ADDENDUM NO. 1

September 27, 2024

(CCS) California Children Services Medical Therapy Unit at Santa Fe Portable Modernization Project
OAKLAND UNIFIED SCHOOL DISTRICT

OUSD PROJECT NUMBER 21115

Oakland Unified School District
Facilities Planning & Management
955 High Street, Oakland, CA 94601

The following changes, additions, modifications, and corrections hereinafter set forth shall apply to the Bid Documents for the project and shall be made a part thereof and subject to all the requirements thereof, as if originally specified and/or shown.

Addendum No 1 to reference: Additional Specifications & Drawings:

Ref#1: TOC – Table of Contents

Ref#2: Santa Fe Portables Specifications: 00 01 07 through 33 46 00

Ref#3: Drawings See link below:

https://drive.google.com/drive/folders/1uQyA8ubtOubN7xhC0-Y5ER8tZSIkT-q1?usp=sharing

or contact our Printing Facility East Bay Blue Print at 510-261-2990 to obtain a copy. Website:www.eastbayblueprint.com

See attachments:
TOC
Portables Specifications
Drawings

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE FORM OF PROPOSAL

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OAKLAND UNIFIED SCHOOL DISTRICT

PROJECT SPECIFICATIONS

Santa Fe CCS Portables

OUSD
955 High Street
Oakland, CA 94601

SECTION 00 01 07
Seals Page

Santa Fe CCS Portables

915 54th Street
Oakland, CA 94608

Architectural	Structural	Mechanical & Plumbing
Electrical	Civil	

Date: 9/27/2024

Hibser Yamauchi Architects, Inc.
300 27th Street
Oakland, CA 94606
Tel: (510) 446-2222

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EXISTING CONDITIONS
DOCUMENT 00 21 01

1. Summary

The attached documents describe existing conditions at or near the Project, and use of information available regarding existing conditions. These documents are **not** part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

2. Reports and Information on Existing Conditions

a. Documents providing a general description of the Site and conditions of the Work may have been collected by Oakland Unified School District ("District"), its consultants, contractors, and tenants. These documents may, but are not required to, include previous contracts, contract specifications, tenant improvement contracts, as-built drawings, utility drawings, and information regarding underground facilities.

b. Information regarding existing conditions may be inspected at the District offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports, documents, and other information are **not** part of the Contract Documents. These reports, documents, and other information do **not** excuse Contractor from fulfilling Contractor's obligation to independently investigate any or all existing conditions or from using reasonable prudent measures to avoid damaging existing improvements.

c. Information regarding existing conditions may also be included in the Project Manual, but shall **not** be considered part of the Contract Documents.

d. Prior to commencing this Work, Contractor and the District's representative shall survey the Site to document the condition of the Site. Contractor will record the survey in digital videotape format and provide an electronic copy to the District within fourteen (14) days of the survey.

e. Contractor may also document any pre-existing conditions in writing, provided that both the Contractor and the District's representative agree on said conditions and sign a memorandum documenting the same.

f. The reports and other data or information regarding existing conditions and underground facilities at or contiguous to the Project are the following:

1) Original Construction Drawings.
2) Survey of Site.
3) Geotechnical Report(s).
4) Hazardous Material Report(s).
5) Videotaped Survey(s).

3. Use of Information

a. Information regarding existing conditions was obtained only for use of District and its consultants, contractors, and tenants for planning and design and is **not** part of the Contract Documents.

b. District does not warrant, and makes no representation regarding, the accuracy or thoroughness of any information regarding existing conditions. Bidder represents and agrees that in submitting a bid it is not relying on any information regarding existing conditions supplied by District.

c. Under no circumstances shall District be deemed to warrant or represent existing above-ground conditions, as-built conditions, or other actual conditions, verifiable by independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder must perform as a condition to bidding and Bidder should not and shall not rely on this information or any other information supplied by District regarding existing conditions.

d. Any information shown or indicated in the reports and other data supplied herein with respect to existing underground facilities at or contiguous to the Project may be based upon information and data furnished to District by the District's employees and/or consultants or builders of such underground facilities or others. District does not assume responsibility for the completeness of this information, and Bidder is solely responsible for any interpretation or conclusion drawn from this information.

e. District shall be responsible only for the general accuracy of information regarding underground facilities, and only for those underground facilities that are owned by District, and only where Bidder has conducted the independent investigation required of it pursuant to the Instructions to Bidders, and discrepancies are not apparent.

4. Investigations/Site Examinations

a. Before submitting a bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of Contract Documents.

b. On request, District will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a bid. Bidders must fill all holes and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be

performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and District's prior approval.

END OF DOCUMENT

GEOTECHNICAL DATA
DOCUMENT 00 21 02

1. Summary

The attached one or more geotechnical documents describe geotechnical data at or near the Project that is in the District's possession available for Contractor's review, and use of data resulting from various investigations. The attached documents are part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

2. Geotechnical Reports

a. Geotechnical reports may have been prepared for and around the Site and/or in connection with the Work by soil investigation engineers hired by Oakland Unified School District ("District"), and its consultants, contractors, and tenants.

b. Geotechnical reports may be inspected at the District offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports are part of the Contract Documents.

c. The reports and drawings of physical conditions that may relate to the Project are the following:

Geotechnical Engineering and Geologic Hazards Study

3. Use of Data

a. Geotechnical data were obtained only for use of District and its consultants, contractors, and tenants for planning and design and are a part of Contract Documents.

b. Except as expressly set forth below, District does not warrant, and makes no representation regarding, the accuracy or thoroughness of any geotechnical data. Bidder represents and agrees that in submitting a bid it is not relying on any geotechnical data supplied by District, except as specifically allowed below.

c. Under no circumstances shall District be deemed to make a warranty or representation of existing above ground conditions, as-built conditions, geotechnical conditions, or other actual conditions verifiable by independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder should perform as a condition to bidding and Bidder must not and shall not rely on information supplied by District.

4. Limited Reliance Permitted on Certain Information

a. Reference is made herein for identification of:

Reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by District in preparation of the Contract Documents.

Drawings of physical conditions in or relating to existing subsurface structures (except underground facilities) that are at or contiguous to the Site and have been utilized by District in preparation of the Contract Documents.

b. Bidder may rely upon the general accuracy of the "technical data" contained in the reports and drawings identified above, but only insofar as it relates to subsurface conditions, provided Bidder has conducted the independent investigation required pursuant to Instructions to Bidders, and discrepancies are not apparent. The term "technical data" in the referenced reports and drawings shall be limited as follows:

1) The term "technical data" shall include actual reported depths, reported quantities, reported soil types, reported soil conditions, and reported material, equipment or structures that were encountered during subsurface exploration. The term "technical data" does not include, and Bidder may not rely upon, any other data, interpretations, opinions or information shown or indicated in such drawings or reports that otherwise relate to subsurface conditions or described structures.

2) The term "technical data" shall not include the location of underground facilities.

3) Bidder may not rely on the completeness of reports and drawings for the purposes of bidding or construction. Bidder may rely upon the general accuracy of the "technical data" contained in such reports or drawings.

4) Bidder is solely responsible for any interpretation or conclusion drawn from any "technical data" or any other data, interpretations, opinions, or information provided in the identified reports and drawings.

5. Investigations/Site Examinations

a. Before submitting a bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of Contract Documents.

b. On request, District will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems

necessary for submission of a bid. Bidders must fill all holes and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and District's prior approval.

END OF DOCUMENT

00 62 00
GENERAL CONDITIONS

for

CONTRACT OF CONSTRUCTION

FOR SANTA FE CCS PORTABLES PROJECT

OAKLAND UNIFIED SCHOOL DISTRICT

March 21, 2024

SUMMARY OF CONTENTS

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ARTICLE 1

GENERAL CONDITIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The "Contract Documents" consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Special, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to bid, Instructions to Bidders, Notice to Bidders, the Bid Form, Project Labor Agreement (if applicable), Local Business Participation Form, Payment Bond, Performance Bond, required insurance certificates, additional insured endorsement and declarations page, Designation of Subcontractors, Noncollusion Declaration, Roof Project Certification (where applicable), Sufficient Funds Declaration (Labor Code section 2810), the Fingerprinting Notice and Acknowledgment and Independent Contractor Student Contact Form, other documents referred to in the Agreement or required by the Instructions to Bidders to be submitted by Contractor, and Modifications issued after execution of the Agreement. A Modification is a written amendment to the Contract signed by both parties, a Change Order, a Construction Change Directive, or a written order for a minor change in the Work issued by the Owner. The Contract Documents are complementary, and each obligation of the Contractor, Subcontractors, material or equipment suppliers in any one shall be binding as if specified in all.

1.1.2 THE CONTRACT

The Contract Documents form the Contract. The "Contract" represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Architect and Contractor, between the Owner and any Subcontractor or Sub-subcontractor, or between any persons or entities other than the Owner and the Contractor. The terms of the Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever except by written agreement signed by the parties and approved or ratified by the Owner's governing board.

1.1.3 THE WORK

The "Work" shall include all labor, materials, services and equipment necessary for the Contractor to fulfill all of its obligations pursuant to the Contract Documents, including but not limited to punch list items and submission of documents. It shall include the initial obligation of any Contractor or Subcontractor, who performs any portion of the Work, to visit the Site of the proposed Work with Owner's representatives, a continuing obligation after the commencement of the Work to fully acquaint and familiarize itself with the conditions as they exist and the character of the operations to be carried on under the Contract Documents, and make such investigation as it may see fit so that it shall fully understand the facilities, physical conditions,

and restrictions attending the Work under the Contract Documents. Each such Contractor or Subcontractor shall also thoroughly examine and become familiar with the Drawings, Specifications, and associated bid documents. The "Site" refers to the grounds of the Project as defined in the Contract Documents and such adjacent lands as may be directly affected by the performance of the Work.

1.1.4 THE PROJECT

The "Project" is the total construction of the Work performed in accordance with the Contract Documents, but "Project" may also include construction by the Owner or by separate contractors of improvements related to, but not included in, the Work. The Project shall constitute a "work of improvement" under Civil Code section 8050 and Public Contract Code section 7107.

1.1.5 THE DRAWINGS

The "Drawings" are graphic and pictorial portions of the Contract Documents prepared for the Project and approved changes thereto, wherever located and whenever issued, showing the design, location, and scope of the Work, generally including plans, elevations, sections, details, schedules, and diagrams as drawn or approved by the Architect.

1.1.6 THE SPECIFICATIONS

The "Specifications" are that portion of the Contract Documents consisting of the written requirements for material, equipment, construction systems, instructions, quality assurance standards, workmanship, and performance of related services.

1.1.7 THE PROJECT MANUAL

The "Project Manual" is the volume usually assembled for the Work which may include, without limitation, the bidding requirements, sample forms, Agreement, Conditions of the Contract, and Specifications.

1.1.8 OR

"Or" shall include "and/or."

1.1.9 COMPLETION

Statutory definitions of "Completion" and "Complete" shall apply for those statutory purposes. For all other purposes, including accrual of liquidated damages, Claims, and warranties, "Completion" and "Complete" mean the point in the Work where (1) Contractor has fully and correctly performed all Work in all parts and requirements, including corrective and punch list work, and (2) Owner's representatives have conducted a final inspection that confirmed this performance. Substantial, or any other form of partial or non-compliant, performance shall not constitute "Completion" or "Complete" under the Contract Documents, except to the extent that substantial completion is required for a milestone deadline.

1.1.10 COMPLETION OF THE PROJECT

For purposes of accrual of liquidated damages for delay to the Project, *completion* shall mean the point in the Project where (1) all contractors and Owner have fully and correctly performed all work of the entire Project in all parts and requirements, including corrective and punch list work, and (2) Owner's representatives have conducted a final inspection of the entire Project that confirmed this performance. Substantial, or any other form of partial or non-compliant, performance shall not constitute *completion* or *complete*.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 CORRELATION AND INTENT

1.2.1.1 ***Documents Complementary and Inclusive.*** The Contract Documents are complementary and are intended to include all items required for the proper execution and Completion of the Work. Any item of Work mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be provided by Contractor as if shown or mentioned in both.

