects or failure.

c. Check for proper travel and alignment of any drawout or plug-in circuit breakers.

d. Check breaker connections to bus.

e. Inspect bolted connections. Torque wrench tighten or remake any questionable connections.

f. Inspect for missing or loose hardware or accessories.

g. Inspect ground bus connections.

h. Operate key and door interlock devices to assure proper operation.

i. Verify proper reporting of the events on the project equipment monitoring system.

2. Electrical Tests:

a. Insulation Resistance Test: Megger main secondary bus and feeder circuits phase-to-phase and phase-to-ground.

b. Energize any space heater circuits to insure proper operations.

c. Check phase rotation with a Biddle phase rotation meter.

d. Instruments and Meter Tests:

1) Inspect panel mounted instruments and meters. Clean and check for calibration accuracy. Make minor adjustments as necessary.

H. LOW VOLTAGE POWER CIRCUIT BREAKERS AND INSULATED CASE CIRCUIT BREAKERS

1. Visual and Mechanical Inspection:

a. Remove each draw-out type circuit breaker.

b. Inspect arc chutes of power circuit breakers.

c. Inspect circuit breaker for defects or damage.

d. Inspect and check contacts. Check alignment, over-travel, and pressure. Adjust if necessary.

e. Inspect finger clusters on line and load stabs of draw-out circuit breakers.

f. Check for proper mechanical operation. Lubricate where necessary.

g. Check auxiliary devices for proper operation.

h. Check breaker racking device (if applicable) for alignment and friction-free operation. Lubricate if necessary.

i. Verify proper reporting of the events on the project equipment monitoring system.

2. Electrical Tests:

a. Insulation Resistance Test: Megger main poles of breaker pole-to-pole, from each pole to ground, and across the open contacts of each pole.

b. Contact Resistance Test: Ductor across main pole contacts with breaker closed and latched to check for good, low resistance contact.

c. Test overcurrent trip device by primary injection and calibrate to settings provided. Static overcurrent trip devices shall be tested per the manufacturer's instructions. Test each pole of the breaker individually. Data shall be compared with manufacturer's published data.

1) Test for minimum pick-up current.

2) Apply 300% of pick-up current and measure time necessary to trip breaker (long time delay).

3) Where short time delay characteristics are provided, test short time pick-up and delay.

4) Test instantaneous trip by passing current sufficiently high to trip breaker instantaneously.

5) Where ground fault protection is provided, test ground fault pick-up and delay.

6) Check reset characteristic of trip unit.

d. Electrically test any auxiliary devices such as shunt trips, undervoltage trips, alarm contacts, and auxiliary contacts.

I. LIGHTING CONTROL SYSTEM

1. Visual and Mechanical Inspection:

a. Inspect each device for physical damage.

b. Check for proper labeling of conductors.

c. Inspect all system lamps and LED's for proper operation. Replace all non-operational equipment.

d. Check all cabinet doors, latches, and hinges for proper operation. Adjust, lubricate, and repair as required.

2. Electrical Tests:

a. Verify the absence of unwanted voltages between circuit conductors and ground that would constitute a hazard or prevent proper system operation.

b. Meggar test all conductors (other than those intentionally grounded) for isolation from ground.

c. Test all conductors (other than those intentionally connected together) for conductor-to-conductor isolation using as insulation testing device.

d. The control unit shall be tested to verify it is in the proper operating condition as detailed in the manufacturer's manual.

e. Each control circuit shall be tested to confirm proper operation of the circuit. Monitor the system with all building equipment energized, such as variable speed controllers, to verify the absence of control inhibiting electrical noise.

END OF SECTION

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.

B. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

C. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

D. UL 67 - Panelboards; Current Edition, Including All Revisions.

1.02 SUMMARY

A. This section describes requirements for branch circuit panelboards.

1.03 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.04 REFERENCE STANDARDS

A. The Underwriters Laboratory, Inc. (UL).

B. National Electrical Manufacturers Association (NEMA).

1.05 SUBMITTALS

A. Submit manufacturers' data and shop drawings in accordance with Section 01 3000 - Administrative Requirements and Section 01 6000 - Product Requirements for items listed.

B. Manufacturers Data:

1. Panelboards.

C. Shop Drawings.

1. Panelboards.

PART 2 PRODUCTS

2.01 ALL PANELBOARDS

A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet (2,000 m).

2. Ambient Temperature:

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

3. Fronts:

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.02 BRANCH CIRCUIT PANELBOARDS

A. General: Provide bussed, circuit breaker or fusible switch type panelboards with main lugs or circuit breaker in flush or surface mounted enclosures as indicated.

B. Construction:

1. Cabinets: Code gauge steel cabinets, deadfront panels, and doors. Fasten deadfront panels to cabinets with concealed trim fasteners. Conceal front door hinges.

2. Dimensions: 20 inches wide by 6 inches deep.

3. Locks: Flush door locks, keyed alike for all panelboards.

4. Access: Door-in-Door (Not EZ-Trim).

5. Standards: Provide UL label where applicable and conform to No. 67 and 50 Underwriters Laboratories, Inc., and NEMA PB-1.

C. Bussing:

1. Phase Bus: Silver-plated copper, rated 1000 amperes per square inch cross sectional area maximum, braced for 100,000 rms amperes minimum.

2. Neutral Bus: Copper with lugs for connection of neutral conductors.

3. Ground Bus: Copper with terminals for equipment grounding conductors.

4. Terminals: As specified in Section 26 0519 - Building Wire and Cable.

D. Finish: Degrease, clean, phosphatize, prime, and finish cabinets, deadfront panels, and doors with baked enamel, color ASA-61, or standard factory grey. Galvanized cabinets are acceptable for flush cabinets.

E. Nameplates:

1. Provide a nameplate identifying panelboard in accordance with 26 0100 - General Requirements for Electrical Work.

2. Provide a manufacturer's nameplate on the deadfront interior panel indicating panelboard type, voltage rating, current rating and manufacturer's name.

F. Directory: Provide a directory card which fits into slots in the back of the panelboard. Protect directory with non-yellowing clear plastic.

G. Manufacturer: Westinghouse (Pow-R-Line 2), General Electric, Square D.

H. Circuit Breakers:

1. Provide circuit breakers for miscellaneous branch circuits with frame sizes and ratings as shown on the plans.

2. Bolt-on, thermal magnetic, molded case, with inverse time current overload, and instantaneous magnetic trips, trip-free and trip-indicating all poles of multi-pole device shall operate simultaneously during open, close and trip operations. Provide circuit breakers indicated with the following ratings:

Panel Type	Circuit Breaker Frame Size	Trip Rating (Amperes)	Voltage (AC Rating	Symmetrical AC Interrupting Capacity
1	100/1 pole	15-100	120	10,000 Min.
	100/2 & 3 poles	15-100	240	10,000 Min.
	150/2 & 3 poles	110-150	240	18,000 Min.

	225/3 poles	125-225	240	22,000 Min.

I. Manufacturer: Eaton Cutler-Hammer (Pow-R-Line 2), General Electric, Square D.

PART 3 - EXECUTION

3.01 BRANCH CIRCUIT PANELBOARDS

A. Mount panelboard so that the top is 6 feet-6 inches above the finished floor.

B. Neatly terminate conductors onto breaker, ground bus and neutral bus. Train conductors in an organized grouping with conductors fanning out at the circuit terminals, bundled in the wireways and laced with plastic ties.

C. Identify all conductors with a circuit number and phase color.

D. Type all panelboard directories.

E. Provide a minimum of three (3) 3/4 inch empty conduits into accessible ceiling space.

F. Provide insulated grounding bushings on all conduits which enter the cabinet and bond to ground bus.

G. Install conduits in a vertical line, perpendicular to the cabinet.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Provide electrical materials, installation and testing for the interior improvements in Culinary Lab at Ventura Academy.

1.02 DESCRIPTION

A. This section describes requirements for wiring devices and connections.

1.03 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

B. Section 26 05 26: Grounding and Bonding for Electrical Systems.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.

B. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

C. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002.

D. CEC - California Electrical Code; most recent edition.

1.05 SUBMITTALS

A. Submit manufacturers' data and shop drawings in accordance with Section 01 3000 - Administrative Requirements and Section 01 6000 - Product Requirements for items listed.

B. Provide submittals for items listed documenting compliance with specification requirements.

C. Product Data:

1. Electrical Materials: Manufacturer's current published catalog sheets.

PART 2 - PRODUCTS

2.01 ALL WIRING DEVICES

A. Provide UL listed wiring devices, ivory or color selected by Engineer, with voltage and current ratings specified and wire terminations designed to contain stranded conductors. Provide grounding type receptacles. Provide RED color for all wiring devices connected to the emergency power system.

B. Provide 120 volt single and duplex receptacles which meet Federal Specification W-C-596 as listed:
   1. HOSPITAL GRADE

	HUBBELL	PASS & SEYMOUR	LEVITON
NEMA 5-20R single	#8310	#9301 - HG	#5361 - HG
NEMA 5-20R duplex	#8300	#9300 - HG	#5362 - HG

   2. SPECIFICATION GRADE - COMMERCIAL (DESIGNER)

	HUBBELL	PASS & SEYMOUR	LEVITON
NEMA 5-20R single	#2161	#26342	#16351
NEMA 5-20R duples	#2162	#26342	#16352

   3. SPECIFICATION GRADE - COMMERCIAL

	HUBBELL	PASS & SEYMOUR	LEVITON
NEMA 5-20R single	#5361	#5361	#5361
NEMA 5-20R duplex	#5362	#5362	#5362
NEMA 5-20R duplex with isolated ground	#IG-5362	#IG-6300	#5362-IG
NEMA 5-20R duplex with GFCI	#GF-5362	#2091-S	#6599

   4. STANDARD GRADE - COMMERCIAL

	HUBBELL	PASS & SEYMOUR	LEVITON
NEMA 5-20R single	#5351	#5358	#5351
NEMA 5-2OR duplex	#5352	#3232	#5352

C. Provide receptacles other than 120 volt single and duplex as indicated on drawings.

D. Provide 20 amp AC quiet type switches which meet federal specification W-C596 with voltage ratings to suit branch circuit requirements indicated and as listed:

	HUBBELL	PASS & SEYMOUR	LEVITON
Single Pole	1221	20AC	1221
Double Pole	1222	5952	1222
Three Way	1223	20AC3	1223
Four Way	1224	5954	1224
SPST Momentary	1557	5935	1257

E. Listed manufacturers establish a standard of quality. Substitutions will be concidered in accordance with Section 26 0100, General Requirements for Electrical Work.

F. Key Switches: Equivalent to listed switches, activated with removable key.

G. Switch with Pilot Light: Leviton #5226, Bryant #6405, G.E. #7945, or equal.

H. Wall Plates: Type 302 stainless steel, satin finish, minimum 0.040 inch thick, single or multiple gang.

2.02 WIRING DEVICES

PART 3 - EXECUTION

3.01 WIRING DEVICES

A. Connect wiring devices to circuits indicated using side or back wiring terminals, designed to contain stranded wire.

B. Connect green grounding pigtail from receptacles to outlet box with screw.

C. Install wiring devices flush with the device plate fronts.

D. Align plates plumb with wall, and cover opening, without use of "jumbo" plates.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.