1.2.1.2 ***Coverage of the Drawings and Specifications.*** The Drawings and Specifications generally describe the work to be performed by Contractor. Generally, the Specifications describe work which cannot be readily indicated on the Drawings and indicate types, qualities, and methods of installation of the various materials and equipment required for the Work. It is not intended to mention every item of Work in the Specifications, which can be adequately shown on the Drawings, or to show on the Drawings all items of Work described or required by the Specifications even if they are of such nature that they could have been shown. All materials or labor for Work, which is shown on the Drawings or the Specifications (or is reasonably inferable therefrom as being necessary to Complete the Work), shall be provided by the Contractor whether or not the Work is expressly covered in the Drawings or the Specifications. It is intended that the Work be of sound, quality construction, and the Contractor shall be responsible for the inclusion of adequate amounts to cover installation of all items indicated, described, or implied in the portion of the Work to be performed by Contractor.

1.2.1.3 ***Conflicts.*** Without limiting Contractor's obligation to identify conflicts for resolution by the Owner, in the event of a conflict between provisions of the Contract Documents, it is intended that the more stringent, higher quality, and greater quantity of Work shall apply; except that in the event of a conflict between a Division 01 specification and a provision in a Division 00 Contract Document (such as the agreement, general conditions, notice to bidders, instructions to bidders, bid form, etc.), the Division 00 provision shall control.

1.2.1.4 ***Conformance With Laws.*** Each and every provision of law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such pr

ovision is not inserted, or is not correctly inserted, then upon application of either party the Contract shall be amended in writing to make such insertion or correction.

Before commencing any portion of the Work, Contractor shall check and review the Drawings and Specifications for such portion for conformance and compliance with all laws, ordinances, codes, rules and regulations of all governmental authorities and public utilities affecting the construction and operation of the physical plant of the Project, all quasi-governmental and other regulations affecting the construction and operation of the physical plant of the Project, and other special requirements, if any, designated in the Contract Documents. In the event Contractor observes any violation of any law, ordinance, code, rule or regulation, or inconsistency with any such restrictions or special requirements of the Contract Documents, Contractor shall promptly notify Architect and Owner in writing of same and shall ensure that any such violation or inconsistency shall be corrected in the manner provided hereunder prior to the construction of that portion of the Work. Where requirements of the Contract Documents exceed those of the applicable building codes and ordinances, the Contract Documents shall govern. Contractor shall comply with all applicable Federal, State and local laws.

If, as and to the extent that Public Contract Code section 1104 is deemed to apply after the award of the Contract, Contractor shall not be required to assume responsibility for the completeness and accuracy of architectural or engineering plans and specifications, notwithstanding any other provision in the Contract Documents, except to the extent that Contractor discovered or should have discovered and reported any errors and omissions to the Architect and Owner, including but not limited to as the result of any review of the plans and specifications by Contractor required by the Instructions to Bidders or other Contract Documents, whether or not actually performed by Contractor.

1.2.1.5 ***Ambiguity.*** Before commencing any portion of the Work, Contractor shall carefully examine all Drawings and Specifications and other information given to Contractor as to materials and methods of construction and other Project requirements. Contractor shall immediately notify Architect and Owner in writing of any perceived or alleged error, inconsistency, ambiguity, or lack of detail or explanation in the Drawings and Specifications in the manner provided herein. If the Contractor or its Subcontractors, material or equipment suppliers, or any of their officers, agents, and employees performs, permits, or causes the performance of any Work under the Contract Documents, which it knows or should have known to be in error, inconsistent, or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all costs arising therefrom including, without limitation, the cost of correction thereof without increase or adjustment to the Contract Sum or the time for performance. If Contractor performs, permits, or causes the performance of any Work under the Contract Documents prepared by or on behalf of Contractor which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction, without increase to or adjustment in the Contract Sum or the time for performance. In no case shall any Subcontractor proceed with the Work if uncertain without the Contractor's written direction and/or approval.

1.2.1.6 ***Execution.*** Execution of the Agreement Between Owner and Contractor by the Contractor is a representation that the Contractor has visited the Site, become familiar with the lo

cal conditions under which the Work is to be performed and has correlated personal observations with the requirements of the Contract Documents.

1.2.2 **ADDENDA AND DEFERRED APPROVALS**

1.2.2.1 ***Addenda.*** Subsequent addenda issued shall govern over prior addenda only to the extent specified. In accordance with Title 24, California Code of Regulations, addenda shall be approved by the Division of the State Architect ("DSA").

1.2.2.2 ***Deferred Approvals.*** The requirements approved by the DSA on any item submitted as a deferred approval in accordance with Title 24, California Code of Regulations, shall take precedence over any previously issued addenda, drawing or specification.

1.2.3 **SPECIFICATION INTERPRETATION**

1.2.3.1 ***Titles.*** The Specifications are separated into titled sections for convenience only and not to dictate or determine the trade or craft involved. Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of work to be performed by any trade.

1.2.3.2 ***As Shown, Etc.*** Where "as shown," "as indicated," "as detailed," or words of similar import are used, reference is made to the Drawings accompanying the Specifications unless otherwise stated. Where "as directed," "as required," "as permitted," "as authorized," "as accepted," "as selected," or words of similar import are used, the direction, requirement, permission, authorization, approval, acceptance, or selection by Architect is intended unless otherwise stated.

1.2.3.3 ***Provide.*** "Provide" means "provided complete in place," that is, furnished, installed, tested, and ready for operation and use.

1.2.3.4 ***General Conditions.*** The General Conditions and any supplementary general conditions are a part of each and every section of the Specifications.

1.2.3.5 ***Abbreviations.*** In the interest of brevity, the Specifications are written in an abbreviated form and may not include complete sentences. Omission of words or phrases such as "Contractor shall," "shall be," etc., are intentional. Nevertheless, the requirements of the Specifications are mandatory. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.

1.2.3.6 ***Plural.*** Words in the singular shall include the plural whenever applicable or the context so indicates.

1.2.3.7 ***Metric.*** The Specifications may indicate metric units of measurement as a supplement to U.S. customary units. When indicated thus: 1" (25 mm), the U. S. customary unit is specific, and the metric unit is nonspecific. When not shown with parentheses, the unit is sp

ecific. The metric units correspond to the "International System of Units" (SI) and generally follow ASTM E 380, "Standard for Metric Practice."

1.2.3.8 ***Standard Specifications.*** Any reference to standard specifications of any society, institute, association, or governmental authority is a reference to the organization's standard specifications, which are in effect as of the date the Notice to Bidders is first published. If applicable specifications are revised prior to completion of any part of the Work, the Contractor may, if acceptable to Owner and Architect, perform such Work in accordance with the revised specifications. The standard specifications, except as modified in the Specifications for the Project, shall have full force and effect as though printed in the Specifications. Architect will furnish, upon request, information as to how copies of the standard specifications referred to may be obtained.

1.2.3.9 ***Absence of Modifiers.*** In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

The Drawings, Specifications, and other documents prepared on behalf of the Owner are instruments of the services of the Architect and its consultants and are the property of the Owner. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Owner, upon request upon Completion of the Work. The Drawings, Specifications, and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Contract. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor, or material or equipment supplier on other contracts or projects or for additions to this Contract or Project outside the scope of the Work without the specific written consent of the Owner and the Architect. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications, and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Owner's property interest or other reserved right. All copies made under this license shall bear appropriate attribution and the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect.

ARTICLE 2

OWNER

2.1 DEFINITION

The term "Owner" means the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner and/or the Owner's authorized representatives, including but not limited to architects and construction managers. To the extent the Contract Documents indicate that Owner has assigned duties to particular representatives of the Owner (such as the Architect, or any construction manager), Owner reserves the right at all times to reassign such duties to different Owner representatives.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 INTENTIONALLY LEFT BLANK

2.2.2 SITE SURVEY

When required by the scope of the Work, the Owner will furnish, at its expense, a legal description or a land survey of the Site, giving, as applicable, grades and lines of streets, alleys, pavements, adjoining property, rights-of-way, restrictions, easements, encroachments, zoning, deed restrictions, boundaries, and contours of the Site. Surveys to determine locations of construction, grading, and Site work shall be provided by the Contractor.

2.2.3 SOILS

2.2.3.1 ***Owner Furnished Services.*** When required by the scope of the Project, the Owner will furnish, at its expense, the services of geotechnical engineers or consultants when reasonably required or as required by local or state codes. Such services with reports and appropriate professional recommendations shall include test boring, test pits, soil bearing values, percolation tests, air and water pollution tests, and ground corrosion and resistivity tests, including necessary operations for determining subsoil, air, and water conditions.

2.2.3.2 ***Contractor Reliance.*** Test borings and soils reports for the Project have been made for the Owner to indicate the subsurface materials that might be encountered at particular locations on the Project. The Owner has made these documents available to the Contractor and the Contractor has studied the results of such test borings and information that it has as to the subsurface conditions and Site geology as set forth in the test borings and soils reports. The Owner does not assume any responsibility whatsoever with respect to the sufficiency or accuracy of the borings made, or of the logs of the test borings, or of other investigations, or of the soils reports furnished pursuant hereto, or of the interpretations to be made beyond the location or depth of the borings. There is no warranty or guarantee, either express or implied that the conditions indicated by such investigations, borings, logs, soil reports or other information are representative of those existing throughout the Site of the Project, or any part thereof, or that un

foreseen developments may not occur. At the Owner's request, the Contractor shall make available to the Owner the results of any Site investigation, test borings, analyses, studies or other tests conducted by or in the possession of the Contractor of any of its agents. Nothing herein contained shall be deemed a waiver by the Contractor to pursue any available legal right or remedy it may have at any time against any third party who may have prepared any report and/or test relied upon by the Contractor.

2.2.4 UTILITY SURVEY

When required by the scope of the Project, the Owner will furnish, at its expense, all information regarding known existing utilities on or adjacent to the Site, including location, size, inverts, and depths.

2.2.5 INFORMATION

Upon the request of the Contractor, Owner will make available such existing information regarding utility services and Site features, including existing construction, related to the Project as is available from Owner's records. The Contractor may not rely upon the accuracy of any such information, other than that provided under Sections 2.2.2 and 2.2.4 (except that the Contractor may not rely upon, and must question in writing to the Owner and the Architect, any information which appears incorrect based upon Contractor's Site inspection, knowledge of the Work and Project, and prior experience with similar projects), unless specifically stated in writing that the Contractor may rely upon the designated information.

2.2.6 EXISTING UTILITY LINES; REMOVAL, RELOCATION

2.2.6.1 ***Removal, Relocation.*** Pursuant to Government Code section 4215, the Owner assumes the responsibility for removal, relocation, and protection of utilities located on the Site at the time of commencement of construction under this Contract with respect to any such utility facilities which are not identified in the drawings and specifications made part of the invitation to bid. The Contractor shall not be assessed for liquidated damages for delay in Completion of the Work caused by failure of the Owner to provide for removal or relocation of such utility facilities. Owner shall compensate the Contractor for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, removing or relocating such utility facilities, and for equipment necessarily idle during such work.

2.2.6.2 ***Assessment.*** These subparagraphs shall not be construed to preclude assessment against the Contractor for any other delays in Completion of the Work. Nothing in these subparagraphs shall be deemed to require the Owner to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the Site can be inferred from the presence of other visible facilities, such as buildings, or meter junction boxes on or adjacent to the Site.

2.2.6.3 ***Notification.*** If the Contractor, while performing work under this Contract, discovers utility facilities not identified by the Owner in the Contract plans or specifications, Contractor shall immediately notify the Owner and the utility in writing.

2.2.6.4 ***Underground Utility Clearance.*** It shall be Contractor's sole responsibility to timely notify all public and private utilities serving the Site prior to commencing work. The Contractor shall notify and receive clearance from any cooperative agency, such as Underground Service Alert, in accordance with Government Code section 4216, et seq. Contractor shall promptly provide a copy of all such notifications to the Owner.

2.2.7 EASEMENTS

Owner shall secure and pay for easements for permanent structures or permanent changes in existing facilities, if any, unless otherwise specified in the Contract or Contract Documents.

2.2.8 REASONABLE PROMPTNESS

Information or services under Owner's control will be furnished by the Owner with reasonable promptness. The Owner shall not be liable for any delays caused by factors beyond the Owner's control including but not limited to DSA's or any other local, State or federal agency's review of bids, change order requests, RFI's or any other documents.

2.2.9 COPIES FURNISHED

The Contractor will be furnished such copies of Drawings and Project Manuals as are stated in the Contract Documents.

2.2.10 DUTIES CUMULATIVE

The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein, and especially those in Article 6 (Construction by Owner or by Separate Contractors), Article 9 (Payments and Completion), and Article 11 (Insurance and Bonds).