B. IES LM-80 - Approved Method: Measuring Lumen Maintenance of LED Light Sources; Illuminating Engineering Society; 2008.

C. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association; 2012.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 101 - Life Safety Code; National Fire Protection Association; 2012.

F. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.02 SUMMARY

A. This section describes requirements for lighting fixtures, lamps, ballasts and accessories.

B. Provide lighting equipment, installation and testing for the interior improvements in Lodi Unified School District Food Service Operation building.

1.03 DESCRIPTION

A. Provide all equipment and materials for a complete lighting system as described herein and as shown on the plans.

1.04 RELATED REQUIREMENTS

A. Section 26 0100: General Requirements for Electrical Work.

B. Section 26 0923: Lighting Control Devices

1.05 SUBMITTALS

A. Procedure: Submit under provisions of Section 01 3000 - Administrative Requirements and Section 01 6000 - Product Requirements.

B. Provide submittals for item listed documenting compliance with specification requirements.

C. Product Data:
   1. Lighting Fixtures: Manufacturer’s current published catalog sheets, including photometric information, size, weight, finishes and accessories.
   2. Ballasts: Manufacturer’s current published catalog sheets including electrical and lighting performance characteristics.

D. Warranties: Manufacturer’s certified warranty documentation.

E. Shop Drawings:
   1. Lighting Fixtures.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 6000 - Product Requirements, except where individual luminaire types are designated with substitutions not permitted.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 and NFPA 101.

D. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

I. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 FIXTURE TYPES

2.05 EXIT SIGNS

A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

2.06 BALLASTS AND DRIVERS

A. Ballasts - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.
   3. Product(s):
      a. Watt Stopper as shown on plans or equal.

2.07 LIGHTING FIXTURES

A. General: Provide fixtures as indicated, factory wired, ready for field connection.

B. Provide recessed fixtures with complete mounting hardware and trims to suit the type of ceiling in which they are installed. Provide access to lamps and ballasts in recessed fixtures through the lensed door or fixture opening, without requiring removal of fixture.

C. For surface mounted fixtures provide all blocking, mounting channels required and hardware for mounting.

D. Provide fixtures Underwriters Laboratories, Inc. (UL) approved for installation against low density ceilings where applicable. Do not use spacers.

E. Lamp Holders: Equip fluorescent fixtures with exposed lamps and bipin sockets with socket type lamp holders at each socket. For fluorescent fixtures with exposed lamps and single hole sockets, provide two clamp type lamp holders of the type which bolt to the fixture body and in which the lamp is seated in a spring steel clamp.

PART 3 EXECUTION

3.01 LIGHTING FIXTURES

A. Install lighting fixtures complete with lamps, ready for operation.

B. Secure fixtures to the structure by means of brackets, flanges another mounting hardware suited for the fixtures and type of installation.

C. Connect recessed fixtures with flexible metal conduit and fixture tap wire as specified in Section 26 0534 - Conduit and 26 0519 - Building Wire and Cable.

D. Secure surface mounted fixtures with a minimum of (2) 1/4 inch bolts, or as detailed.

E. Secure recessed fluorescent fixtures with a minimum of 2 #12 AWG hanger wires, independent of ceiling hangers.

3.02 SIESMIC LIGHTING BRACING

A. Firmly attach items weighing less than 20 pounds to main cross runners. Two 12 gauge support wires to the ceiling system hangers or structure shall be included for items from 20 to

56 pounds. Directly support items over 56 pounds from the structure above with approved hangers

3.03 CLEANING

A. Clean lighting fixtures prior to final acceptance.

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Addition to existing fire alarm system; design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station is existing.

1.02 SUMMARY

A. This section describes requirements for automatic fire alarm systems with voice evacuation capabilities.

B. The system as specified shall be supplied, install, tested and approved by the local Authority Having Jursidiction, and turned over to the owner in an operation condition.

1.03 DESCRIPTION

A. Work includes:
   1. Furnish all labor, fire protection engineering, design, materials, tools, equipment and services for addition to existing fire detection and alarm system consisting of addressable initiating and signaling devices, conduit, boxes, wiring, annunciator panels, and other components necessary for proper operation, testing and control of a complete and demonstrable operable system.
   2. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation. Any omission in specified equipment will not relieve the Contractor of the responsibility for furnishing and installing a fully operational system.
   3. Provide all electrical connections needed for new equipment. The term "electrical connections" includes all operations and materials associated with completing electrical connection starting with pulled in wire including, but is not limited to:
      a. Stripping of jacket(s) and insulation.
      b. Checking for continuity.
      c. Meggering.
      d. Tracing of wire.
      e. Fanning.
      f. Measuring and cutting to final termination lengths.
      g. Installing wire and permanent wire markers for identification of conductors.
      h. Installation of lugs, connectors or terminals.
      i. Fastening wire to designated terminal point or other designated point.
      j. Taping.

B. Description of system: Automatic detectors, addressable, analog, general alarm, supervised, 24 volt DC fire detection and alarm system.

C. Provide components including but not limited to following.
   1. Fire alarm control panel.
   2. Remote annunciator.

3. Automatic addressable heat detectors with provisions for future analog output devices.
4 Automatic addressable smoke detectors with provisions for future analog output devices.
5. Modules for interfacing contact closure devices to addressable system. Do not use interface modules to connect non-addressable manual stations to fire alarm system.
6. Flashing general alarm lights.
7.. Combination audible and visual signal devices.
8. Fire alarm system conduit and wire.

1.04 FIRE ALARM SYSTEM: SCOPE

A. General:
   1. This project includes adding new fire alarm control panel w/ voice evacuation capabilities, connecting to the existing fire alarm control panel, and programming that both panels work as one complete and fully functional fire alarm system as specified on plan for the building.

B. Scope of Work:
   1. Prepare complete shop drawings and obtain Engineer's approval prior to Contractor's deferred approval submission.
   2. Furnish, install, connect and test new manual pull stations: horn, strobes, smoke detectors, heat detectors, duct detectors, Division 15 Fire/Smoke Dampers, door holders, flow and tamper switches and wiring (in conduit) to the fire alarm control panel.
   3. Provide and install new fire alarm signal transmitter to transmit signal to the owner's chosen, listed supervisory station.
   4. Test and demonstrate operation of the fire alarm control panel with initiating and signal appliance devices installed and connected.
   5. Post permanent signage on door(s) leading to the fire alarm control panel stating the following: FIRE ALARM PANEL. Letters shall be no less than 3 inches tall, white in color on red background. In addtion, provide similar signage on all doors leading to remote power supplies or other fire alarm control equipment.

1.05 RELATED SECTIONS

A. Section 26 0100: General Requirements for Electrical Work.

1.06 QUALITY ASSURANCE

A. System standards:
   1. National Fire Protection Association (NFPA) 72, 2022 Edition
   2. National Fire Protection Association 90A.
   3. California Electrical Code (CEC) 2022 edition, Article 760.
   4. California Building Code (CBC), 2022 edition Title 24 Parts 2,3,7,9, & 12.
   5. Factory Mutual (FM) approved.
   6. Approved by California State Fire Marshal (CSFM) and Title 19.
   7. TITLE 24 Parts 2, 3, 7, 9, & 12.

8. Other codes as required.

B. Design criteria:
   1. Comply with all system standards.
   2. Meet all requirements of fire authorities having jurisdiction.
   3. Complete fire detection and alarm system design, wiring diagrams, interface wiring diagrams, and operational details by system manufacturer or authorized technical representative.
   4. System: All equipment shall be approved and listed by the CSFM and Underwriters Laboratories, Inc. (UL).
   5. Installation shall conform to the CSFM requirements and shall be subject to inspection by them.

C. Contractor qualifications:
   1. Offer an annual maintenance contract including complete service and equipment costs for maintenance of complete system.
   2. Show evidence upon request of five years experience minimum servicing fire alarm systems.
   3. Show evidence upon request of five years experience minimum installing systems of similar type and scope.
   4. Provide for 24 hour emergency service.
   5. Factory trained technicians.

1.07 GUARANTEE

A. Warrant the entire fire alarm system improvements for a period of 2 years.

B. For all repairs that cannot be completed after the initial response, submit a written plan of correction to the Owner prior to leaving the premises.

C. Furnish warranty service from the installing company. Provide response time for emergency service no longer than 2 hours from the time of notification. For non-emergency service provide response time no longer than twenty four (24) hours from the time of notification

1.08 SUBMITTALS

A. Submit the following with shop drawings:
   1. Floor plans showing the entire area, all fire rated walls, the addresses for all addressable devices and the routing of conduit and wire. Indicate on all conduit runs, the conduit size and type and size of wires.
   2. Single line riser diagram showing all fire alarm system circuits.
   3. Point to point diagram.
   4. Wiring diagrams that indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
   5. Technical data showing exact types and quantity of all fire alarm system components. High-light or otherwise identify specific components on catalog cut sheets. All equipment drawing alarm or supervisory current shall have documentation of the current draw highlighted in the submittal information.
   6. CSFM listing sheet with current expiration date for each component.

7. Battery capacity calculations. Submit complete battery calculation sheet showing all the electrical requirements for the entire fire alarm system, including the power consumption to the individual devices, both in alarm and supervisory modes on 8-1/2 x 11 inch paper.
8. Voltage drop calculations for all wire and cable runs.
9. Equipment list to show all fire alarm system components, the symbols used, the quantities, manufacturers' model number and CSFM listing numbers.
10. Provide sequence of operations to show how the system will react to the activation of each type of device.
11. List of wire and cable that specifies gauge and type of wire to be used.
12. Details and listing number of through penetration fire stop system.
13. All fire alarm panel programming information.
14. Details for mounting of equipment.
15. Stamp and signature of design professional of record.
16. Include the following statements on shop drawings:
    a. Provide fire alarm system that conforms to Article 760 of the CEC.
    b. Do not start installation of the fire alarm system until details, plans and specifications, CSFM Listing Sheets, including listing number with annual update and expiration date, for all system components have been approved by the CSFM.
    c. Keep a stamped set of approved fire alarm shop drawings on the job site and use for installation. Obtain approval for all deviations from approved shop drawings, including substitution of devices, from the CSFM.
    d. Upon completion of the installation of the fire alarm system, perform two separate tests. In both tests, successfully demonstrate all functions required in the contract. Complete one test in the presence of the Owner's representative and conduct a separate test for final acceptance by the CSFM in the presence of the Owner's representative.
    e. Bring all discrepancies between the drawings and the codes or recognized standards to the attention of the Owner.
    f. Provide a minimum of 48 hours notice to the Owner's representative for all inspection and/or testing.

B. Submittals will be automatically rejected if complete listing information does not accompany submittal.

1.09 OPERATION AND MAINTENANCE MANUAL

A. Provide a minimum of 6 copies of the Operations and Maintenance Manual. Label and neatly install the manuals in a binder with tabs and sections as indicated in a Table of Contents. Neatly fold large drawings and blueprints. Include manufacturers' data sheets, maintenance and operation information sheets, copies of all programming sheets with the final room numbers included, as built drawings showing the final room numbers, and any other information on operation or maintenance.

B. Submit 2 copies of complete as-built installation wiring documentation, internal fire alarm control panel schematics, and maintenance manuals prior to final acceptance.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Provide material that is new, in condition acceptable to Owner's representative and suitable for intended use.

B. Deliver materials in the original, unopened and labeled packages.

C. Handle and store materials to protect from damage.

D. Deliver spare parts to the Owner's representative. Obtain a receipt as proof of delivery of spare parts specified in this Section.

1.11 SITE EXAMINATION AND CONDITIONS

A. Refer to Section 26 0100 - General Requirements for Electrical Work for coordination with other trades.

B. Accept information shown on the drawings based upon available records and data as approximate only. Make minor deviations found necessary to conform to actual locations and conditions with no increase in contract sum.

PART 2 PRODUCTS

2.01 FIRE ALARM SYSTEM

A. Acceptable manufacturer:
   1. Manufacturer must have local service organization.
   2. Fire alarm system, per plan or equal.

B. All equipment:
   1. UL listed as a product of a single manufacturer under appropriate category.
   2. Equipment shall not be modified or installed to alter or void UL label or listing.
   3. CSFM listed.
   4. Equipment and material damaged during transportation, installation, or operation will be considered as totally damaged. Replace with new. Variance from this will be permitted only with written approval from the Owner's Representative.
   5. Miscellaneous Accessories: Channels, joiners, hangers, caps, nuts and bolts, and associated parts shall be plated electrolytically with zinc, followed immediately thereafter by treating the freshly deposited zinc surfaces with chromic acid to obtain a surface which will not form a white deposit on surface for an average of 120 hours when subject to a standard salt spray cabinet test or accessories shall be hot-dipped galvanized.

2.02 FIRE ALARM SYSTEM OPERATION: SUPERVISORY

A. Supervisory signals shall cause the following:
   1. Fire alarm control panel to enter supervisory mode.
   2. Transmit a supervisory signal to the remote alarm station.

2.03 FIRE ALARM SYSTEM OPERATION: TROUBLE

A. Initiation of any trouble signal condition shall cause the following:
   1. Fire alarm control panel to enter trouble mode.
   2. Transmit the trouble signal to the remote alarm station.
   3. Annunciate trouble at fire alarm control and remote annunciator.

B. Reset the control unit at fire alarm control panel.

C. Remote station signaling unit shall automatically transmit fire alarm and/or trouble signals via telephone line to following location(s):
   1. Fire Dispatch alarm receiver.

D. Activation of any system trouble shall initiate the following:
   1. Common audible trouble signal shall sound and trouble light shall illuminate at remote annunciators.
   2. Common audible trouble signal shall sound and illuminate at CPU. Also a specific display shall be provided at CPU to indicate specific device.

E. Audible trouble signal shall be silence-able by switch. Visual trouble indication remains until trouble condition is corrected. A subsequent trouble condition received after manually silencing shall cause audible trouble signal to resound. Restoration of system to normal causes audible trouble signal until silencing switch is returned to normal position. Trouble signal will be initiated under following conditions:
   1. Open on an initiation or alarm indicating circuit.
   2. Open in wiring to remote zone light annunciator(s).
   3. Ground fault condition.
   4. Auxiliary manual control switch out of normal position.
   5. Loss of 120 volt operating power to CPU.
   6. Low or no battery voltage condition.
   7. Main sprinkler valve is closed.
   8. Post indicator valve is closed.
   9. Any sprinkler or standpipe O, S & Y valve is closed.

2.04 FIRE ALARM SYSTEM OPERATION: ALARM

A. Activation of any signal initiating devices shall cause the following:
   1. Fire alarm control panel to enter alarm mode.
   2. Transmit the alarm signal to remote alarm station.
   3. Operate alarm horn/strobes.
   4. Annunciate the alarm at the remote annunciation.
   5. Shut down fans in the affected and adjoining zones as described in the specifications/plans for this project.

B. Area smoke detector alarm shall also cause the following:
   1. Fire alarm control panel to enter supervisory mode.
   2. Transmit a supervisory signal to the remote alarm station.
   3. Release fire/smoke damper control for duct in which duct detector is in alarm.

C. Configure horn/strobes and strobes to operate in a synchronized fashion and to be silenced at fire alarm control panel. Provide capability to silence horns of horn/strobe combinations allowing strobe to continue in alarm mode.

D. All fire alarm signals are automatically locked in at CPU and remote annunciators until originating device is returned to normal and CPU is manually reset.
   1. Audible alarm signals shall be silence-able from CPU and LCD panel allowing for re-initiation following a subsequent alarm. Silencing of alarm signals shall not impair ability of system to continue to perform as specified.

2. Alarms shall be identified on screen by highlighting or underlining or some other easily discernable method.
3. Provide capability of clearing the display on any CRT display.

E. Operate fan control relays to energized or de-energize certain air-handling equipment, upon operation of smoke detector in unit in accordance with Division 15 and/or as described below:
1. Fans shall not restart until CPU is manually reset or manually overridden.
2. Fans serving surgical suite shall not shut-down unless alarm is initiated by associate detectors.

2.05 SIGNAL INITIATING DEVICES

A. Not used.

B. Area smoke detectors: Analog addressable plug-in type, 24V DC, 4-wire detectors with an LED indicator which illuminates on signal alarm actuation. Supervise the detector power at the fire alarm control panel.

C. Automatic thermal sensors: Fixed temperature type or combination rate-of-rise and fixed temperature type. Addressable.
1. Rated at 140 degrees F, for ordinary areas where normal ceiling temperature does not exceed 100 degrees F, or rated 190 degrees F, for up to 150 degrees F, ceiling temperatures.
2. Detectors shall use restorable elements.
3. Quantity and spacing:
   a. Smooth ceilings: In accord with UL rating.
   b. Non-smooth ceilings: In accord with CSFM's requirements.
   c. High hazard areas: As indicated.
4. Layout is based on 30 feet spacing for fixed-type and 50 feet spacing for combination type for smooth ceiling.
5. Provide in areas required by NFPA 72E or as directed by an Owner’s Representative.
6. Detector means of testing detector at detector and from CPU.
7. Detector with a flashing status indicating LED for visual supervision. When detector is actuated, flashing LED will latch on steady and at full brilliance.
8. Base capable of accepting analog output sensor.

D. Automatic smoke sensor: Photoelectric type, products of combustion detectors (Ionization). Addressable.
1. Operate on photoelectric principle, activated by presence of smoke particles.
2. Operating characteristics shall allow detector to remain stable under varying conditions of vibration, mechanical shock, supply voltage, ambient temperature, air flow and barometric variations.
3. Low voltage, solid-state design employing voltage and RF transient suppression.
4. Detector base: Molded construction equipped with terminal screws for all wiring connections, designed for mounting on any standard 4 inch square outlet box for concealed wiring, or special box for surface raceway, provide base with sounder where requested by the Owner.

5. U/L listed to Standard 268 and shall be documented as compatible with control equipment to which it is connected.
6. Detector with a flashing status indicating LED for visual supervision. When detector is actuated, flashing LED will latch on steady and at full brilliance.
7. Operating power supplied from basic 24 volt DC zone circuit.
8. Removal of detector head will interrupt supervisory circuit of zone circuit and cause a trouble signal to be initiated.
9. Detector head easily dissembled to facilitate cleaning.
10. Sensors shall include test provisions which simulate alarm conditions.
11. Sensor sensitivity can be adjusted from building CPU.
12. Base capable of accepting analog output sensor.
13. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
14. The detectors shall provide address-setting means on the detector head using decimal switches. The detectors shall also store an internal identifying code that the control panel shall use to identify the type of detector.
15. Using software in the Fire Alarm Control Panel (FACP), the detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72E.
16. Detectors located within concealed spaces (e.g., duct detectors located above the ceiling/in interstitial spaces) will be provided with readily-accessible remote LED indicators and test/reset stations. Detectors located within normally-locked rooms/spaces (Pharmacy etc.) shall be provided with readily-visible remote LED indicators.

E. Duct Smoke Detector: addressable intelligent air duct smoke detector with included smoke photelectric detector, for detecting smoke and products of combustion present in air moving through an HVAC air handling system.

1. The detector shall operate in airflow speeds of 100 to 4000 feet per minute, temperatures of -4°F to 158°F, and a humidity range of 0 to 95 percent (non-condensing).
2. The detector is not provided with a relay. Provide compatible relay and mount adjacent to a duct detector.
3. Provide test station as described on the plans and mount as directed in the field.

F. Not used.

G. Not used.

H. Not used.

I. Addressable interface module:

1. Provide interface module for all contact closure devices to provide a complete addressable system. Interface module shall identify a contact closure device such as a tamper switch as a specific point.
2. All monitor modules to be located in a visible location, so device LED can be seen, without having to move any ceiling panels, etc. This may mean lowering the devices and cutting ceiling tile, installing boxes, etc., as required.
3. All monitor modules to be identified with a plastic (white on red) laminated stick-on label indicating device function and identification number.

2.06 ALARM SIGNALLING APPLIANCES

A. General: Provide the number and location of audible devices necessary to meet the audibility requirements of the codes and standards. Furnish and install additional devices where required and perform tests to show that audible devices meet these requirements.

2.07 FIRE ALARM WIRE AND CABLE

A. Conduit: 1/2 inch minimum.

B. Conductors shall be as indicated on the plans.

PART 3 EXECUTION

3.01 INSTALLATION

A. General
1. Install all components as shown on drawings and in accordance with all codes, and manufacturers' diagrams. If the drawings contradict codes or manufacturers' data sheets, immediately contact the Architect to clarify and correct the problem.
2. Install all components as indicated and in accord with manufacturer's wiring diagrams, instructions and recommendations. Assemble together all equipment which requires assembling including bussing and internal wire connections where required. Connect all incoming conduit, cable and wires properly, and adjust and make ready for service electrical equipment and material required by this Contract.
3. Perform all work in an orderly manner, and present a neat appearing installation when completed.
4. Cables shall be installed in conduits, no exceptions.

B. Equipment
1. Accurately set and level, neatly placed support and anchor properly. Anchor with bolts to .56G for essential equipment and .22G for nonessential equipment to prevent movements in an earthquake. No allowance will be made for negligence to foreseen or unforeseen means of placing or installing, equipment into position.
2. Install equipment in flammable or explosive atmospheres, which is approved and listed for such application. Install all raceway and fittings in accordance with the CEC for hazardous (classified) locations.
3. Closely coordinate installation of equipment and devices that pertain to work in other Divisions of the Specifications.

C. Devices
1. Ceiling-type detectors:

a. Install where shown on drawings.
b. Mount units in accordance with drawings and manufacturer's standard details.
c. Locate detectors with indicating light visible from floor, all oriented in the same direction.
d. Do not conceal detectors behind HVAC ductwork.
e. Do not locate area protection detectors in direct air stream from supply air outlets. Maintain a minimum distance of 3 feet from air outlets.
f. Do not install smoke detectors until project area is clean, HVAC system is clean, HVAC system has run for a minimum of 3 hours and construction is finished.