2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents, or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may order the Contractor to stop the Work or any portion thereof, until the Contractor corrects the deficiencies. Contractor shall not be entitled to a time extension for any delays caused by such order. The right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Article 6.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor fails or refuses to carry out the Work in accordance with the Contract Documents, Owner may correct such deficiencies by whatever reasonable method the Owner may deem expedient without prejudice to other remedies the Owner may have, including but not limited to having another contractor perform some or all of the Work without terminating the Contract with Contractor. Owner may exercise this right at any time during the Contractor's

Work.

Owner shall first provide written notice to Contractor of Contractor's failure or refusal to perform. The notice will provide the time period within which Contractor must begin correction of the failure or refusal to perform. If the Contractor fails to begin correction within the stated time, or fails to continue correction, the Owner may proceed to correct the deficiencies. In the event the Owner bids the work, Contractor shall not be eligible for the award of the contract. The Contractor may be invoiced the cost to Owner of the work, including compensation for additional professional and internally generated services and expenses made necessary by Contractor's failure or refusal to perform. Owner may withhold that amount from the retention, or progress payments due the Contractor, pursuant to Section 9.5. If retention and payments withheld then or thereafter due the Contractor are not sufficient to cover that amount, the Contractor shall pay the difference to the Owner.

ARTICLE 3

THE CONTRACTOR

3.1 DEFINITION

The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative. To the extent that any portion of the Work is provided with the Contractor's own forces, any reference to Subcontractors shall be equally applicable to the Contractor.

3.2 SUPERVISION AND CONSTRUCTION PROCEDURES

3.2.1 CONTRACTOR

The Contractor shall supervise and direct the Work using the Contractor's best skill and attention, which shall meet or exceed the standards in the industry. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, procedures, and coordinating all portions of the Work under the Contract, unless Contract Documents give other specific instructions concerning these matters.

If part of the Project is performed by other contractors that Owner directly retains, Owner shall schedule and coordinate the activities of Contractor with the other contractors. Contractor agrees to accept the Owner's construction schedules, schedule updates, overall sequence and coordination of construction for the Project.

Contractor realizes that work by other contractors or Owner may occur simultaneously with Contractor's Work in any given area. Contractor is responsible for its own sequences that may occur within a given activity or set of activities. Contractor shall not commit or permit any act which will adversely affect the work of any other contractor or Owner. Contractor shall provide

layout of its Work at the request of any other contractor or Owner.

Specific duties of the Contractor shall be in accordance with Title 24 of the California Code of Regulations. Contractor shall fully comply with any and all reporting requirements of Education Code sections 17309 and 81141 in the manner prescribed by Title 24.

3.2.2 CONTRACTOR RESPONSIBILITY

The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors, material and equipment suppliers, and their agents, employees, invitees, and other persons performing portions of the Work under direct or indirect contract with the Contractor or any of its Subcontractors.

3.2.3 OBLIGATIONS NOT CHANGED BY OTHERS' ACTIONS

The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents by the activities or duties of the Owner's representatives, including but not limited to any construction manager and the Architect, or the Inspector of Record; or by tests, inspections, or approvals required or performed by persons other than the Contractor.

3.2.4 CONTRACTOR RESPONSIBILITY FOR READINESS FOR WORK

The Contractor shall be responsible for inspection of Work already performed under the Contract Documents to determine that such portions are in proper condition to receive subsequent work.

3.2.5 PROJECT MEETINGS

During its Work, Contractor shall attend Owner's Project meetings as scheduled by the Contract Documents, or as otherwise instructed by Owner, to discuss the current status of the Work and Project, and the future progress of the Work and the Project. Contractor shall have five (5) days after receipt of Owner's Project meeting minutes to provide written objections and suggested corrections. Either party may audio record any meeting related to the Contract.

3.3 SUPERINTENDENT

3.3.1 FULL TIME SUPERINTENDENT

The Contractor shall provide a competent superintendent and assistants as necessary, all of whom shall be reasonably proficient in speaking, reading and writing English and, who shall be in attendance at the Project Site during performance of the Work. The superintendent shall have five (5) years of experience on K-12 public school construction projects in California. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

3.3.2 STAFF

The Contractor and each Subcontractor shall: furnish a competent and adequate staff as necessary for the proper administration, coordination, supervision, and superintendence of its portion of the Work; organize the procurement of all materials and equipment so that the materials and equipment will be available at the time they are needed for the Work; and keep an adequate force of skilled workers on the job to Complete the Work in accordance with all requirements of the Contract Documents.

3.3.3 RIGHT TO REMOVE

Owner shall have the right, but not the obligation, to require the removal from the Project of any superintendent, staff member, agent, or employee of any Contractor, Subcontractor, material or equipment supplier, etc., for cause.

3.4 LABOR AND MATERIALS

3.4.1 CONTRACTOR TO PROVIDE

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, material, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and Completion of the Work whether temporary or permanent, and such facilities, labor, equipment, material, and services are included in the Work. Owner shall not be liable for, and Contractor shall bear the burden of, any post-bid escalation in the cost of materials; but Contractor will retain the benefit of any post-bid material cost decreases. Owner shall have no responsibility for security of, or repair or replacement costs of, such facilities, labor, equipment, material, and services provided by Contractor pursuant to this subsection.

3.4.2 QUALITY

Unless otherwise specified, all materials and equipment to be permanently installed in the Project shall be new and shall be of such quality as required to satisfy the standards of the Contract Documents. The Contractor shall, if requested, promptly furnish satisfactory evidence as to kind and quality of all materials and equipment. All labor shall be performed by workers skilled in their respective trades, and the quality of their work shall meet whichever is the higher standard for their work: the standard in the industry or the standard in the Contract Documents.

3.4.3 REPLACEMENT

Any work, materials, or equipment, which does not conform to these standards may be disapproved and rejected by the Owner, in which case, they shall be removed and replaced by the Contractor at no cost to the Owner.

3.4.4 **DISCIPLINE**

The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract in accordance with paragraph 5.5.1 including, but not limited to, Subcontractors, and material or equipment suppliers retained for the Project.

3.5 **WARRANTY**

For the period of one (1) year after Completion of the Work (see Sections 9.7.1, 12.2.5, and 12.2.6), the Contractor warrants to the Owner that material and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty does not cover damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

3.6 **TAXES**

Contractor will pay all applicable Federal, State, and local taxes on all materials, labor, or services furnished by it, and all taxes arising out of its operations under the Contract Documents. Owner is exempt from Federal Excise Tax, and a Certificate of Exemption shall be provided upon request.

3.7 **PERMITS, FEES AND NOTICES**

3.7.1 **PAYMENT**

The Contractor shall secure and pay for all permits and governmental fees, licenses, and inspections necessary for proper execution and Completion of the Work which are customarily secured after execution of the Contract and are legally required by any authority having jurisdiction over the Project, except those required by the Division of the State Architect (DSA). Owner shall be responsible for all testing and inspection as required by the DSA on-Site or within the distance limitations set forth in paragraph 13.5.2, unless a different mileage range is specified in the Contract Documents.

3.7.2 **COMPLIANCE**

The Contractor shall comply with and give notices required by any law, ordinance, rule, regulation, and lawful order of public authorities bearing on performance of the Work.

3.7.3 CONTRACT DOCUMENTS

It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with any applicable law, statute, ordinance, building codes, rule, or regulation. However, if the Contractor knew, or should have known, or observes that portions of the Contract Document are at variance therewith, the Contractor shall promptly notify the Architect, any construction manager, and Owner in writing, and necessary changes shall be accomplished by appropriate modification.

3.7.4 RESPONSIBILITY

If the Contractor performs any work that it knows, or should have known, is contrary to any law, statute, ordinance, building code, rule or regulation, the Contractor shall assume full responsibility for such work, and shall bear the attributable cost of correction and delays to the Work, other contractors' work, and the Project.

3.8 ALLOWANCES

3.8.1 CONTRACT

The Contractor shall include in the Contract Sum all allowances, including any general contingency allowance, stated in the Contract Documents. Items covered by specific allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities against whom the Contractor makes reasonable and timely objection.

3.8.2 SCOPE

3.8.2.1 ***Prompt Selection.*** Materials and equipment under an allowance shall be selected promptly by the Owner to avoid delay to the Work.

3.8.2.2 ***Cost.*** Allowances shall cover the cost to the Contractor of materials and equipment delivered at the Site and all required taxes, less applicable trade discounts, etc., as delineated in paragraph 7.7.4.

3.8.2.3 ***Cost Included in Contract Sum.*** Contractor's costs for unloading and handling at the Site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances.

3.8.2.4 ***Contract Sum Adjustment.*** Whenever Contractor seeks payment from an allowance and the requested costs are approved by Owner as compliant with the Contract Documents (including Sections 3.8.2.2 and 3.8.2.3, above), Owner may elect to pay the approved costs from the allowance, or pay the costs via Change Order. Any such allowance payment shall conform to the requirements of the Agreement and other Contract Documents.

3.9 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.9.1 REQUIREMENTS

Before the Contractor's commencement of Work or within two (2) weeks of award of the Contract, whichever is earlier, Contractor shall prepare and submit for the Owner's, and any construction manager's, information the baseline construction schedule for the Work, which shall conform to the Contract Documents' requirements.

Contractor shall submit an updated schedule by the first day of every month, and whenever else requested by the Owner. Each schedule update must include an accurate as-built schedule and the current as-planned schedule, both of which shall conform to the Contract Documents' requirements. Contractor shall submit its daily logs for the prior month with the updated schedule.

The original schedule and all updates shall conform, at a minimum, to industry standards for (a) critical path scheduling and (b) facilitation of Owner's Project management and evaluation of Contractor Claims for additional money or time.

The original schedule and all updates shall not exceed time limits (including milestone deadlines) under the Contract Documents and shall comply with the Contract Documents scheduling requirements and with any scheduling requirements the Owner provides to the Contractor at the beginning of the Work. The original schedule and all updates shall accurately reflect Work performed to date; reasonable dates for future Work; all construction activities (including procurement); the critical path schedule for Completion of the remainder of the Work; the logic, sequencing, and relationship between the construction activities, including each activity's predecessor and successor activities; and the percentage of the Work completed. Contractor shall specifically include in its schedule and updates at least the number of anticipated calendar days of weather delay to the critical path as indicated in the Special Conditions for each month of the year. These days shall be shown in the schedule and updates as independent critical path activities, and the Contractor may elect to include in the schedule and updates a greater number of days.

The construction schedule shall be in the form of either a tabulation, chart, or graph, unless otherwise stated in Division 1 of the Specifications, and shall be in sufficient detail to show the chronological relationship of all activities of the Work including, but not limited to, estimated starting and completion dates of various activities, (including early and late dates and reasonable float for each activity), procurement of materials, the critical path, and scheduling of equipment. Float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity durations, or imposed dates shall be apportioned for the benefit of the Work. Whenever in the Contract Documents Contractor is required to provide a schedule and/or schedule updates, the Contractor shall provide the schedule and updates in electronic format as well as hard copy. Contractor shall be solely responsible for the accuracy, utility and reasonableness of all of its schedules. Owner's acceptance, approval or non-rejection of Contractor's schedules shall not affect Contractor's responsibility for its schedules.

The Contractor and Owner shall use any float on a "first come, first served" basis. The original schedule and updates shall reflect Contractor's and Owner's use of float. Float is not for the exclusive use or benefit of either Owner or Contractor, but it is a jointly owned expiring Work resource available to both parties as needed to meet schedule milestones. For the original schedule and updates, Contractor shall use a critical path network format with the critical paths clearly indicated. Contractor shall use an MS Project, Primavera, or an equivalent or better program. Contractor shall include reports that sort and list the activities in order of increasing float and by early and late start dates. Contractor shall endeavor to label ten to thirty percent (10-30%) of the tasks as critical, but shall not label less than five (5%) or more than fifty (50%) as critical. Contractor shall use calendar days.

If any change in Contractor's method of operations will cause a change in the construction schedule, Contractor shall submit to Owner, Architect, and any construction manager, a revised construction schedule within seven (7) days of the change.