D. Wiring
1. Install all wiring in accordance with CEC, Article 760.
2. Install all wiring in rigid, intermediate or electrical metallic conduit, minimum conduit size is 1/2 inch. Do not install fire alarm system conductors in conduits, junction boxes or outlet boxes with conductors of any other systems. Install circuits for AC separate from circuits using DC. Install each data loop separate from any other data loops. Install circuits for door holders and other non-power limited circuits in conduits separate from alarm initiating and annunciating circuits. Install all initiating devices and signaling line circuits, above-grade. Provide exposed liquid-tight flexible conduit of the minimum length required for neat and secure installation where used for attachment to water-flow and valve tamper switches or similar applications. Do not bury nor locate flexible conduit closer than 12 inches to grade.
3. Pack conduit with removable sealant where connected to ceiling or duct detectors.
4. Paint all conduits except that which is exposed in public areas red in color for six inches at least every 6 feet for the entire circumference of the conduit. Paint all concealed junction boxes red. Label junction boxes “fire alarm” with contrasting colored letters.

E. Connections: Make wire connections to terminal with terminal spade lugs or to terminal blocks approved for use without lugs. Engage the service of manufacturer’s certified technicians to make all final connections.

F. Identification: Identify all conductors with E-Z Code or Brady wire markers by zones, or equivalent, designation, at all junction boxes, detector outlets, pull stations, strobe, strobe/horn and master terminals.

G. Grounding: Permanently ground all metallic conduit, cabinets, junction boxes, and exposed non-current-carrying metal parts. Connect a separate No. 10 AWG conductor to a grounding bus bar located in each main terminal cabinet to building ground. Provide the bus bar with a minimum of 5 tubular, pressure type screw terminals, sized for No. 18 AWG through No. 10 AWG wire. Connect the ground wire for the FACP and the main terminal cabinet to the bus bar.

3.02 PERFORMANCE

A. Cutting and patching:
1. As specified in Section 01045: Cutting and Patching.

2. Perform all cutting and patching, including structural reinforcing, necessary for this work.
3. Perform no cutting or patching without prior approval. Repair damage done by cutting and patching equal to original condition.

B. Provide metal backing plates, anchor plates, and similar items that are required for anchorage for the work of this Section. Securely weld or bolt to metal framing. Wood blocking or backing will not be permitted in combination with metal framing.

C. Provide special forming, recesses, chases, and similar items and wood blocking, backing, and grounds necessary for the proper installation of the fire alarm system as part of the Work.

3.03 PROGRAMMING

A. Program the system in accord with Owner requirements.

B. Obtain a list of the room numbers from the Owner's Representative prior to beneficial occupancy of the areas. Correct all final programming and as-built drawings submitted to the Owner's Representative for Operating & Maintenance (O & M) manual to reflect correct room numbers.

C. Program as follows:
1. Program for supervisory protection connected to the following sensors:
   a. Area smoke detectors.
   b. System trouble.
2. Standardize the programming to meet Owner's nomenclature.

3.04 TESTING ACCEPTANCE

A. Obtain services of a factory trained representative of system manufacturer to supervise installation and its progress, supervise final connections to equipment and provide testing to assure that system is in proper operating condition, and is in compliance with all applicable regulations.

B. Provide 4 sets of preliminary as-built drawings for mark-up during testing. The Owner will retain these sets. Perform 2 separate tests after the system is completed. Successfully demonstrate as part of each test all functions required in the contract. Complete one test in the presence of the Owner's Representative and conduct a separate test for final acceptance by the CSFM in the presence of the Owner's Representative. Notify the Owner's Representative 5 days before date of performance and acceptance tests.

C. Furnish all labor and test equipment required for this work. Testing work is defined as that work necessary to establish that equipment has been properly assembled, connected, and checked to verify that intent and purpose of drawings, manufacturer's instruction manuals, and directions of Architect have been accomplished in a satisfactory manner. Perform re-testing of all failures to verify corrections.

D. Prior to the CSFM test, correct punch list items identified by the Owner's Representative. After re-inspection of punch list items perform additional testing necessary to verify compliance. Continue to correct and retest system until defect-free.

E. Acceptance testing will include, but not be limited to the following:
   1. Test that horns deliver the rated sound pressure levels of the specified device and 10-dB sound level above ambient level.
   2. Test that manual pull stations close the specified circuits and cause specified alarm signals.
   3. Test that automatic detectors operate when the appropriate fire or smoke conditions are generated.
   4. Test that panels and supervisory devices display and control functions specified.
   5. Test that fire alarm supervisory and trouble signals are received at the remote alarm station.
   6. Test that battery with provide 24 hour backup upon removal of AC power (4 hours if fire alarm system is supplied by emergency power).
   7. Turning over and obtaining receipt for completion of NFPA Certification Application Form.

F. Prior to performing acceptance testing:
   1. Verify entire system tests free from opens, grounds, and short circuits.
   2. Verify that horns, horn/strobes, manual pull stations, transmitters, automatic detectors and supervisory devices, and all other fire alarm system components are functioning as specified.
   3. Verify that all individual circuits are connected at panel for proper operation.
   4. Verify control circuit integrity:
   5. Verify component compliance with specifications,
   6. Open initiating device circuits and verify that the trouble signal actuates.
   7. Open and short signaling line circuits and verify that the trouble signal actuates.
   8. Open and short indicating appliance circuits and verify that trouble signal actuates.
   9. Ground all circuits and verify response of trouble signals.
   10. Check presence and audibility of all alarm notification devices.
   11. Check installation, supervision, and operation of all intelligent smoke detectors.

G. Ground tests shall meet requirements of California Code of Regulations (CCR), Title 24, Part 3.

H. After completion of testing and adjustment, operate the different systems and equipment under normal working conditions and show specified performance. If, in the opinion of the Architect, performance of equipment or systems is not in accordance with Specifications or submitted data, alter or replace equipment at no increase in Contract Sum.

I. Do not allow or cause any work to be covered up or enclosed before it has been inspected and approved. Should any work be enclosed or covered up before it has been approved, uncover such work and after it has been inspected and approved, make all repairs necessary to restore work condition in which it was found at time of cutting, all at no increase in Contract Sum.

J. Before requesting final approval of the installation, furnish a written statement to the CSFM to the effect that the system has been installed and completely tested in accordance with (2010) NFPA 72 Sections 10.18.1.3 and 14.4.1.2.

3.05 SEQUENCE OF OPERATION

A. Provide a clear and concise description of sequence of operations that gives, in detail, the information required to operate properly the equipment and system.

B. Provide type written original on 8-1/2 x 11 inch paper and a copy on 3.5 inch diskette in Word format.

END OF SECTION

APPENDIX

FACS
Forensic Analytical Consulting Services

March 15, 2024

Asbestos & Lead Survey Report

Culinary Lab Venture Academy
San Joaquin County Office of Education
2829 Transworld Drive
Stockton, California 95206

Prepared for:

Tim Sutton, Director II
Operations & Support Services
San Joaquin County Office of Education
2922 Transworld Drive
Stockton, CA 95206
(209) 468-9061 | tisutton@sjcoe.net

Prepared By:

Tyler Faison
Forensic Analytical Consulting Services
313 Banner Court, Suite B
Modesto, California 95356
(209) 551-2000 | tyler.faison@facs.com

FACS Project #PJ80862

Contents

List of Acronyms

AAS	Atomic Absorption Spectroscopy
ACCM	Asbestos Containing Construction Material
ACM	Asbestos Containing Material
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
CAC	California - Certified Asbestos Consultant
Cal/OSHA	California Occupational Safety and Health Association
CCR	Code of California Regulations
CFR	Code of Federal Regulation
CSST	California – Certified Site Surveillance Technician
DOSH	Department of Occupational Safety and Health
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency (EPA)
FACS	Forensic Analytical Consulting Services, Inc.
FALI	Forensic Analytical Laboratories, Inc.
ND	None Detected
NESHAP	National Emissions Standard Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Science and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
PCM	Phase Contrast Microscopy
PLM	Polarized Light Microscopy
SGS	SGS - Forensic Laboratories
TEM	Transmission Electron Microscopy
TTLC	Total Threshold Limit Concentration
<	Less Than Reporting Limit

Executive Summary

Forensic Analytical Consulting Services, Inc. (FACS) was retained by the San Joaquin County Office of Education to perform an asbestos and lead paint survey of the building located at 2829 Transworld Drive in Stockon, California. The survey involved the surveying of any suspect asbestos-containing materials (ACM) and suspect paints and coatings which may be disturbed during a future renovation project. A summary list of suspect asbestos-containing materials which were identified and sampled is included in Appendix A of this report. A table reporting suspect lead-containing paints or coatings which were identified and sampled is included in Appendix B of this report. The survey was performed on March 5, 2024 for all spaces to be impacted as part of the Culinary project within the Venture Academy.

Asbestos

All suspect materials that were sampled during this survey were identified to not contain asbestos by laboratory analysis.

Please see Appendix A for a complete listing of materials sampled at the work areas and results from this survey. Any suspect materials not included must be assumed to be asbestos-containing materials until tested and proven not to contain asbestos.

Lead

All paints sampled did not contain detectable concentrations of lead above the laboratory's reporting limit.

Please see Appendix B for a complete listing of paints sampled at the work areas and results from this survey. Any paints not included in the survey must be handled as lead-containing unless sampled and proven otherwise.

FACS recommends that the results of this report be incorporated into any plans provided for this project for informational purposes.

Introduction

Forensic Analytical Consulting Services, Inc. (FACS) was retained by the San Joaquin County Office of Education to perform an asbestos and lead paint survey of the building located at 2829 Transworld Drive in Stockon, California. The survey involved any suspect asbestos-containing materials (ACM) and suspect paints and coatings which may be disturbed during a future renovation. The survey was performed on March 5, 2024 for all spaces to be impacted as part of the Culinary project within the Venture Academy.

Scope of Work

The purpose of this survey was to identify asbestos-containing materials (ACMs) and lead-containing paints and coatings which may be disturbed during the upcoming renovation project. The visual inspection, bulk sampling, and survey documentation was performed by Tyler Faison. Mr. Faison is a DOSH Certified Asbestos Consultant (CAC #22-6824) and CDPH Certified Lead Inspector/Assessor (LRC-00002454), as required under California regulations. The scope of the survey and the services provided by FACS included:

- Performing a visual inspection of the project area to identify accessible suspect asbestos-containing materials (ACMs) and lead-containing paints and coatings that will be disturbed during the planned project;
- Collection of bulk material samples for asbestos laboratory analysis by polarized light microscopy (PLM);
- Collection of bulk paint chip samples for lead laboratory analysis using atomic absorption spectrometry (AAS);
- Ensuring the technical quality of all work by using Asbestos Hazard Emergency Response Act (AHERA) accredited Building Inspectors;
- Ensuring the technical quality of all work by using California Department of Public Health (CDPH) Certified Lead Sampling Technicians and Inspector/Assessors;
- Consolidating data and findings into a report format.

Site Characterization

The building was comprised of common construction materials such as concrete, drywall, and single-ply roofing. Paints applied to the structures were primarily tan, white, and green.