If, in the Owner's opinion, the Contractor is not prosecuting the Work at a rate sufficient to meet the Work schedule or a contractual milestone, or to Complete the Work within the Contract Time as adjusted by change orders, or if the Contractor's actual progress falls behind the Work schedule or it is apparent to Owner that Contractor will not meet contractual milestones or Complete the Work within the Contract Time as adjusted by change orders, the Owner may require that the Contractor prepare and submit a recovery plan. Contractor must submit a recovery plan within seven (7) days of a demand for the plan. At a minimum, the recovery plan must include a proposed schedule that shows Completion of the Work by the contractual milestones and within the Contract Time, as adjusted by change orders, or Completion by other dates Owner specifies in the demand for a recovery plan. The recovery plan shall state the corrective actions Contractor will undertake to implement it. The recovery plan shall also list any additional money that Contractor believes it should receive if Owner orders Contractor to fully or partially implement the recovery plan. If the Owner orders Contractor to implement the recovery plan, Contractor shall do so, but the order shall not constitute an admission by Owner that Contractor is entitled to additional money. To recover additional money, Contractor must comply with General Conditions Articles 4.5, 7 and 8.

All schedules Contractor submits shall be certified as true and correct, as follows:

> I, _____ *[name of declarant]*, declare the following:
>
> _____ *[Contractor company name]* has contracted with _____ *[public entity name]* for the _____ Contract ("Contract"). _____ *[Contractor company name]* authorized me to prepare schedules for _____ *[public entity name]* for this Project, and I prepared the attached schedule. I am the most knowledgeable person at _____ *[Contractor company name]* regarding the scheduling of the Work for this Contract.
>
> The attached schedule does not breach the Contract between _____ *[Contractor company name]* and _____ *[public entity name]* for this Project,

does not violate any applicable law, satisfies all provisions of the Contract applicable to submission of schedules, only contains truthful and accurate as-built and as-planned dates of the Work (including supporting data), and is not a false claim.

The attached schedule is submitted in compliance with all laws applicable to submission of a Claim, including but not limited to California Penal Code section 72 (Fraudulent Claims), Government Code sections 12650 et seq. (False Claims Act; for example, Government Code section 12651(a)(7)), and Business and Professions Code sections 17200 et seq. (Unfair Business Practices Act). I am aware that submission or certification of false claims, or other Claims that violate law or the Contract, may lead to fines, imprisonment, and/or other serious legal consequences for myself and/or _____ *[Contractor company name]*.

While preparing this declaration and schedule I consulted with others (including attorneys, consultants, or others who work for _____ *[Contractor company name]*) when necessary to ensure that the statements were true and correct.

I declare under the penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed _____, 20__, at _____, California.

_____ *[signature]*
_____ *[name of declarant]*

3.9.2 DSA OVERSIGHT PROCESS

In connection with the DSA Construction Oversight Process which includes inspection cards and review of changes to the DSA-approved construction documents, the Contractor must (a) include specific tasks in its baseline schedule to take into account these procedures since they are critical path issues; and (b) include a reasonable amount of float in the baseline schedule to accommodate the additional time required by these DSA procedures.

3.9.3 FAILURE TO MEET REQUIREMENTS

Failure of the Contractor to provide proper schedules may, at the sole discretion of Owner, constitute either grounds to withhold, in whole or in part, progress payments to the Contractor, or a breach of contract allowing Owner to terminate the Contract.

3.10 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the Site for the Owner one applicable copy of Titles 19 and 24 and record copy of the Drawings, Specifications, Addenda, Change Orders, and other Modifications, in good order and marked currently to record changes and selections made during

construction. In addition, the Contractor shall maintain at the Site approved Shop Drawings,

Product Data, Samples, and similar required submittals. These documents shall be available to the Owner and shall be delivered to the Owner, or the Architect for delivery to the Owner, upon Completion of the Work.

3.11 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

3.11.1 SUBMITTALS DEFINED

3.11.1.1 ***Shop Drawings.*** The term "shop drawings" as used herein means drawings, diagrams, schedules, and other data, which are prepared by Contractor, Subcontractors, manufacturers, suppliers, or distributors illustrating some portion of the Work, and includes: illustrations; fabrication, erection, layout and setting drawings; manufacturer's standard drawings; schedules; descriptive literature, instructions, catalogs, and brochures; performance and test data including charts; wiring and control diagrams; and all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment, or systems and their position conform to the requirements of the Contract Documents. The Contractor shall obtain and submit with the shop drawings all seismic and other calculations and all product data from equipment manufacturers. "Product data" as used herein are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work. As used herein, the term "manufactured" applies to standard units usually mass-produced, and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements. Shop drawings shall: establish the actual detail of all manufactured or fabricated items, indicate proper relation to adjoining work, amplify design details of mechanical and electrical systems and equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions.

3.11.1.2 ***Samples.*** The term "samples" as used herein are physical examples furnished by Contractor to illustrate materials, equipment, or quality and includes natural materials, fabricated items, equipment, devices, appliances, or parts thereof as called for in the Specifications, and any other samples as may be required by the Owner to determine whether the kind, quality, construction, finish, color, and other characteristics of the materials, etc., proposed by the Contractor conform to the required characteristics of the various parts of the Work. All Work shall be in accordance with the approved samples.

3.11.1.3 ***Contractor's Responsibility.*** Contractor shall obtain and shall submit to Architect all required shop drawings and samples in accordance with Contractor's "Schedule for Submission of Shop Drawings and Samples" provisions in Division 1 of the Specifications and in accordance with the Contractor's original and updated schedules, and with such promptness as to cause no delay in its own Work or in that of any other contractor, Owner or subcontractor but in no event later than ninety (90) days after the execution of the Agreement. Contractor may be assessed $100 a day for each day it is late in submitting a shop drawing or sample. No ex

tensions of time will be granted to Contractor or any Subcontractor because of its failure to have shop drawings and samples submitted in accordance with the Schedule. Each Subcontractor shall submit all shop drawings, samples, and manufacturer's descriptive data for the review of the Owner, the Contractor, and the Architect through the Contractor. By submitting shop drawings, product data, and samples, the Contractor or submitting party (if other than Contractor) represents that it has determined and verified all materials, field measurements, field conditions, catalog numbers, related field construction criteria, and other relevant data in connection with each such submission, and that it has checked, verified, and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. At the time of submission, any deviation in the shop drawings, product data, or samples from the requirements of the Contract Documents shall be narratively described in a transmittal accompanying the submittal. However, submittals shall not be used as a means of requesting a substitution, the procedure for which is defined in paragraph 3.11.4, "Substitutions." Review by Owner and Architect shall not relieve the Contractor or any Subcontractor from its responsibility in preparing and submitting proper shop drawings in accordance with the Contract Documents. Contractor shall stamp, sign, and date each submittal indicating its representation that the submittal meets all of the requirements of the Contract Documents. Any submission, which in Owner's or Architect's opinion is incomplete, contains numerous errors, or has been checked only superficially by Contractor will be returned unreviewed for resubmission by the Contractor.

3.11.1.4 ***Extent of Review.*** In reviewing shop drawings, the Owner will not verify dimensions and field conditions. The Architect will review and approve shop drawings, product data, and samples for aesthetics and for conformance with the design concept of the Work and the information given in the Contract Documents. The Architect's review shall neither be construed as a complete check nor relieve the Contractor, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist or from any departures or deviations from the requirements of the Contract Documents unless the Contractor has, in writing, called the Architect's attention to the deviations at the time of submission and the Architect has given specific written approval. The Architect's review shall not relieve the Contractor or Subcontractors from responsibility for errors of any sort in shop drawings or schedules, for proper fitting of the Work, or from the necessity of furnishing any Work required by the Contract Documents, which may not be indicated on shop drawings when reviewed. Contractor and Subcontractors shall be solely responsible for determining any quantities, whether or not shown on the shop drawings.

3.11.2 **DRAWING SUBMISSION PROCEDURE**

3.11.2.1 ***Transmittal Letter and Other Requirements.*** All shop drawings must be properly identified with the name of the Contract and Contractor's name and dated, and each lot submitted must be accompanied by a letter of transmittal referring to the name of the Contract and Contractor and to the Specification section number for identification of each item clearly stating in narrative form, as well as "clouding" on the submissions, all qualifications, departures, or deviations from the Contract Documents, if any. Shop drawings, for each section of the Work, shall be numbered consecutively, and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each dr

awing shall have a clear space for the stamps of Architect and Contractor. Only shop drawings required to be submitted by the Contract Documents shall be reviewed.

3.11.2.2 ***Copies Required.*** Each submittal shall include one (1) legible, reproducible sepia and five (5) legible prints of each drawing, including fabrication, erection, layout and setting drawings, and such other drawings as required under the various sections of the Specifications until final acceptance thereof is obtained. Subcontractor shall submit copies, in an amount as requested by the Contractor, of: manufacturers' descriptive data for materials, equipment, and fixtures, including catalog sheets showing dimensions, performance, characteristics, and capacities; wiring diagrams and controls; schedules; all seismic calculations and other calculations; and other pertinent information as required.

3.11.2.3 ***Corrections.*** The Contractor shall make any corrections required by Architect and shall resubmit as required by Architect the required number of corrected copies of shop drawings or new samples until approved. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than one (1) re-review of required submittals of shop drawings, product data, or samples are subject to charge to the Contractor pursuant to paragraph 4.4.

3.11.2.4 ***Approval Prior to Commencement of Work.*** No portion of the Work requiring a shop drawing or sample submission shall be commenced until the submission has been reviewed by Owner and approved by Architect unless specifically directed in writing by the Owner. All such portions of the Work shall be in accordance with approved shop drawings and samples.

3.11.3 **SAMPLE SUBMISSIONS PROCEDURE**

3.11.3.1 ***Samples Required.*** In case a considerable range of color, graining, texture, or other characteristics may be anticipated in finished products, a sufficient number of samples of the specified materials shall be furnished by the Contractor to indicate the full range of characteristics, which will be present in the finished products; and products delivered or erected without submittal and approval of full range samples shall be subject to rejection. Except for range samples, and unless otherwise called for in the various sections of the Specifications, samples shall be submitted in duplicate. All samples shall be marked, tagged, or otherwise properly identified with the name of the submitting party, the name of the Contract, the purpose for which the samples are submitted, and the date and shall be accompanied by a letter of transmittal containing similar information, together with the Specification section number for identification of each item. Each tag or sticker shall have clear space for the review stamps of Contractor and Architect.

3.11.3.2 ***Labels and Instructions.*** Samples of materials, which are generally furnished in containers bearing the manufacturers' descriptive labels and printed application instructions, shall, if not submitted in standard containers, be supplied with such labels and application instructions.

3.11.3.3 ***Architect's Review.*** The Architect will review and, if appropriate, approve submissions and will return them to the Contractor with the Architect's stamp and signature applied thereto, indicating the appropriate action in compliance with the Architect's standard procedures.

3.11.3.4 ***Record Drawings and Annotated Specifications.*** The Contractor will prepare and maintain on a current basis an accurate and complete set of Record Drawings showing clearly all changes, revisions, and substitutions during construction, including, without limitation, field changes and the final location of all mechanical equipment, utility lines, ducts, outlets, structural members, walls, partitions, and other significant features, and Annotated Specifications showing clearly all changes, revisions, and substitutions during construction. A copy of such Record Drawings and Annotated Specifications will be delivered to Owner in accordance with the schedule prepared by Contractor. In the event of a specification that allows Contractor to elect one of several brands, makes, or types of material or equipment, the annotations shall show which of the allowable items the Contractor has furnished. The Contractor will update the Record Drawings and Annotated Specifications as often as necessary to keep them current but no less often than weekly. The Record Drawings and Annotated Specifications shall be kept at the Site and available for inspection by the Owner, Inspector of Record and the Architect. On Completion of the Contractor's Work and prior to Application for Final Progress Payment, the Contractor will provide one complete set of Record Drawings and Annotated Specifications to the Owner, certifying them to be a complete and accurate reflection of the actual construction conditions of the Work.

3.11.3.5 ***Equipment Manuals.*** Contractor shall obtain and furnish to the Owner three (3) complete sets of manuals containing the manufacturers' instructions for maintenance and operation of each item of equipment and apparatus furnished under the Contract Documents and any additional data specifically requested under the various sections of the Specifications for each division of the Work. The manuals shall be arranged in proper order, indexed, and placed in three-ring binders. At the Completion of its Work, the Contractor shall certify, by endorsement thereon, that each of the manuals is complete, accurate, and covers all of its Work. Prior to submittal of Contractor's Application for Final Progress Payment, and as a further condition to its approval by the Architect, each Subcontractor shall deliver the manuals, arranged in proper order, indexed, endorsed, and placed in three-ring binders, to the Contractor, who shall assemble these manuals for all divisions of the Work, review them for completeness, and submit them to the Owner through the Architect.

3.11.3.6 ***Owner's Property.*** All shop drawings and samples submitted shall become the Owner's property.