Survey Methods

Document Review

No previous documentation was reviewed prior to the inspection. The extent of the planned project was provided by the San Joaquin County Office of Education during a pre-survey site visit.

Visual Inspection

Accessible building materials were visually inspected using the methods presented in the Federal AHERA regulations (40 CFR, Part 763). AHERA inspection methodology is required to be used for

inspections of K-12 schools and is generally accepted as the industry standard for all ACM inspections regardless of structure or facility type. Suspect ACMs were also physically assessed for friability, condition and possible disturbance factors.

All areas were accessible during this inspection.

Asbestos Inspection

Bulk Sample Collection

Bulk samples of identified homogeneous materials were collected in building areas that may be impacted by the planned renovation activities. Samples were collected of each separate homogeneous area. A homogeneous area is defined as a surfacing material, thermal system insulation, or miscellaneous material that is uniform in use, color and texture. Examples of homogeneous areas could include:

Vinyl floor tiles
False ceiling panels
Drywall with joint compound
Vinyl sheet flooring

The specific number of samples collected was determined by using the methods required by the Federal AHERA regulations (40 CFR, Part 763.86) as noted below:

1) For Surfacing Material:
   1,000 ft^2 or less - collect 3 samples
   1,001 to 5,000 ft^2 - collect 5 samples
   5,001 ft^2 or greater - collect 7 samples

2) For Thermal System Insulation:
   “In a randomly distributed manner” - collect 3 samples
   6 linear feet of patching or less - collect 1 sample
   cementitious pipe fittings - “In a manner sufficient to determine”

3) For all Miscellaneous Material:
   Collect samples "In a manner sufficient to determine whether material is ACM (asbestos-containing material) or not ACM..."

The suspect ACMs were sampled using a knife, chisel, scraper, drill or other similar coring device suitable to the type of material sampled to cut through its entire thickness and to ensure that a cross-section of the material was obtained. The material was then placed in an appropriately labeled container that was sealed and submitted to SGS-Forensic Laboratories for analysis. A unique sample number (e.g. PJ80105-01A) was assigned to each sample.

Bulk samples will be retained by the laboratory for one month unless otherwise instructed. After this period, the samples will be disposed of appropriately.

Bulk Sample Analysis

A total of seventeen (17) bulk samples were collected from a total of seven (7) suspect materials. Bulk samples were analyzed by SGS-Forensic Laboratories (SGS) in Hayward, California. SGS is accredited by the California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP) and the National Institute of Science and Technology's (NIST) National Voluntary Laboratory Accreditation Program (NVLAP). SGS participates in the National Institute for Occupational Safety and

Health (NIOSH) Proficiency Analytical Testing Program and has substantial experience in the analysis of asbestos.

All samples were analyzed using Polarized Light Microscopy with Dispersion Staining (PLM/DS) techniques in accordance with the methodology approved by the U.S. Environmental Protection Agency (EPA). The percentage of asbestos present in the samples was determined on the basis of a visual area estimation. The EPA defines asbestos-containing materials (ACM) as any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM). 40 CFR Part 763 identifies the lower limit of reliable quantification for asbestos using the PLM method as approximately one percent (1%) by volume. Regulations in California (CAL/OSHA Title 8 CCR 1529) define asbestos-containing construction materials (ACCM) as those materials having asbestos content of greater than one tenth of one percent (> 0.1%); therefore, for the purpose of this survey, any amount of asbestos detected will be considered positive. In addition to the percentages, the types of asbestos minerals are also reported. The PLM method is the standard method used to analyze asbestos bulk samples.

When "None Detected" (ND) appears in the laboratory results, it should be interpreted as meaning asbestos was not observed in the sample material.

Lead Inspection

The client-defined lead inspection was conducted in accordance with the CDPH Lead-Related Construction Program and modeled upon the sampling protocol described in “Chapter 7: Lead Based Paint Inspection” of the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (1997 Revision).

Cal/OSHA, in Title 8 California Code of Regulations (CCR) Section 1532.1, Lead in Construction Standard which implements California Labor Code 8716-6717, regulates all construction work where an employee may be occupationally exposed to lead. Paint or materials with any detectable level of lead is considered lead-containing by Cal/OSHA.

Bulk Sampling Methodology

During this inspection, FACS personnel collected five (5) bulk paint chip samples for laboratory confirmation of lead-content. Each sample was scraped from the substrate it had been applied to using a knife or chisel to obtain sufficient material for analysis. Each sample was given a unique marker number, identified on a chain-of-custody, packaged, and sent via FedEx to SGS in Hayward, California for analysis. SGS is accredited by the American Industrial Hygiene Association’s Environmental Lead Laboratory Accreditation Program for the analysis of lead in bulk paint chips by flame atomic absorption.

Regulations

Background

Asbestos is the name of a class of magnesium-silicate minerals that occur in fibrous form. Minerals that are included in this group are chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos. Although the chrysotile minerals are the most common type of asbestos found in the construction industry, all types of asbestos are regulated in the same manner. Asbestos has been used in more than 3,000 different building materials. Asbestos was added to building materials to: increase fire-resistance, insulate against heat, cold and sound, resist corrosion, and increase tensile strength. Common building materials that may contain asbestos include but are not limited to the following: floor tile, resilient sheet flooring, ceiling tile, mastics, roofing materials, fireproofing, acoustical treatments, wallboard, pipe and boiler insulations. Adverse health effects have been associated with the

inhalation of airborne asbestos. However, asbestos fibers that are tightly bound in the building material, may not represent an exposure hazard, unless disturbed in such a way that releases airborne fibers (i.e., cutting, drilling, sanding, and other abrasive methods).

Building Surveys

The following is a summary of some current Federal and California State regulations which contain requirements related to the performance of building surveys for asbestos. These summaries are not intended to be all inclusive and do not contain every aspect of the regulations discussed.

U.S. EPA National Emission Standard for Hazardous Air Pollutants (NESHAPs), 40 CFR Part 61

Under the NESHAPs regulation, no visible emissions are allowed during building demolition or renovation activities which involve regulated asbestos-containing materials. For this reason, all buildings must be surveyed for asbestos-containing materials prior to demolition or renovation. The EPA, CARB, and/or the local Air Quality Management District which implements EPA actions, must be notified prior to any building demolition even if no asbestos-containing materials are present.
Regulated asbestos-containing material (RACM) is defined as a) any friable material with an asbestos content of greater than one percent, or b) any non-friable material with asbestos content of greater than one percent that will, or could, become friable.

Asbestos Hazard Emergency Response Act (AHERA), 40 CFR Part 763, Subpart E

AHERA requires performance of asbestos surveys and the development of Asbestos Management Plans for all primary and secondary schools in the United States. Although this regulation applies to primary and secondary schools only, the procedures mandated under AHERA are considered the industry standard and are applied to all surveys performed by FACS unless otherwise specified by the building owner.

Worker Protection

California Assembly Bill AB3713, Health and Safety Code Division 20, Chapter 10.4, Section 25915-25924

The state of California has enacted legislation that requires building owners, employers, lessees, etc. to notify tenants, employees and contractors of the presence of asbestos in both friable and non-friable forms. In addition, preventive maintenance activities must be developed and communicated to these parties. Notification is required 15 days after the identification of ACM in the building, and annually thereafter.

Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1101 and 8 CCR 1529

The Federal and State Occupational Safety and Health Administrations (OSHA) require employers to implement specific work practices which protect workers from airborne asbestos exposure.

Building materials which contain even low levels of asbestos (<1%) can potentially generate significant concentrations of airborne asbestos fibers when disturbed. Therefore, control measures should be instituted which adequately address worker health and safety during planned renovation or demolition activities involving these materials. Cal/OSHA defines asbestos-containing construction materials as those materials having greater than one tenth of one percent asbestos (>0.1%). As stated previously, there is currently no viable method to accurately quantify asbestos at this level.

Hazardous Waste

Building materials reported to contain less than one percent (<1%) of asbestos are not considered hazardous by the U.S. EPA, and hence, may not require removal and disposal prior to demolition or renovation. Regulations may vary, however, between regional air quality management districts and/or other state agencies responsible for implementing EPA's rules. Therefore, local agencies should be contacted for specific ACM definitions and handling requirements. Cal/OSHA may also require special packaging and labeling on containers with asbestos-containing construction materials.

Composite sampling, which may potentially reduce the total asbestos content of the material, is only permitted when sampling joint compound, tape, and gypsum wallboard according to EPA's Asbestos NESHAP Clarification Regarding Analysis of Multi-Layered Systems (40 CFR Part 61 FRL-4821-7).

Lead

Cal/OSHA Lead (8 CCR 1532.1) & CDPH (Title 17)

If paints or coatings containing any detectable concentration of lead will be impacted, a project should be considered regulated by Cal/OSHA as lead-related construction (8 CCR 1532.1).

A contractor who has employees that may be occupationally exposed to lead during a project must perform an initial determination regarding worker exposures to lead, which may be based on personal air monitoring at the start of the project, prior employee monitoring from the past 12 months under workplace conditions closely resembling the current project, or objective data demonstrating that exposures will not exceed the Cal/OSHA action level (30 micrograms per cubic meter of air). It is the contractor's responsibility to conduct their initial determination and comply with any relevant Cal/OSHA requirements.

Workers disturbing existing paints or coatings during a project must have lead awareness or action level training depending on the initial exposure determination and lead-safe work practices must be used. Disturbance of lead-containing paints or coatings must be performed within a contained area to prevent the spread and build-up of lead dust in order to comply with CDPH requirements. HEPA vacuums, dustless tools or shrouds, and/or intact removal of components should be employed to minimize lead dust generation and properly cleanup work areas following disturbance to lead-containing materials during a project. Waste generated during disturbance to lead-containing materials must be profiled in a hazardous waste determination to ascertain proper disposal requirements.

If the initial determination or initial exposure monitoring shows that workers impacting lead can be expected to be or are shown to be exposed to lead above the Cal/OSHA permissible exposure level (50 micrograms per cubic meter of air) workers and supervisors must have the requisite training and CDPH lead worker or supervisor certification.

Findings and Recommendations

Forensic Analytical Consulting Services, Inc. (FACS) was retained by the San Joaquin County Office of Education to perform an asbestos and lead paint survey of the building at 2829 Transworld Drive in Stockon, California.

Asbestos

All suspect materials sampled during this survey were identified to not contain asbestos by laboratory analysis.

Please see Appendix A for a complete listing of materials sampled at the work areas and results from this survey. Any suspect materials not included must be assumed to be asbestos-containing materials until tested and proven not to contain asbestos.

Lead

All paints sampled did not contain detectable concentrations of lead above the laboratory's reporting limit.

Please see Appendix B for a complete listing of paints sampled at the work areas and results from this survey. Any paints not included in the survey must be handled as lead-containing unless sampled and proven otherwise.

FACS recommends that the results of this report be incorporated into any plans provided for this project for informational purposes.

Limitations

This investigation is limited to the conditions and practices observed, and information made available to FACS. The methods, conclusions and recommendations provided are based on FACS' judgment, expertise, and the standard of practice for professional service. They are subject to the limitations and variability inherent in the methodology employed. As with all environmental investigations, this investigation is limited to the defined scope and does not purport to set forth all hazards, nor indicate that other hazards do not exist.

Please do not hesitate to contact our office at (209) 551-2000 with any questions or concerns. Thank you for the opportunity to assist San Joaquin County Office of Education with promoting worker safety and a healthy environment.

Respectfully,
FORENSIC ANALYTICAL

Tyler Faison
Assistant Local Director, Central Valley
Cal/OSHA CAC #22-6824
CDPH LRC-00002454

Reviewed by:
FORENSIC ANALYTICAL

Chris Chipponeri
Local Director, Central Valley
Cal/OSHA CAC #10-4633
CDPH LRC-0000078

Appendix A

Asbestos Survey Summary Table, Sample Chain-of-Custody and Laboratory Results Report

Asbestos Survey Summary (Lab Report # B357703) SJCOE – 2829 Transworld Drive – Culinary HBM Survey Survey Date: March 5, 204						
Sample Numbers	**Material Description**	**Location(s) of Material**	**Material Number**	**Asbestos Content (percent)**	**Asbestos NESHAP Category**	**Approximate Quantity**
01A-F	Drywall – Medium Texture	Room 38, Room 37, MPR	01	Layer: White Drywall: None Detect Layer: White Joint Compound: None Detect Layer: Drywall Tape: None Detect Layer: White Joint Compound: None Detect Layer: Paint	NA	NA
02A	4” Baseboard and Mastic - Tan	Room 38, Room 37, MPR	02	Layer: Tan Non-Fibrous Material: None Detect Layer: Beige Mastic: None Detect Layer: White Texture: None Detect Layer: Paint: None Detect	NA	NA
03A, 03B	Concrete	Room 38, Room 37, MPR	03	Layer: Grey Cementitious Material: None Detect	NA	NA
04A	Sink Coating	Room 38	04	Layer: Grey Non-Fibrous Material: None Detect Layer: Grey Semi-Fibrous Material: None Detect	NA	NA
05A	FRP - White	Room 37	05	Layer: White Non-Fibrous Material: None Detect Layer: Yellow Adhesive: None Detect Layer: White Semi-Fibrous Material: None Detect	NA	NA
06A, 06B	2’ x 4’ False Ceiling Panels	MPR, Hallway	06	Layer: Tan Fibrous Material: None Detect Layer: Paint: None Detect	NA	NA

Asbestos Survey Summary (Lab Report # B357703) SJCOE – 2829 Transworld Drive – Culinary HBM Survey Survey Date: March 5, 204						
Sample Numbers	**Material Description**	**Location(s) of Material**	**Material Number**	**Asbestos Content (percent)**	**Asbestos NESHAP Category**	**Approximate Quantity**
07A-07C	Single Ply Roofing	Roof (around skylight)	07	Layer: White Non-Fibrous Material: None Detect Layer: Grey Semi-Fibrous Material: None Detect Layer: White Felt (4 layers): None Detect Layer: White Semi-Fibrous Material: None Detect	NA	NA

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Analysis Request Form (COC)

Client Name & Address: FACS Modesto 313 Banner Court, STE B Modesto, CA 95350	Client No.: Mod08
PO / Job#: PJ80862	Date: 3.5.2024
Turn Around Time: Same Day / 1Day / 2Day / ~~3Day~~ / 4Day / ~~5Day~~ 3 DAY	
☐ PCM: ☐ NIOSH 7400A / ☐ NIOSH 7400B ☐ Rotometer	
☒ PLM: ☒ Standard / ☐ Point Count 400-1000 / ☐ CARB 435	
Contact: Tyler Faison	Phone: (209) 551-2000
E-mail: tyler.faison@facs.com	☐ TEM Air: ☐ AHERA / ☐ Yamate2 / ☐ NIOSH 7402 ☐ TEM Bulk: ☐ Quantitative / ☐ Qualitative / ☐ Chatfield ☐ TEM Water: ☐ Potable / ☐ Non-Potable / ☐ Weight % ☐ TEM Dust: ☐ D5755 (microvac) / ☐ D6480 (wipe)
Site Name: San Joaquin County Office of Education	☐ IAQ Particle Identification ☐ Opaques/Char (Wildfire) ☐ Limited Particle ID (Wildfire) ☐ Special Project
Site Location: 2829 Transworld Drive - Venture Academy	☐ Metals Analysis Matrix: Method: Analytes:
Comments:	☐ Silica in Air ☐ w/Gravimetry ☐ Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
PJ80862 - 01A	3.5.2024	Drywall - Medium Texture w/ JC Room 38 - SE Corner	A P C				
PJ80862 - 01B	3.5.2024	Drywall - Medium Texture w/ JC Room 38 - SW Corner	A P C				
PJ80862 - 01C	3.5.2024	Drywall - Medium Texture w/ JC Room 38 - NE Corner	A P C				
PJ80862 - 01D	3.5.2024	Drywall - Medium Texture w/ JC Room 37 - NE Corner	A P C				
PJ80862 - 01E	3.5.2024	Drywall - Medium Texture w/ JC Room 37 - NW Corner	A P C				
PJ80862 - 01F	3.5.2024	Drywall - Medium Texture w/ JC Room 37 - SE Corner	A P C				
PJ80862 - 02A	3.5.2024	4" Baseboard and Mastic - Tan Room 38 - East Center	A P C				
PJ80862 - 02B	3.5.2024	4" Baseboard and Mastic - Tan Room 37 - SE Corner	A P C				
PJ80862 - 03A	3.5.2024	Concrete Room 37 - SW Corner	A P C				
PJ80862 - 03B	3.5.2024	Concrete Room 37 - SW Corner	A P C				

Sampled By: Tyler Faison Date/Time: 3.5.2024 Shipped Via: ☒ Fed Ex ☐ UPS ☐ US Mail ☐ Courier ☐ Drop Off ☐ Other:

Relinquished By:	Relinquished By:	Relinquished By:
Date / Time:	Date / Time:	Date / Time:
Received By:	Received By:	Received By:
Date / Time: MAR 06 2024 10:30	Date / Time:	Date / Time:
Condition Acceptable? ☐ Yes ☐ No	Condition Acceptable? ☐ Yes ☐ No	Condition Acceptable? ☐ Yes ☐ No

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Analysis Request Form (COC)

Client Name & Address: FACS Modesto 313 Banner Court, STE B Modesto, CA 95350	Client No.: Mod08
PO / Job#: PJ80862	Date: 3.5.2024
Turn Around Time: Same Day / 1Day / 2Day / 3Day / 4Day / 5Day	
☐ PCM: ☐ NIOSH 7400A / ☐ NIOSH 7400B ☐ Rotometer	
☒ PLM: ☒ Standard / ☐ Point Count 400 - 1000 / ☐ CARB 435	
Contact: Tyler Faison	Phone: (209) 551-2000
☐ TEM Air: ☐ AHERA / ☐ Yamate2 / ☐ NIOSH 7402 ☐ TEM Bulk: ☐ Quantitative / ☐ Qualitative / ☐ Chatfield ☐ TEM Water: ☐ Potable / ☐ Non-Potable / ☐ Weight % ☐ TEM Dust: ☐ D5755 (microvac) / ☐ D6480 (wipe)	
E-mail: tyler.faison@facs.com	
Site Name: San Joaquin County Office of Education	☐ IAQ Particle Identification ☐ Opaques/Char (Wildfire) ☐ Limited Particle ID (Wildfire) ☐ Special Project
Site Location: 2829 Transworld Drive - Venture Academy	☐ Metals Analysis Matrix: Method: Analytes:
Comments:	☐ Silica in Air ☐ w/Gravimetry ☐ Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
PJ80862 - 04A	3.5.2024	Sink Coating - Grey Room 38 - North Center	A P C				
PJ80862 - 05A	3.5.2024	FRP - White Room 37 - West Side Center	A P C				
PJ80862 - 06A	3.5.2024	2x4 FCP - PF MPR - North Center	A P C				
PJ80862 - 06B	3.5.2024	2x4 FCP - PF MPR - North Center	A P C				
PJ80862 - 07A	3.5.2024	Single Ply Roofing West Center at skylight	A P C				
PJ80862 - 07B	3.5.2024	Single Ply Roofing West Center at skylight	A P C				
PJ80862 - 07C	3.5.2024	Single Ply Roofing West Center at skylight	A P C				
			A P C				
			A P C				
			A P C				

Sampled By: Tyler Faison Date/Time: 3.5.2024 Shipped Via: ☒ Fed Ex ☐ UPS ☐ US Mail ☐ Courier ☐ Drop Off ☐ Other:

Relinquished By:	Relinquished By:	Relinquished By:
Date / Time:	Date / Time:	Date / Time:
Received By:	Received By:	Received By:
Date / Time: MAR 06 2024 10:30	Date / Time:	Date / Time:
Condition Acceptable? ☐ Yes ☐ No	Condition Acceptable? ☐ Yes ☐ No	Condition Acceptable? ☐ Yes ☐ No

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Chicago Office: 3020 Woodcreek Drive, Suite C, Downers Grove, IL 60515 • Phone: 341/465-2464

Final Report

Bulk Asbestos Analysis

(EPA Method 40CFR, Part 763, Appendix E to Subpart E and EPA 600/R-93-116, Visual Area Estimation)
NVLAP Lab Code: 101459-0

FACS - Modesto
Tyler Faison
313 Banner Court
Suite B
Modesto, CA 95356

Client ID: MOD08
Report Number: B357703
Date Received: 03/06/24
Date Analyzed: 03/11/24
Date Printed: 03/11/24
First Reported: 03/11/24

Job ID/Site: PJ80862; San Joaquin County Office of Education 2829 Transworld Drive Stockton CA

SGSFL Job ID: MOD08
Total Samples Submitted: 17
Total Samples Analyzed: 17

Date(s) Collected: 03/05/2024

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ80862-01A	12733339						
Layer: White Drywall			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Drywall Tape			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (20 %) Fibrous Glass (10 %)							
PJ80862-01B	12733340						
Layer: White Drywall			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Drywall Tape			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (20 %) Fibrous Glass (10 %)							
PJ80862-01C	12733341						
Layer: White Drywall			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Drywall Tape			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (20 %) Fibrous Glass (10 %)							
PJ80862-01D	12733342						
Layer: White Drywall			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Drywall Tape			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (20 %) Fibrous Glass (10 %)							

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Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ80862-01E	12733343						
Layer: White Drywall			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Drywall Tape			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components: Cellulose (20 %) Fibrous Glass (10 %)		**Asbestos (ND)**					
PJ80862-01F	12733344						
Layer: White Drywall			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Drywall Tape			**ND**				
Layer: White Joint Compound			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components: Cellulose (20 %) Fibrous Glass (10 %)		**Asbestos (ND)**					
PJ80862-02A	12733345						
Layer: Tan Non-Fibrous Material			**ND**				
Layer: Beige Mastic			**ND**				
Layer: White Texture			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ80862-02B	12733346						
Layer: Tan Non-Fibrous Material			**ND**				
Layer: Beige Mastic			**ND**				
Layer: White Texture			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ80862-03A	12733347						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ80862-03B	12733348						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace)		**Asbestos (ND)**					
PJ80862-04A	12733349						
Layer: Grey Non-Fibrous Material			**ND**				
Layer: Grey Semi-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components: Cellulose (Trace) Synthetic (Trace)		**Asbestos (ND)**					

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Report Number: B357703

Client Name: FACS - Modesto **Date Printed:** 03/11/24

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ80862-05A	12733350						
Layer: White Non-Fibrous Material			**ND**				
Layer: Yellow Adhesive			**ND**				
Layer: White Semi-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (10 %) Fibrous Glass (15 %)							
PJ80862-06A	12733351						
Layer: Tan Fibrous Material			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (35 %) Fibrous Glass (45 %)							
PJ80862-06B	12733352						
Layer: Tan Fibrous Material			**ND**				
Layer: Paint			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (35 %) Fibrous Glass (45 %)							
PJ80862-07A	12733353						
Layer: White Non-Fibrous Material			**ND**				
Layer: Grey Semi-Fibrous Material			**ND**				
Layer: White Non-Fibrous Material			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Semi-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (55 %) Fibrous Glass (10 %)							
Comment: Bulk complex sample.							
PJ80862-07B	12733354						
Layer: White Non-Fibrous Material			**ND**				
Layer: Grey Semi-Fibrous Material			**ND**				
Layer: White Non-Fibrous Material			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Semi-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (55 %) Fibrous Glass (10 %)							
Comment: Bulk complex sample.							