3.11.4 **SUBSTITUTIONS**

3.11.4.1 ***One Product Specified.*** Unless the Specifications state that no substitution is permitted, whenever in the Contract Documents any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction is indicated or specified by name, make, trade name, or catalog number, with or without the words "or equal," such specification shall be deemed to be used for the purpose of facilitating description of material, pr

ocess, or article desired and shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer any material, process, or article, which shall be substantially equal or better in every respect to that so indicated or specified and will completely accomplish the purpose of the Contract Documents.

3.11.4.2 ***Two or More Products Specified.*** When two or more acceptable products are specified for an item of the Work, the choice will be up to the Contractor. Contractor shall utilize the same product throughout the Project. If a timely substitution request as set forth in Section 3.11.4.3 is not provided and an "or equal" substitution is requested, the Owner may consider the substitution if the product specified is no longer commercially available. If the Owner allows the substitution to be proposed pursuant to such an untimely request, the Contractor will be responsible for the professional fees incurred by the Architect or Architect's consultants in reviewing the proposed substitution which fees may be withheld from progress payments and/or retention.

3.11.4.3 ***Substitution Request Form.*** Requests for substitutions of products, materials, or processes other than those specified must be made on the Substitution Request form available from the Owner. Any Requests submitted after the deadline specified in the Instructions to Bidders will not be considered, except as noted in paragraph 3.11.4.2. A Substitution Request must be accompanied by evidence as to whether or not the proposed substitution: is equal in quality and serviceability to the specified item; will entail no changes in detail and construction of related work; will be acceptable in consideration of the required design and artistic effect; will provide no cost disadvantage to Owner; and will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts. The burden of proof of these facts shall be upon the Contractor. The Contractor shall furnish with its request sufficient information to determine whether the proposed substitution is equivalent including but not limited to all drawings, specifications, samples, performance data, calculations, and other information as may be required to assist the Architect and the Owner in determining whether the proposed substitution is acceptable. The final decision shall be the Owner's. The written approval of the Owner, consistent with the procedure for Change Orders, shall be required for the use of a proposed substitute material. Owner may condition its approval of the substitution upon delivery to Owner of an extended warranty or other assurances of adequate performance of the substitution. All risks of delay due to the Division of the State Architect's approval, or the approval of any other governmental agency having jurisdiction, of a requested substitution shall be on the requesting party.

3.11.4.4 ***List of Manufacturers and Products Required.*** The Subcontractor shall prepare and submit to the Contractor within thirty (30) days of execution of the Subcontract comprehensive lists, in quadruplicate, of the manufacturers and products proposed for the Project, including information on materials, equipment, and fixtures required by the Contract Documents, as may be required for Contractor's or Architect's preliminary approval. Approval of such lists of products shall not be construed as a substitute for the shop drawings, manufacturer's descriptive data, and samples, which are required by the Contract Documents, but rather as a base from which more detailed submittals shall be developed for the final review of the Contractor and the Architect.

3.11.5 **DEFERRED APPROVALS**

Deferred approvals shall be submitted and processed pursuant to the requirements of Division 1 of the Specifications. All risks of delay due to the Division of the State Architect's, or any other governmental agency having jurisdiction, approval of a deferred approval shall be on the requesting party.

3.12 CUTTING AND PATCHING

3.12.1 **SCOPE**

The Contractor shall be responsible for cutting, fitting, or patching required to Complete the Work or to make its parts fit together properly.

3.12.2 **CONSENT**

The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or a separate contractor by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work. All cutting shall be done promptly, and all repairs shall be made as necessary.

3.12.3 **STRUCTURAL MEMBERS**

New or existing structural members and elements, including reinforcing bars and seismic bracing, shall not be cut, bored, or drilled except by written authority of the Architect. Work done contrary to such authority is at the Contractor's risk, subject to replacement at its own expense and without reimbursement under the Contract. Agency approvals shall be obtained by the Architect, not by the Contractor.

3.12.4 **SUBSEQUENT REMOVAL**

Permission to patch any areas or items of the Work shall not constitute a waiver of the Owner's or the Architect's right to require complete removal and replacement of the areas of items of the Work if, in the opinion of the Architect or the Owner, the patching does not satisfactorily restore quality and appearance of the Work or does not otherwise conform to the Contract Documents. Any costs caused by defective or ill-timed cutting or patching shall be borne by the person or entity responsible.

3.13 CLEANING UP

3.13.1 CONTRACTOR'S RESPONSIBILITY

The Contractor shall keep the Site and surrounding area free from accumulation of waste material or rubbish caused by operations under the Contract. The Site shall be maintained in a neat and orderly condition. All crates, cartons, paper, and other flammable waste materials shall be removed from Work areas and properly disposed of at the end of each day. The Contractor shall continuously remove from and about the Site the waste materials, rubbish, tools, construction equipment, machinery, and materials no longer required for the Work.

3.13.2 FAILURE TO CLEANUP

If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so, without prior notice to the Contractor and the cost thereof shall be invoiced to the Contractor and withheld from progress payments and/or retention. Each Subcontractor shall have the responsibility for the cleanup of its own Work. If the Subcontractor fails to clean up, the Contractor must do so.

3.13.3 CONSTRUCTION BUILDINGS

When directed by the Owner or the Architect, Contractor and Subcontractor shall dismantle temporary structures, if any, and remove from the Site all construction and installation equipment, fences, scaffolding, surplus materials, rubbish, and supplies belonging to Contractor or Subcontractor. If the Contractor does not remove the tools, equipment, machinery, and materials within fifteen (15) days after Completion of its Work, then they shall be deemed abandoned, and the Owner can dispose of them for its own benefit in whatever way it deems appropriate. Contractor shall pay for any costs to dispose of the items.

3.14 ACCESS TO WORK

The Contractor shall provide the Owner, the Architect, and the Inspector of Record, access to the Work in preparation and progress wherever located.

3.15 ROYALTIES AND PATENTS

3.15.1 PAYMENT AND INDEMNITY

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims of infringement of patent rights and shall hold the Owner and the Architect harmless and indemnify them, to the extent not caused by the Owner's active negligence, sole negligence or willful misconduct, from loss on account thereof but shall not be responsible for such defense or loss when a particular design, process, or product of a particular manufacturer is required by the Contract Documents. However, if the Contractor has reason to believe the required design, process, or product is an infringement of a patent, the Contractor shall be responsible for such

loss unless such information is promptly furnished to the Owner and Architect.

3.15.2 **REVIEW**

The review by the Owner or Architect of any method of construction, invention, appliance, process, article, device, or material of any kind shall be for its adequacy for the Work and shall not be an approval for the use by the Contractor in violation of any patent or other rights of any person or entity.

3.16 INDEMNIFICATION

3.16.1 SCOPE: CONTRACTOR

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, any construction manager, Architect, Architect's consultants, the Inspector of Record, the State of California, and their respective agents, employees, officers, volunteers, Boards of Trustees, members of the Boards of Trustees, and directors ("Indemnitees"), from and against claims, actions, damages, liabilities, losses (including but not limited to injury or death of persons, property damage, and compensation owed to other parties), and expenses (including but not limited to attorneys' fees and costs including fees of consultants) alleged by third parties against Indemnitees arising out of or resulting from the following: Contractor's, its Subcontractors', or its suppliers' performance of the Work, including but not limited to the Contractor's or its Subcontractors' use of the Site; the Contractor's or its Subcontractors' construction of the Work, or failure to construct the Work, or any portion thereof; the use, misuse, erection, maintenance, operation, or failure of any machinery or equipment including, but not limited to, scaffolds, derricks, ladders, hoists, and rigging supports, whether or not such machinery or equipment was furnished, rented, or loaned by any of the Indemnitees; or any act, omission, negligence, or willful misconduct of the Contractor or its Subcontractors or their respective agents, employees, material or equipment suppliers, invitees, or licensees but only to the extent caused in whole or in part by the acts or omissions of the Contractor, its Subcontractors, its suppliers, anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to a party, person, or entity described in this paragraph. The obligation to defend, indemnify and hold harmless includes any claims or actions by third parties arising out of or resulting from Labor Code section 2810. Contractor shall have no obligation to defend or indemnify the Indemnitees against claims, actions, damages, liabilities, losses, and expenses caused by the active negligence, sole negligence or willful misconduct of Indemnitees. This indemnification shall apply to all liability, as provided for above, regardless of whether any insurance policies are applicable, and insurance policy limits do not act as a limitation upon the amount of the indemnification to be provided by the Contractor.

3.16.2 SCOPE: SUBCONTRACTORS

3.16.2.1 ***Indemnity.*** The Subcontractors shall defend, indemnify, and hold harmless the In

demnitees from and against claims, actions, damages, liabilities, and losses (including but not limited to injury or death of persons, property damage, and compensation owed to other parties), and expenses (including but not limited to attorneys' fees and costs including fees of consultants) alleged by third parties against Indemnitees arising out of or resulting from the following: Subcontractors' performance of the Work, including but not limited to the Subcontractors' use of the Site; the Subcontractors' construction of the Work or failure to construct the Work or any portion thereof; the use, misuse, erection, maintenance, operation, or failure of any machinery or equipment, including, but not limited to, scaffolds, derricks, ladders, hoists, and rigging supports, whether or not such machinery or equipment was furnished, rented, or loaned by any of the Indemnitees; or any act, omission, negligence, or willful misconduct of the Subcontractors or their respective agents, employees, material or equipment suppliers, invitees, or licensees but only to the extent caused in whole or in part by the acts or omissions of the Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to a party, person, or entity described in this paragraph. This obligation to defend, indemnify and hold harmless includes any claims or actions by third parties arising out of or resulting from Labor Code section 2810. Subcontractors shall have no obligation to defend or indemnify the Indemnitees against claims, actions, damages, liabilities, losses, and expenses caused by the active negligence, sole negligence or willful misconduct of Indemnitees. This indemnification shall apply to all liability, as provided for above, regardless of whether any insurance policies are applicable, and insurance policy limits do not act as a limitation upon the amount of the indemnification to be provided by the Subcontractors.

3.16.2.2 ***Joint and Several Liability.*** In the event more than one Subcontractor is connected with an accident or occurrence covered by this indemnification, then all such Subcontractors shall be jointly and severally responsible to each of the Indemnitees for indemnification, and the ultimate responsibility among such indemnifying Subcontractors for the loss and expense of any such indemnification shall be resolved without jeopardy to any Indemnitee. The provisions of the indemnity provided for herein shall not be construed to indemnify any Indemnitee for its own negligence if not permitted by law or to eliminate or reduce any other indemnification or right which any Indemnitee has by law or equity.

3.16.3 **NO LIMITATION**

The Contractor's and the Subcontractor's obligation to indemnify and defend the Indemnitees hereunder shall include, without limitation, any and all claims, damages, and costs: for injury to persons and property (including loss of use), and sickness, disease or death of any person; for breach of any warranty, express or implied; for failure of the Contractor or the Subcontractor to comply with any applicable governmental law, rule, regulation, or other requirement; and for products installed in or used in connection with the Work.

3.17 OWNER AS INTENDED BENEFICIARY

The Owner is an intended beneficiary of any architectural or engineering work secured by, or

performed by, the Contractor to fulfill its obligations under the Contract. Contractor shall state in its contracts with architectural or engineering consultants that their work is for the intended benefit of the Owner.

3.18 NOTICE OF EXCUSE FOR NONPERFORMANCE

If Contractor believes that acts or omissions of Owner (including but not limited to Owner caused delay) have prevented Contractor from performing the Work as required by the Contract Documents and Contractor intends to rely on Owner's acts or omissions and Civil Code section 1511(1) as reasons to excuse Contractor's nonperformance or to support, among other things, Contractor's requests for time extensions under Section 4.5, below, Contractor shall provide written notice of the excuse within five (5) days of the Owner's acts or omissions. If Contractor fails to timely submit the written notice, Contractor shall have waived any right to later rely on the acts or omissions as a defense to Contractor's nonperformance or as the basis for a time extension, regardless of the merits of the defense or time extension. Contractor will not have satisfied a condition precedent or exhausted administrative remedies. Contractor acknowledges that these written notices are of critical importance to the Owner's management of the Work and Project and the mitigation of costs and delays to the Work and Project.

3.19 RECOVERY OF COSTS, DAMAGES, OR TIME EXTENSIONS FROM OWNER

Notwithstanding any other provisions of the Contract Documents, Contractor expressly waives its right to recover any special, consequential, or indirect damages from Owner in relation to this Contract or the Project. Contractor may only recover general (also known as direct) damages from Owner to the extent allowed by the Contract Documents.