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Report Number: B357703

Client Name: FACS - Modesto **Date Printed:** 03/11/24

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
PJ80862-07C	12733355						
Layer: White Non-Fibrous Material			**ND**				
Layer: Grey Semi-Fibrous Material			**ND**				
Layer: White Non-Fibrous Material			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Felt			**ND**				
Layer: White Semi-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Cellulose (55 %) Fibrous Glass (10 %)							
Comment: Bulk complex sample.							

Maria E. Casper

Maria Cosper, Laboratory Supervisor, Hayward Laboratory

Note: Limit of Quantification ('LOQ') = 1%. 'Trace' denotes the presence of asbestos below the LOQ. 'ND' = 'None Detected'.

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Appendix B

Lead Paint Chip Summary, Sample Chain-of-Custody, Laboratory Results Report and CDPH 8552 Form

Lead Paint Chip Summary (Lab Report #M256802) San Joaquin County Office of Education – 2829 Transworld Drive – HBM Survey Survey Date: March 5, 2024					
Sample Number	**Component Location**	**Component**	**Color**	**Substrate**	**Analytical Results (weight percent of lead)**
01Pb	Room 37, Room 38	Door Frame	White	Metal	<0.02
02Pb	Room 37	Wall	Black	Drywall	<0.007
03Pb	Room 37	Door Frame	Black	Metal	<0.009
04Pb	Room 37, Room 38	Floor	Tan	Concrete	<0.007
05Pb	Roof	Roofing	White	Rubber	<0.006

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Analysis Request Form (COC)

Client Name & Address: FACS Modesto 313 Banner Court, STE B Modesto, CA 95350	Client No.: Mod08
PO / Job#: PJ80862	Date: 3.5.2024
Turn Around Time: ☐ Same Day / ☐ 1Day / ☐ 2Day / ☒ 3Day / ☐ 4Day / ☐ 5Day	
☐ PCM: ☐ NIOSH 7400A / ☐ NIOSH 7400B ☐ Rotometer	
☐ PLM: ☐ Standard / ☐ Point Count 400 - 1000 / ☐ CARB 435	
Contact: Tyler Faison	Phone: (209) 551-2000
☐ TEM Air: ☐ AHERA / ☐ Yamate2 / ☐ NIOSH 7402 ☐ TEM Bulk: ☐ Quantitative / ☐ Qualitative / ☐ Chatfield ☐ TEM Water: ☐ Potable / ☐ Non-Potable / ☐ Weight % ☐ TEM Dust: ☐ D5755 (microvac) / ☐ D6480 (wipe)	
E-mail: tyler.faison@facs.com	
Site Name: San Joaquin County Office of Education	☐ IAQ Particle Identification ☐ Opaques/Char (Wildfire) ☐ Limited Particle ID (Wildfire) ☐ Special Project
Site Location: 2829 Transworld Drive - Venture Academy	☒ Metals Analysis Matrix: S Method: FLAME AA Analytes: Pb
Comments:	☐ Silica in Air ☐ w/Gravimetry ☐ Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
PJ80862 - 01Pb	3.5.2024	White Metal Door Frame Room 37 - SE Corner	A P C				
PJ80862 - 02Pb	3.5.2024	Black Drywall Wall Room 37 - South Center	A P C				
PJ80862 - 03Pb	3.5.2024	Black Metal Door Frame MPR - North CenterRoom 37 - North Door	A P C				
PJ80862 - 04Pb	3.5.2024	Tan Concrete Floor Room 38 - East Center	A P C				
PJ80862 - 05Pb	3.5.2024	Single Ply Roofing West Center at skylight	A P C				
			A P C				
			A P C				
			A P C				
			A P C				
			A P C				

Sampled By: Tyler Faison Date/Time: 3.5.2024 Shipped Via: ☒ Fed Ex ☐ UPS ☐ US Mail ☐ Courier ☐ Drop Off ☐ Other:

Relinquished By:	Relinquished By:	Relinquished By:
Date / Time: 3.5.24	Date / Time:	Date / Time:
Received By:	Received By:	Received By:
Date / Time: MAR 06 2024 10:30am	Date / Time:	Date / Time:
Condition Acceptable? ☐ Yes ☐ No	Condition Acceptable? ☐ Yes ☐ No	Condition Acceptable? ☐ Yes ☐ No

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Chicago Office: 3020 Woodcreek Drive, Suite C, Downers Grove, IL 60515 • Phone: 341/465-2464

Metals Analysis of Paints

(AIHA-LAP, LLC Accreditation, Lab ID #101762)

FACS - Modesto
Tyler Faison
313 Banner Court
Suite B
Modesto, CA 95356

Client ID: MOD08
Report Number: M258118
Date Received: 03/06/24
Date Analyzed: 03/11/24
Date Printed: 03/11/24
First Reported: 03/11/24

Job ID / Site: PJ80862; San Joaquin County Office of Education 2829 Transworld Drive Stockton CA
SGSFL Job ID: MOD08

Date(s) Collected: 3/5/24
Total Samples Submitted: 5
Total Samples Analyzed: 5

Sample Number	Lab Number	Analyte	Result	Result Units	Reporting Limit*	Method Reference
PJ80862-01PB	30935736	Pb	< 0.02	wt%	0.02	EPA 3050B/7000B
PJ80862-02PB	30935737	Pb	< 0.007	wt%	0.007	EPA 3050B/7000B
PJ80862-03PB	30935738	Pb	< 0.009	wt%	0.009	EPA 3050B/7000B
PJ80862-04PB	30935739	Pb	< 0.007	wt%	0.007	EPA 3050B/7000B
PJ80862-05PB	30935740	Pb	< 0.006	wt%	0.006	EPA 3050B/7000B

* The Reporting Limit represents the lowest amount of analyte that the laboratory can confidently detect in the sample, and is not a regulatory level. The Units for the Reporting Limit are the same as the Units for the Final Results.

Kevin Poon

Kevin Poon, Laboratory Supervisor, Hayward Laboratory

Note* Sampling data used in this report was provided by the client as noted on the associated chain of custody form.

3777 Depot road, Suite 409, Hayward, CA 94545 | Phone: 510.887.8828 / 800.827.3274 Fax: 510.887.4218 | https://falaboratories.sgs.com

State of California—Health and Human Services Agency

California Department of Public Health

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation 3.5.2024

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

☑ Lead Inspection ☐ Risk assessment ☐ Clearance Inspection ☐ Other (specify) _____

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
2829 Transworld Drive	Stockton	San Joaquin	95206

Construction date (year) of structure	Type of structure	Children living in structure?
Unknown	☐ Multi-unit building ☑ School or daycare ☐ Single family dwelling ☐ Other_____	☐ Yes ☐ No ☐ Don't Know

Section 4 — Owner of Structure (if business/agency, list contact person)

Name	Telephone number
San Joaquin County Office of Education	209-468-9061

Address [number, street, apartment (if applicable)]	City	State	Zip Code
2922 Transworld Drive	Stockton	CA	95206

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

☑ No lead-based paint detected ☐ Intact lead-based paint detected ☐ Deteriorated lead-based paint detected

☑ No lead hazards detected ☐ Lead-contaminated dust found ☐ Lead-contaminated soil found ☐ Other_____

Section 6 — Individual Conducting Lead Hazard Evaluation

Name	Telephone number
Tyler Faison	209-551-2000

Address [number, street, apartment (if applicable)]	City	State	Zip Code
313 Banner Court, STE B	Modesto	CA	95356

CDPH certification number	Signature	Date
I/A LRC-00002454		3/12/2024

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
B. Each testing method, device, and sampling procedure used;
C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector

Second copy and attachments retained by owner

Third copy only (no attachments) mailed or faxed to:

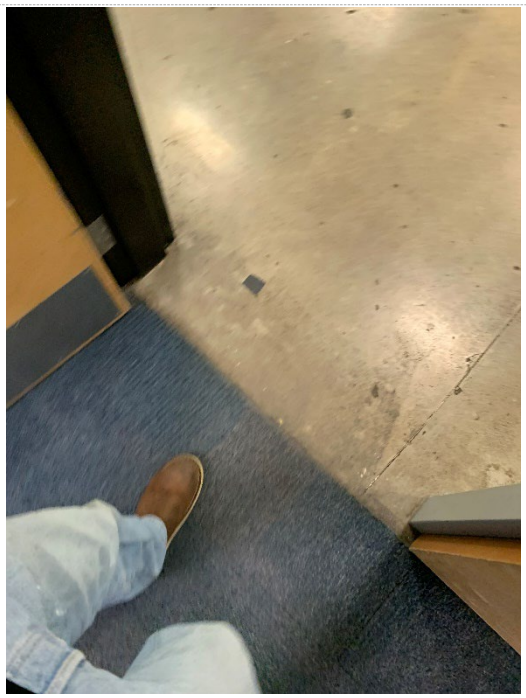
California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656