A Notice of Potential Change, Change Order Request and, if necessary, a Claim (see Sections 4.5, 7.2, and 7.6, below) are the exclusive means for Contractor to preserve its rights to recover any costs, damages, or time extensions related to the Contract or the Project from Owner, including but not limited to alleged breaches of contract based on extra work, delay, wrongful withholding, or wrongful termination. Contractor's failure to comply with the Contract Documents' procedures for a COR, CO, and Claim (including but not limited to Sections 4.5, 7.2, 7.6, and 7.7, below) may completely waive Contractor's rights to recovery any such costs or damages.

3.20 USE OF FEDERAL FUNDS

If federal funds are being used either in whole or in part for this Project (see the Instructions to Bidders), then the Project is subject to, and Contractor must comply with, all applicable federal laws including but not limited to the federal regulations set forth in CFR Title 2, Part 200. Accordingly, Contractor agrees to comply with all such federal requirements, including but not limited to the following:

A. EQUAL EMPLOYMENT OPPORTUNITY. Contractor agrees to comply with and be bound by Title 14, CFR, Section 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment

Opportunity, Department of Labor," the terms of which are incorporated by reference as though set forth in full herein.

B. DAVIS-BACON ACT. If the Contract Price exceeds $2,000, Contractor agrees to comply with and be bound by, and assist Owner in ensuring compliance with, the Davis-Bacon Act, as applicable. (40 U.S.C. §§ 3141-3144; 3146-3148 as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction").) Contractor is required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. Additionally, Contractor is required to pay wages not less than once a week. Furthermore, pursuant to the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"), Contractor is prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled.

C. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT. If the Contract Price exceeds $100,000 that involve the employment of mechanics or laborers, Contractor agrees to comply with and be bound by, and assist Owner in ensuring compliance with, the Contract Work Hours and Safety Standards Act, as applicable. (40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5).) Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

D. RIGHTS TO INVENTIONS MADE UNDER A CONTRACT AGREEMENT. For all contracts that meet the definition of "funding agreement" under 37 CFR § 401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," Contractor agrees to comply with and be bound by, and assist Owner in ensuring compliance with, 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," the provisions of which are incorporated herein by this reference, and any implementing regulations issued by the awarding agency, as applicable.

E. CLEAN AIR AND FEDERAL WATER POLLUTION ACT CONTROL. If the Contract Price exceeds $150,000, Contractor agrees to comply with and be bound by, and assist Owner in

ensuring compliance with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Any violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

F. DEBARMENT AND SUSPENSION. Contractor represents and warrants that it is not listed on the government-wide exclusions in the System for Award Management (SAM), and Contractor agrees to comply with and be bound by, and assist Owner in ensuring compliance with, the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

G. BYRD ANTI-LOBBYING AMENDMENT. If the Contract Price exceeds $100,000, Contractor agrees to comply with and be bound by, and assist Owner in ensuring compliance with, the Byrd Anti-Lobbying Amendment (31 U.S.C. § 1352). Contractor shall file the declaration and certification required by 31 U.S.C. § 1352(b).

H. PROCUREMENT OF RECOVERED MATERIALS. Contractor agrees to comply with, and be bound by, and assist Owner in ensuring compliance with, 2 CFR Section 200.323, as applicable.

I. PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT. Contractor agrees to comply with, and be bound by, and assist Owner in ensuring compliance with, 2 CFR Section 200.216, as applicable.

J. DOMESTIC PREFERENCES FOR PROCUREMENT. Contractor agrees to comply with, and be bound by, and assist Owner in ensuring compliance with, 2 CFR Section 200.322, as applicable. 2 CFR Section 200.322 requires Contractor to provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products), to the greatest extent practicable.

K. CONTRACTING WITH SMALL AND MINORITY BUSINESSES, WOMEN'S BUSINESS ENTERPRISES, AND LABOR SURPLUS AREA FIRMS. Contractor agrees to comply with, and be bound by, and assist Owner in ensuring compliance with, 2 CFR Section 200.321, as applicable. 2 CFR Section 200.321 requires Contractor to take the affirmative steps listed in 2 CFR Section 200.321 paragraphs (b)(1) through (5) to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible.

L. SAFETY AND HEALTH STANDARDS. As required by 34 CFR 75.609, Contractor agrees to comply with and be bound by, and assist Owner in ensuring compliance with, the standards under the Federal Occupational Safety and Health Act of 1970 (29 U.S.C.A., Section 651 et seq.) and State and local codes to the extent that they are more stringent.

M. ENERGY CONSERVATION. As required by 34 CFR 75.616, Contractor agrees to construct facilities to maximize the efficient use of energy and to comply with and be bound by, and assist OWNER in ensuring compliance with, the following standards of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) set forth in 34 CFR 75.616. Contractor shall also comply with and be bound by, and assist Owner in ensuring compliance with, the mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plans issued in compliance with the Energy Policy and Conservation Act (Pub. L 94-163, 89 Stat. 871).

N. If any provision is required by federal law, or by the federal grant program funding such project, to be included in the Contract Documents, such provisions shall be deemed by the parties to have been included.

ARTICLE 4

ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 DEFINITION

The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative, and shall also refer to all consultants under the Architect's direction and control.

4.1.2 MODIFICATION

To the extent the Contract Documents indicate that Owner has assigned duties or responsibilities to the Architect, Owner reserves the right at all times to reassign such duties or responsibilities to different Owner representatives.

4.1.3 TERMINATION

In the case of the termination of the Architect, the Owner may appoint an architect or another construction professional or may perform such functions with its own licensed professional personnel. The status of the replacement Architect under the Contract Documents shall be that of the former architect.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 STATUS

The Architect will provide administration of the Contract and may be one of several Owner's representatives during construction, through release of all retention, and during the one (1) year

period following the commencement of any warranties. The Architect will advise and consult with the Owner. The Architect will have authority to act on behalf of the Owner only to the extent set forth in the Owner/Architect agreement. The Architect will have all responsibilities and power established by law, including California Code of Regulations, Title 24, to the extent set forth in the Owner/Architect agreement.

4.2.2 SITE VISITS

The Architect will visit the Site at intervals necessary in the judgment of the Architect or as otherwise agreed by the Owner and the Architect in writing to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when Completed, will be in accordance with the Contract Documents.

4.2.3 LIMITATIONS OF CONSTRUCTION RESPONSIBILITY

The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract Documents, or by tests, inspections, or approvals required or performed by persons other than the Contractor.

4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

The Owner and the Contractor shall communicate through the Architect, unless there is a construction manager for the Project or the Owner directs otherwise. Communications between Owner and Subcontractors or material or equipment suppliers shall be through the Contractor.

4.2.5 PAYMENT APPLICATIONS

The Contractor shall submit payment applications to the Architect, unless there is a construction manager for the Project or the Owner directs otherwise.

4.2.6 REJECTION OF WORK

The Architect, Inspector of Record, any construction manager and others may recommend to the Owner that the Owner reject Work which does not conform to the Contract Documents or that the Owner require additional inspection or testing of the Work in accordance with paragraph 13.5.5, whether or not the Work is fabricated, installed, or completed. However, no recommendation shall create a duty or responsibility to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

4.2.7 CHANGE ORDERS

The Architect may prepare change orders and construction change directives and may authorize

minor changes in the Work.

4.2.8 WARRANTIES UPON COMPLETION

The Architect in conjunction with the Inspector of Record, or as otherwise directed by Owner, will conduct field reviews of the Work to determine the date of Completion, shall receive and forward to the Owner for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor. The handling by the Architect of such warranties, maintenance manuals, or similar documents shall not diminish or transfer to the Architect any responsibilities or liabilities required by the Contract Documents of the Contractor or other entities, parties, or persons performing or supplying the Work.

Except as may be otherwise directed by Owner, the Architect will conduct a field review of the Contractor's work pursuant to Section 9.7.1, below, for development of a punch list and one (1) follow-up field review if required. The cost incurred by the Owner for further field reviews or the preparation of further punch lists by the Architect shall be invoiced to the Contractor and withheld from payment and/or retention.

4.2.9 INTERPRETATION

The Architect, Inspector of Record, any construction manager, the Owner or any independent consultant of Owner, as Owner deems appropriate, will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of the Contractor. The Owner's response to such requests will be made with reasonable promptness, while allowing sufficient time to permit adequate review and evaluation of the request.

4.2.10 ADDITIONAL INSTRUCTIONS

4.2.10.1 ***Architect's Interpretations and Decisions.*** Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations of and decisions regarding the Contract Documents, the Architect will endeavor to secure faithful performance under the Contract Documents by both the Owner and the Contractor and will not show partiality to either. The Work shall be executed in conformity with, and the Contractor shall do no work without, approved drawings, Architect's clarifying instructions, and/or submittals.

4.2.10.2 ***Typical Parts and Sections.*** Whenever typical parts or sections of the Work are completely detailed on the Drawings, and other parts or sections which are essentially of the same construction are shown in outline only, the complete details shall apply to the Work which is shown in outline.

4.2.10.3 ***Dimensions.*** Dimensions of Work shall not be determined by scale or rule. Figured dimensions shall be followed at all times. If figured dimensions are lacking on Drawings, Architect shall supply them on request. The Owner's decisions on matters relating to aesthetic effect will be final if consistent with the Contract Documents.

4.3 INSPECTOR OF RECORD

4.3.1 GENERAL

One or more Project inspectors ("Inspector of Record") employed by the Owner and approved by the Division of the State Architect will be assigned to the Work in accordance with the requirements of Title 24 of the California Code of Regulations. The Inspector of Record's duties will be as specifically defined in Title 24.

4.3.2 INSPECTOR OF RECORD'S DUTIES

All Work shall be under the observation of or with the knowledge of the Inspector of Record. The Inspector of Record shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the Inspector of Record such information as may be necessary to keep the Inspector of Record fully informed regarding progress and manner of work and character of materials. Such observations shall not, in any way, relieve the Contractor from responsibility for full compliance with all terms and conditions of the Contract, or be construed to lessen to any degree the Contractor's responsibility for providing efficient and capable superintendence. The Inspector of Record is not authorized to make changes in the drawings or specifications nor shall the Inspector of Record's approval of the Work and methods relieve the Contractor of responsibility for the correction of subsequently discovered defects, or from its obligation to comply with the Contract Documents.

4.3.3 INSPECTOR OF RECORD'S AUTHORITY TO REJECT OR STOP WORK

The Inspector of Record shall have the authority to reject work that does not comply with the provisions of the Contract Documents. In addition, the Inspector of Record may stop any work which poses a probable risk of harm to persons or property. The Contractor shall instruct its employees, Subcontractors, material and equipment suppliers, etc., accordingly. The absence of any Stop Work order or rejection of any portion of the Work shall not relieve the Contractor from any of its obligations pursuant to the Contract Documents.

4.3.4 INSPECTOR OF RECORD'S FACILITIES

Within seven (7) days after notice to proceed, the Contractor shall provide the Inspector of Record with temporary facilities.

4.4 RESPONSIBILITY FOR ADDITIONAL CHARGES INCURRED BY THE OWNER FOR PROFESSIONAL SERVICES

If at any time prior to the Completion of the requirements under the Contract Documents, through no fault of its own, the Owner is required to provide or secure additional professional services for any reason by any act or omission of the Contractor, the Contractor shall be invoiced by the Owner for any actual costs incurred for any such additional services, which costs may, among other remedies, be withheld from the progress payments and/or retention. Such invoicing

shall be independent from any other Owner remedies, including but not limited to liquidated damages; ***except that*** to the extent that such additional services constitute Owner's delay damages under Public Contract Code section 7203, Owner may not recover them or invoice Contractor for them. If payments then or thereafter due to the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. Additional services shall include, but shall not be limited to, the following:

A. Services made necessary by the default of the Contractor.

B. Services made necessary due to the defects or deficiencies in the Work of the Contractor.

C. Services required by failure of the Contractor to perform according to any provision of the Contract Documents.

D. Services in connection with evaluating substitutions of products, materials, equipment, Subcontractors proposed by the Contractor, and making subsequent revisions to drawings, specifications, and providing other documentation required (except for the situation where the specified item is no longer manufactured or available).

E. Services for evaluating and processing Claims submitted by the Contractor in connection with the Work outside the established Change Order process.

F. Services required by the failure of the Contractor to prosecute the Work in a timely manner in compliance within the specified time for Completion.