Appendix C

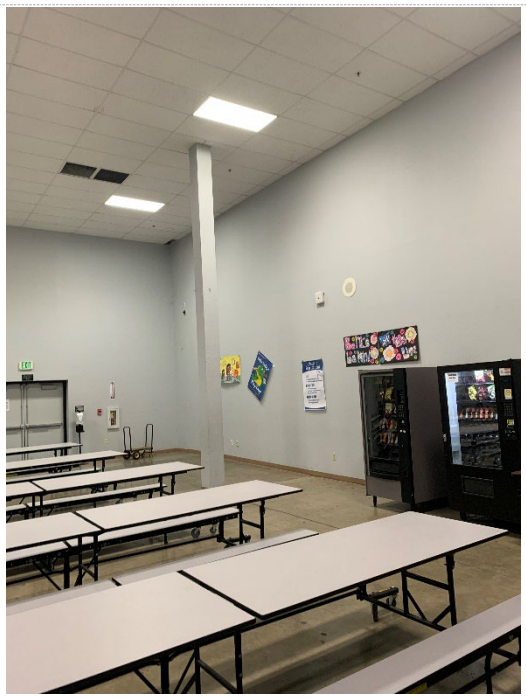
Site Photos and Sample Location Drawing

Room 38

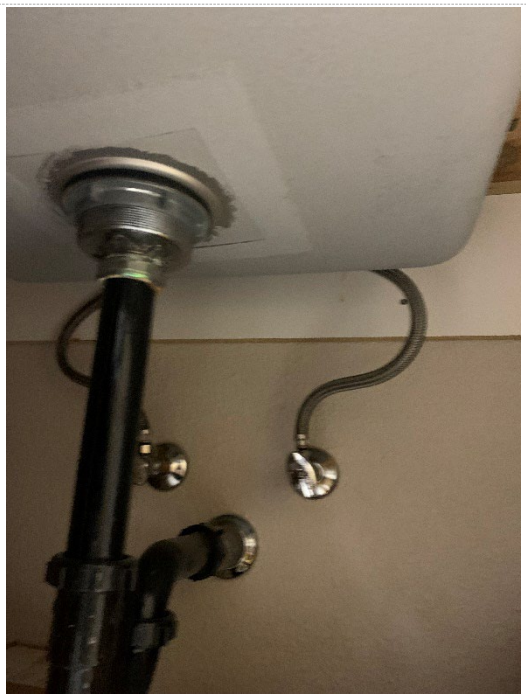
Room 37



Concrete Flooring



MPR – 2x4 False Ceiling Panels

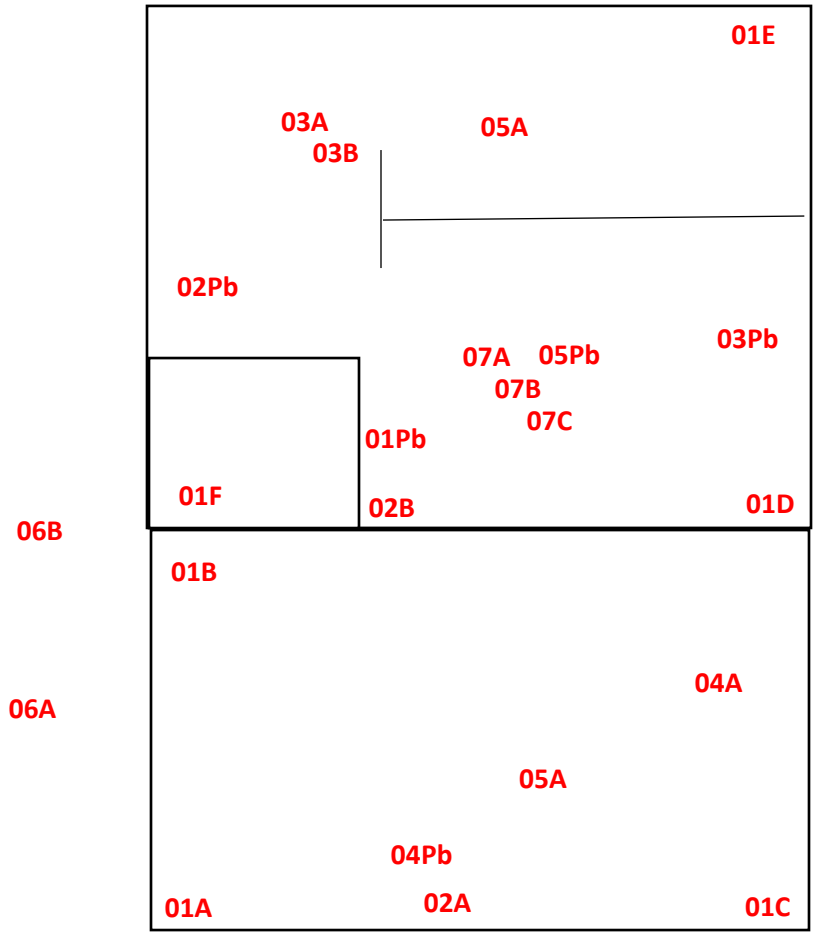
	
Sink Coating	Single Ply Roofing

FACS
Forensic Analytical Consulting Services

MAP WITH ASSOCIATED SAMPLE LOCATIONS

Site Name:	SJCOE – 2829 Transworld Drive – Culinary HBM Survey

N



NOT DRAWN TO SCALE

Appendix D
Certifications of Personnel and Laboratories

STATE OF CALIFORNIA Gavin Newsom, Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
Division of Occupational Safety and Health-Asbestos Certification
1750 Howe Avenue, Suite 460
Sacramento, CA 95825
(916) 574-2993 Office http://www.dir.ca.gov/dosh/asbestos.html actu@dir.ca.gov

008186824C **461** **463**

January 10, 2024

Tyler J Faison
3417 Switzer Avenue
Modesto CA 95350

Dear Certified Asbestos Consultant or Technician:

Enclosed is your certification card. **To maintain your certification, you must abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card. [8 CCR 341.15(h)(1)].

Please hold and do not send copies of your required AHERA refresher renewal certificates to our office until you apply for renewal of your certification.

Certificates must be kept current if you are actively working as a CAC or CSST. The grace period is only for those who are not actively working as an asbestos consultant or site surveillance technician.

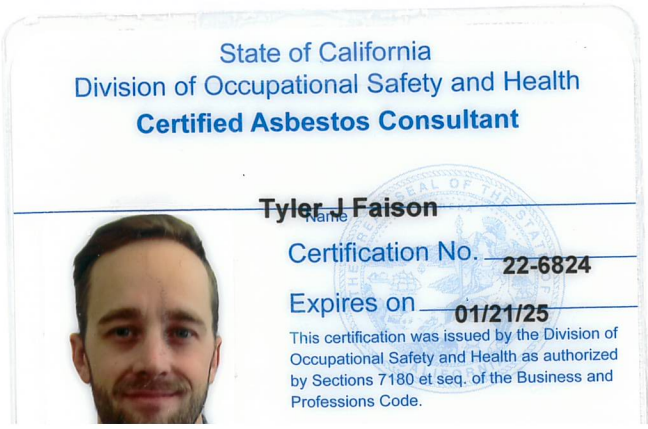
Please contact our office at the above address or email w any changes in your contact/mailing information within 15 days of the change.

Sincerely,

Kevin Graulich
Principal Safety Engineer

Attachment: Certification Card

cc: File



Forensic Analytical Consulting Services, Inc.

This is to confirm that

Tyler Faison

Has attended the four-hour

AHERA Refresher Course for Asbestos Inspectors

And has completed the requisite training for

asbestos accreditation under TSCA Title II

September 05, 2023

Certificate Number: FACSBIR1519

Valid Until: 9/05/24

Cal/OSHA Approval Number: CA-025-06

FACS
Forensic Analytical Consulting Services

Fred J. Vinciguerra, Chief Executive Officer
Forensic Analytical Consulting Services,Inc.
21228 Cabot Blvd, Hayward, CA 94545
(800) 677-1483

California Department of PublicHealth

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
 **Tyler Faison**	Lead Project Monitor	LRC-00002383	12/26/2024
	Lead Inspector/Assessor	LRC-00002454	8/13/2024

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD

STATE OF CALIFORNIA Gavin Newsom, Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
Division of Occupational Safety and Health-Asbestos Certification
1750 Howe Avenue, Suite 460
Sacramento, CA 95825
(916) 574-2993 Office http://www.dir.ca.gov/dosh/asbestos.html actu@dir.ca.gov

005174633C **339**

June 05, 2023

Christopher J Chipponeri
1401 Louise Avenue
Modesto CA 95350

Dear Certified Asbestos Consultant or Technician:

Enclosed is your certification card. **To maintain your certification, you must abide by the rules printed on the back of the certification card.**

Your certification is valid for a period of one year. If you wish to renew your certification, you must apply for renewal at least 60 days before the expiration date shown on your card. [8 CCR 341.15(h)(1)].

Please hold and do not send copies of your required AHERA refresher renewal certificates to our office until you apply for renewal of your certification.

Certificates must be kept current if you are actively working as a CAC or CSST. The grace period is only for those who are not actively working as an asbestos consultant or site surveillance technician.

Please contact our office at the above address or email w any changes in your contact/mailing information within 15 days of the change.

Sincerely,

Kevin Graulich
Principal Safety Engineer

Attachment: Certification Card

cc: File


State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

Christopher J Chipponeri
Name

Certification No. **10-4633**

Expires on **06/16/24**

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

Renewal – Card Attached

Forensic Analytical Consulting Services, Inc.

This is to confirm that

Chris Chipponeri

Has attended the four-hour

AHERA Refresher Course for Asbestos Inspectors

And has completed the requisite training for

asbestos accreditation under TSCA Title II

September 05, 2023

Certificate Number: FACSBIR1518

Valid Until: 9/05/24

Cal/OSHA Approval Number: CA-025-06

FACS
Forensic Analytical
Consulting Services

Fred J. Vinciguerra, Chief Executive Officer
Forensic Analytical Consulting Services,Inc.
21228 Cabot Blvd, Hayward, CA 94545
(800) 677-1483

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
 **Chris Chipponeri**	Lead Inspector/Assessor	LRC-00000782	6/20/2024

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 101459-0

SGS Forensic Laboratories

Hayward, CA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2023-07-01 through 2024-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

SGS Forensic Laboratories
3777 Depot Road, Suite 409
Hayward, CA 94545-2761
Nerissa Platon
Phone: 510-266-8183
Email: nerissa.platon@sgs.com
http://www.falaboratories.com

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 101459-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

AIHA Laboratory Accreditation Programs, LLC

acknowledges that

SGS Forensic Laboratories

3777 Depot Rd, Suite 409, Hayward, CA 94545-2761

Laboratory ID: LAP-101762

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs, LLC (AIHA LAP) accreditation to the ISO/IEC 17025:2017 international standard, General Requirements for the Competence of Testing and Calibration Laboratories in the following:

LABORATORY ACCREDITATION PROGRAMS

☑	**INDUSTRIAL HYGIENE**	Accreditation Expires: July 01, 2025
☑	**ENVIRONMENTAL LEAD**	Accreditation Expires: July 01, 2025
☑	**ENVIRONMENTAL MICROBIOLOGY**	Accreditation Expires: July 01, 2025
☐	**FOOD**	Accreditation Expires:
☐	**UNIQUE SCOPES**	Accreditation Expires:
☐	**BERYLLIUM FIELD/MOBILE**	Accreditation Expires:

Specific Field(s) of Testing/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached Scope of Accreditation. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2017 and AIHA LAP requirements. This certificate is not valid without the attached Scope of Accreditation. Please review the AIHA LAP website (www.aihaaccreditedlabs.org) for the most current Scope.

Cheryl O Morton
Managing Director, AIHA Laboratory Accreditation Programs, LLC

Revision21: 05/15/2023

Date Issued: 08/01/2023

Right People

Right Perspective

Right Now

www.forensicanalytical.com