G. Services in conjunction with the testing, adjusting, balancing and start-up of equipment other than the normal amount customarily associated for the type of Work involved.

H. Services in conjunction with more than one (1) re-review of required submittals of shop drawings, product data, and samples.

4.5 NOTICES OF POTENTIAL CHANGE, CHANGE ORDER REQUESTS, AND CLAIMS

If the Contractor identifies the potential for extra work, delay in the critical path schedule, or the need for additional money or time, or if the Contractor requests additional money or time on any grounds (including but not limited to an alleged breach of an implied warranty of the correctness of the plans and specifications [*Souza & McCue Construction Co. v. Superior Court* (1962) 57 Cal.2d 508]), or if the Contractor believes that Owner has failed to pay amounts due or otherwise breached the Contract, or otherwise believes that it is entitled to a modification of the Contract terms and conditions, then Contractor shall follow the procedures in this Section 4.5 and Article 7, otherwise Contractor shall have waived its rights to pursue those issues and any later attempts to recover money or obtain a modification shall be barred. Contractor specifically acknowledges

the Owner's and public's interest in, and need to know of, potential changes and disputes as early as possible so Owner can investigate, mitigate and resolve adverse cost and time impacts, if any. It is Contractor's obligation to know and comply with the requirements of the Contract Documents, including but not limited to Section 4.5 and Articles 7 and 8, and Owner has no obligation to notify Contractor of any failure to comply with those requirements.

4.5.1 NOTICE OF POTENTIAL CHANGE

Contractor shall submit a written Notice of Potential Change for extra work, critical path delay, or additional money or time. Contractor shall submit written Notices of Potential Change to Owner within five (5) days of the earlier of (a) Contractor becoming aware of the issue creating a potential change, or (ii) the date by which Contractor should have become aware of the issue creating a potential change; unless the issues are, or may soon be, adversely affecting the costs or critical path of the Work, in which case the Contractor must submit the written notice without delay so the Owner may take immediate action to mitigate cost and schedule impacts of the change, if any. The written notice shall explain the nature of the potential change so the Owner may take action to mitigate costs and schedule impacts, if necessary.

When submitting a written Notice of Potential Change based on extra work, Contractor shall not perform the extra work until directed in writing to do so by Owner. When submitting a written Notice of Potential Change for an issue of critical path delay, Contractor shall proactively mitigate the effects of the alleged delay as much as reasonably possible so as to minimize any impact to the schedule, until otherwise directed by Owner. If Contractor intends to rely on Owner's acts or omissions in support of a request for a time extension, then Contractor must also provide the notice set forth in section 3.18, above.

Failure to timely submit a written Notice of Potential Change shall constitute a complete waiver by Contractor of any right to later submit a change order request or pursue a Claim on that issue, or to later pursue any additional money or time extensions in any manner related to that issue, regardless of the merits. Contractor will not have satisfied a condition precedent or exhausted administrative remedies. Contractor acknowledges that these written notices are of critical importance to the Owner's Work and Project management and the mitigation of Work and Project costs and delays.

4.5.2 CHANGE ORDERS REQUESTS

If, after submitting a written Notice of Potential Change pursuant to Section 4.5.1, Contractor continues to believes that it is entitled to additional money or time (including but not limited to grant of a time extension; payment of money or damages arising from work done by, or on behalf of, the Contractor, payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to; or an amount the payment of which is disputed by the Owner) based on an issue, then Contractor shall submit a Change Order Request ("COR"; see Section 7.6.1) to Owner within twenty (20) days of the earlier of (i) Contractor becoming aware of the issue creating a potential change, or (ii) the date by which Contractor should have become aware of the issue creating a potential change. A rejection at any time or a lack of a rejection by

Owner of a Notice of Potential Change does not affect the timeline for submitting a COR.

Failure to timely submit a COR related to an issue, or failure to comply with any of the COR requirements in the Contract, shall constitute a complete waiver by Contractor of any right to later submit a COR or Claim on that issue, or to later pursue any additional money or time in any manner related to that issue, regardless of the merits. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

The COR shall state the grounds for the additional money or time requested and the amount of money or time requested, and Contractor shall include all information and documentation supporting the COR, including but not limited to calculations and analysis that demonstrate that the requested money or time is allowed by the applicable contract provisions and law. For any money or time other than the money and time specifically requested in the COR, Contractor will have completely waived its rights to recover such additional money or time (Contractor will not have satisfied a condition precedent or exhausted administrative remedies). If the COR requests money, then the COR must explain how the requested amounts were calculated. If the COR requests time, then the COR must identify the number of days of time being requested, establish that the days of delay are excusable (see Section 8.4.1), and include some critical path schedule analysis to support the number of days requested. Contractor may not reserve its rights, whether in a COR or other document, to submit a COR at a later time or in a manner other than as required by the Contract Documents. Any inclusion of a reservation of rights in a COR shall be grounds for rejection of the COR.

In the event that costs or delay are continuing to accrue at the time that a COR is required to be submitted, Contractor must still timely submit the COR with all available information and documentation supporting the COR as described above, and Contractor shall identify the costs or delay that are continuing. For continuing costs, the COR must include an estimate of when the extra work is expected to conclude and the total costs that will be incurred by the time that the extra work is expected to conclude. For continuing delay, the COR must include a schedule and delay analysis of when Contractor estimates that the delay will cease, what the final time extension request is estimated to be, and an estimate of the total of delay damages, if any, that will be requested. When the continuing cost or delay ends, within ten (10) days Contractor shall submit an updated COR that states the final dollar amount and/or time extension requested and that includes all required information and documentation. Failure to submit such final COR shall act as a waiver as described above.

Contractor shall certify each COR that it submits, including the initial COR and final COR for a continuing cost or delay, using the form set forth in Section 4.5.5.1, except that every reference to "Claim" shall be changed to "COR." If a COR is submitted without certification, a certification can still be submitted within the timelines set forth in the first paragraph of Section 4.5.2. If the COR is not timely certified, Contractor will have completely waived its rights to any money or time for that issue. Contractor will not have satisfied a condition precedent or exhausted administrative remedies. A certification of an initial COR for a continuing cost or delay shall include a statement that "Any estimates in the attached initial COR for a continuing cost or delay are based on true and correct facts and reasonable assumptions, as explained in the initial COR."

The Owner may accept the entire COR, accept part of the COR and reject the remainder, reject the entire COR, or request additional information. If the Owner does not respond within thirty (30) days of submission of the COR by accepting the entire COR, accepting part of the COR and rejecting the remainder, or requesting additional information, the entire COR shall be deemed rejected as of the thirtieth (30th) day. In the case of continuing costs or delay, the 30-day deadline in the previous sentence shall not apply to the initial COR; it will only apply to the final COR (see above). If the Owner requests additional information within thirty (30) days of submission, then the Contractor shall submit the information within fifteen (15) days of the date of the request and the Owner shall have fifteen (15) days after the receipt of the additional information to accept or reject (in whole or in part) the COR. If the Contractor fails to submit the information within fifteen (15) days, then the COR shall be deemed rejected. If the Owner fails to respond within fifteen (15) days after the submission of additional information, the entire COR shall be deemed rejected as of the fifteenth (15th) day.

4.5.3 **DEFINITION OF CLAIM**

A "Claim" is a separate demand by the Contractor sent by registered or certified mail, return receipt requested, for (a) a time extension, including, without limitation, a request for relief from damages or penalties for delay assessed by Owner under the Contract Documents; (b) payment by Owner of money or damages arising from work done by, or on behalf of, the Contractor pursuant to the Contract Documents, and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to (including but not limited to a claim for damages based on misleading or incomplete plans or specifications); or (c) an amount the payment of which is disputed by the Owner. A Claim includes any claim within the scope of Public Contract Code sections 9204 or 20104 et seq., and any alleged violation of a prompt payment statute. Resubmittal in any manner of a COR which was previously rejected under Section 4.5.2 constitutes a Claim, whether the COR was rejected in whole or in part, and whether the COR was rejected expressly or deemed rejected by Owner inaction. A Claim includes any dispute Contractor may have with the Owner, including one which does not require a Notice of Potential Change or COR under Sections 4.5.1 and 4.5.2, and including any alleged breach of contract or violation of law by the Owner (such as wrongful withholding of a payment by the Owner or wrongful termination by the Owner). A Claim under this Article 4.5 shall also constitute a claim for purposes of the California False Claims Act. In the event of a conflict between a Claims provision in Division 1 of the Specifications and Section 4.5, Section 4.5 shall take precedence.

The Notice of Potential Change and COR procedures above are less formal procedures which precede the more formal Claim. A Notice of Potential Change does not constitute a Claim. A COR does not constitute a Claim; **except that** if insufficient time remains before the Claim deadline (see Article 4.5.4) for Contractor to submit a COR and for Owner to process and reject the COR under Article 4.5.2, then either (1) Contractor may submit a COR which Owner shall treat as a Claim, but only if the COR complies with all requirements in this Article 4.5 and Article 7 for COR's and Claims, or (2) a COR is not required so long as a Claim complying with this Article 4.5 is timely submitted.

A Claim does not include vouchers, invoices, progress payment applications, or other routine or authorized forms of requests for progress payments on the Contract; however, those documents remain "claims" for purposes of the California False Claims Act. A Claim does not include a Government Code Claim. ("Government Code Claim" means a claim under Government Code sections 900 et seq. and 910 et seq.)

4.5.4 TIME FOR SUBMITTING CLAIM; WAIVER

Contractor shall submit a Claim to the Owner's construction manager (or in the absence of a construction manager, to Architect) and Owner within the earlier of (a) fifteen (15) days after Owner's rejection of a COR in whole or in part, or (b) fifteen (15) days after a COR being deemed rejected, pursuant to Section 4.5.2 above. If the Claim is not based on an issue for which a COR would be required (such as wrongful withholding by the Owner), then Contractor shall submit the Claim within fifteen (15) days after the date on which Contractor knew, or should have known, about the issue on which the Claim is based. If a Claim has not been submitted as of the date that the Contractor Completes the Work and submittal of the Claim was not yet required under the Contract Documents, then the Claim shall be submitted within seven (7) days of Completion of the Work; and such Claim shall not be barred due to lack of a Notice of Potential Change or COR if the deadline for the Notice of Potential Change or COR was after Completion of the Work.

In addition, within seven (7) days of Completion of the Work, Contractor shall submit to Owner, in writing, a list and summary of all Claims for money or time extensions under or arising out of this Contract which were timely filed, which were fully compliant with the Contract's requirements for Claims, and which the Contractor wishes to pursue in whole or in part. This Claim summary requirement shall not extend the time for submitting a Claim.

Failure to timely submit a Claim or Claim summary, failure to specifically identify a Claim in the Claim summary, or failure to comply with any of the requirements in the Contract for a Claim, including but not limited to this Article 4, will act as a complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim for the money or time (see Section 4.5.6.4), and (c) initiate any action, proceeding or litigation for the money or time, regardless of the merits; Contractor will not have satisfied a condition precedent or exhausted administrative remedies. Owner does not have an obligation to reject the Claim for a failure to comply with any of the Claim requirements in the Contract, including the lack of certification, and any failure by Owner to reject, or any delay in rejecting, a Claim on that basis does not waive the Owner's right to reject the Claim on that basis at a later time. In no event may the Contractor reserve its rights to assert a Claim for a time extension or additional money beyond the timelines set forth in this provision unless the Owner agrees in writing to allow the reservation.

4.5.5 CONTENT OF CLAIM

4.5.5.1 *Claim Format; Waiver*

Every Claim shall be in writing. All money or time extensions sought must be stated and

itemized in the Claim at the time submitted. The responsibility to substantiate Claims shall rest with the Contractor, and the Contractor shall furnish reasonable documentation to support each Claim, including as applicable, that documentation set forth in sections 4.5.5.2 through 4.5.5.4. In addition, the Contractor shall include a certification with each and every Claim at the time of submission, as follows:

> I, _____ *[name of declarant]*, declare the following:
>
> _____ *[Contractor company name]* has contracted with ____ *[public entity name]* for the _____ Contract ("Contract"). _____ *[Contractor company name]* authorized me to prepare the attached Claim for money and/or time extension for _____ *[public entity name]* regarding this Contract (such Claim being dated _____, 20__, and entitled _____, and requesting $_____ and/or ___ additional days), and I prepared the attached Claim. I am the most knowledgeable person at _____ *[Contractor company name]* regarding this Claim.
>
> The attached Claim complies with all laws applicable to submission of a Claim, including but not limited to California Penal Code section 72, Government Code sections 12650 et seq. (False Claims Act), and Business and Professions Code sections 17200 et seq. (Unfair Business Practices Act). I am aware that submission or certification of false claims, or other claims that violate law or the Contract, may lead to fines, imprisonment, and/or other serious legal consequences for myself or _____ *[Contractor company name]*.
>
> The attached Claim does not breach the Contract, is not a false claim, does not violate any applicable law, satisfies all provisions of the Contract applicable to submission of the Claim, only contains truthful and accurate supporting data, and only requests money and/or time extensions that accurately reflect the adjustments to money and time for which I believe that _____ *[public entity name]* is responsible under its Contract with _____ *[Contractor company name]*.
>
> While preparing this declaration and Claim I consulted with others (including attorneys, consultants, or others who work for _____ *[Contractor company name]*) when necessary to ensure that the statements were true and correct.
>
> Contractor understands and agrees that any Claim submitted without this certification does not meet the terms of the Contract Documents; that Owner, or Owner's representatives, may reject the Claim on that basis; and that unless Contractor properly and timely files the Claim with the certification, Contractor cannot further pursue the Claim in any forum and all rights to additional money or time for the issues covered by the Claim are waived due to a condition precedent not having been satisfied.

I declare under the penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed _____, 20__, at _____, California.

_____ *[signature]*
_____ *[name of declarant]*

Contractor's failure to timely submit a certification will constitute a complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim (see Section 4.5.6.3) for the money or time, and (c) initiate any action, proceeding or litigation for the money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

4.5.5.2 ***Claims for Additional Money***

Each Claim for additional money (including but not limited to those described in (b) and (c) of the first paragraph of Section 4.5.3) must include all facts supporting the Claim, including but not limited to all supporting documentation plus a written analysis as to (a) why the claimed cost was incurred, (b) why Contractor could not mitigate its costs, (c) why the claimed cost is the responsibility of the Owner, and (d) why the claimed cost is a reasonable amount. In no event will the Contractor be allowed to reserve its rights, whether in a Claim or other document, to assert a Claim for money at a later time or in a manner other than as required by the Contract Documents. Any inclusion of a reservation of rights in a Claim shall be grounds for rejection of the Claim. Any costs, direct or indirect, not timely asserted in a certified Claim shall be waived. A Claim may not include any costs incurred in preparation of the Claim or in preparation of any underlying COR, including but not limited to costs of delay analysis.

4.5.5.3 ***Claims for Additional Time***

4.5.5.3.1 ***Notice of Extent of Claim***

If the Contractor wishes to make a Claim for an increase in the Contract Time (including but not limited to Section 4.5.3(a)), the Claim shall include, but not be limited to, all facts supporting the Claim, all documentation of such facts, all information required by the Contract Documents, all information establishing entitlement to a time extension pursuant to Section 8.4.1 below, a current and certified schedule (see Section 3.9.1, above), and a delay analysis explaining (a) the nature of the delay, (b) the Owner's responsibility for the claimed delay, (c) the claimed delay's impact on the critical path, (d) the claimed delay's impact on the date of Completion (including an analysis of any float still remaining and whether the alleged delay in work exceeds such remaining float), and (e) why Contractor could not mitigate the delay impacts. Failure to include an updated and certified schedule, or a delay analysis, in a Claim seeking a time extension will act as a complete waiver of Contractor's rights to (i) recover money or time based on the issues addressed by the Claim, (ii) submit a Government Code Claim for the requested money or time (see Section 4.5.6.4), and (iii) initiate any action, proceeding or litigation for the requested

money or time, regardless of the merits; Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

In no event will the Contractor be allowed to reserve its rights, whether in a Claim or other document, to assert a Claim for a time extension at a later time or in a manner other than as required by the Contract Documents. Any inclusion of a reservation of rights in a Claim shall be grounds for rejection of the Claim. Any time extension not timely asserted in a certified Claim shall be waived.

4.5.5.3.2 ***Weather Claims***

If weather is the basis for a Claim for additional time, Contractor's delay analysis (see Section 4.5.5.3.1, above) must also provide data and facts showing that Contractor is entitled to a time extension pursuant to Article 8, including that the weather conditions were unusual and uncommon for the period of time, could not have been reasonably anticipated or mitigated, had an adverse effect on the critical path of the scheduled construction, and meet all other Contract requirements for a time extension (including but not limited to Section 8.4.1, below).

4.5.5.4 ***Subcontractor Requests for Money or Time***

A Subcontractor or supplier to Contractor may not submit a request for additional time or money directly to the Owner due to its lack of contractual privity with Owner. If a Subcontractor or supplier submits to Contractor a request for additional money or time based on an alleged breach of the subcontract or supplier contract by Contractor, Contractor may elect to seek money or time from Owner based on that request of the Subcontractor or supplier.

For any such request to Owner by Contractor, Contractor must comply with the requirements and prerequisites in the Contract Documents for requests to the Owner for money or time (including but not limited to Section 4.5 of the General Conditions regarding Notices of Potential Change, Change Order Requests ["CORs"], Claims, and certifications) and with Public Contract Code section 9204(d)(5). Any such COR or Claim by Contractor must include Contractor's certification (see General Conditions §§4.5.2 and 4.5.5.1), a complete copy of the Subcontractor's or supplier's request for money or time (including all documents submitted by the Subcontractor or supplier), and any other necessary supporting documentation. Any such COR or Claim by Contractor must include (a) Contractor's detailed analysis of the merit of Subcontractor's or supplier's request to the Contractor, including (i) analysis of Contractor's alleged breaches of the subcontract or supplier contract that allegedly caused the Subcontractor or supplier to incur damages or delay, and (ii) analysis of all of Contractor's defenses to the request for money or time by the Subcontractor or supplier; and (b) Contractor's detailed analysis of the Owner's liability to Contractor for any money or time that Contractor owes, or may later be determined to owe, to Subcontractor or supplier (including but not limited to how Owner's alleged breaches of the Contract Documents caused Contractor to breach the subcontract or supplier contract). In any such COR or Claim, Contractor may deny that it is liable to the Subcontractor or supplier for some or all of the requested money or time, or it may assert that it is merely submitting the COR or Claim to Owner on behalf of the Subcontractor or supplier; but doing one or the other would not excuse Contractor from complying with the above

requirements for its request to the Owner.

Any failure by Contractor to timely comply with this Section 4.5.5.4 (including a failure to timely submit a Notice of Potential Change, COR, Claim, certifications, or detailed analysis) shall act as a complete waiver of Contractor's rights to (a) recover money or time from Owner based on any money or time that Contractor owes, or may later be determined to owe, to the Subcontractor or supplier, (b) submit a Government Code Claim to Owner for the money or time requested by the Subcontractor or supplier (see Section 4.5.6.3), and (c) initiate any action, proceeding or litigation against Owner for any money or time that Contractor owes, or may later be determined to owe, to the Subcontractor or supplier. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

4.5.6 PROCEDURES FOR CLAIMS (PUBLIC CONTRACT CODE SECTION 9204)

Claims are subject to this section 4.5.6 and Public Contract Code section 9204, as well as the separate procedures and substantive provisions of Sections 4.5.1 through 4.5.5 and the rest of the Contract Documents. Claims of $375,000 or less are also subject to Public Contract Code sections 20104 et seq., but to the extent that one of the procedures in Sections 20104 et seq. conflicts with the procedures in Section 9204, the requirements of Section 9204 shall control.

4.5.6.1 *Claims*

The Owner shall conduct a reasonable review of the Claim and shall respond in writing to any written Claim within 45 days of receipt of the Claim. During that 45-day period, plus any extension, Owner may request, in writing, additional documentation supporting the Claim or relating to defenses to the Claim the Owner may have against the Contractor. Owner shall review any additional documentation Contractor supplies in response to that request within the 45 day, plus any extension, timeline.

After receipt of a Claim, the 45-day period may be extended by Owner and Contractor. The written response shall identify which portion of the Claim is disputed and what portion is undisputed. If Owner needs approval from its governing board to provide the written response, and the governing board does not meet within the 45 days or any extended period of time, then the Owner shall have up to three days after the next publicly noticed meeting of the governing board to provide the written response. Any payment due on an undisputed portion of the Claim shall be processed and made within sixty (60) days after the Owner issues the written response. Owner's failure to respond to a Claim within the above time periods or to otherwise meet the above time requirements shall result in the Claim being deemed rejected in its entirety.

4.5.6.2 *Meet and Confer*

If the Contractor disputes the Owner's written response, or the Owner fails to respond within the time prescribed, the Contractor may so notify the Owner, in writing, either within 15 days of receipt of the Owner's response or within 15 days of the Owner's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a written demand sent by registered or certified mail

return receipt requested, the Owner shall schedule a meet and confer conference for settlement of the dispute, which shall take place within 30 days of the demand. Upon written agreement of the Owner and Contractor, the conference may take place during regularly scheduled Project meetings. The informal conference is not a mediation since there is no neutral person facilitating communication to assist the parties to reach agreement; therefore, the provisions of Evidence Code sections 1115-1128 shall not apply to any portion of the informal conference (including but not limited to any documents provided or shown, or statements of fact or opinion made, by a party) unless the parties expressly agree in writing to their application. Any offer of compromise at an informal conference shall not be admissible to prove liability, as provided in Evidence Code section 1152, but this statute's prohibition of admissibility shall not apply to other statements before or at the informal conference, or in any document prepared for or exchanged at the informal conference.

If Contractor fails to timely notify the Owner that it wishes to meet and confer pursuant to the previous paragraph, then Contractor will have waived all rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim (see Section 4.5.6) for such money or time, and (c) initiate any action, proceeding or litigation for such money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

Within ten (10) business days after the conclusion of the meet and confer conference, the Owner shall give a written statement to the Contractor identifying the portion of the Claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the Claim shall be processed and made within sixty (60) days after the Owner issues the written statement. Within ten (10) business days of issuance of Owner's written statement, Contractor shall identify in writing the disputed portion of the Claim that shall be submitted to non-binding mediation (which may consist of any nonbinding process, including but not limited to neutral evaluation or a dispute review board), with the Owner and Contractor sharing the costs equally. The Owner and Contractor shall mutually agree to a mediator within ten (10) business days after the Contractor has identified in writing the disputed portion of the Claim. If they cannot agree upon a mediator, then each shall select a mediator and those two mediators shall select a qualified neutral third party to mediate the disputed portion of the Claim. (Each party shall bear the fees and costs its respective mediator charged in connection with the selection of the neutral mediator). The parties may mutually waive in writing the requirement for mediation. If Contractor fails to timely notify the Owner in writing that it wishes to mediate pursuant to this paragraph, Contractor will have waived all right to further pursue the Claim pursuant to section 4.5.4. The parties shall reasonably cooperate to schedule and attend a mediation as soon as reasonably possible. Owner's failure to respond to the Claim within the above time periods or to otherwise meet the above time requirements shall result in the Claim being deemed rejected in its entirety.

4.5.6.3 ***Government Code Claim***

If the Claim or any portion remains in dispute after the mediation and Contractor wishes to pursue it, the Contractor **must** file a timely and proper Government Code Claim. The filing of a Government Code Claim is specifically required in addition to all contractual procedures

described in Sections 4.5 through 4.5.6.2. The above contractual procedures do not act as a substitute for the Government Code Claim process, and the two sets of procedures shall be sequential with the contractual procedures coming first.

Failure to timely file a Government Code Claim shall act as complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Government Code Claim was required, and (b) initiate any action, proceeding or litigation for such money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

Owner and Contractor shall proceed with the Government Code Claim according to Government Code, Section 900 et seq., and as otherwise permitted by law. For purposes of the applicable Government Code provisions, and as provided in Public Contract Code section 20104.2(e), the running of the time period within which a Contractor must file a Government Code Claim shall be tolled from the time the Contractor submits a written Claim under Article 4.5 until the time that the Claim is denied, in whole or in part, as a result of the meet and confer process in Section 4.5.6.2, including any period of time utilized by the meet and confer process.

4.5.7 CONTINUING CONTRACT PERFORMANCE

Despite Contractor's submission of, or Owner's rejection of, a Notice of Potential Change, COR, Claim, or Government Code Claim based on alleged breaches of the Contract by Owner, the Contractor shall proceed diligently with performance of the Contract as directed by Owner, and the Owner shall continue to make any undisputed payments in accordance with the Contract. Contractor acknowledges that Completion of the Work is a high priority for both Owner and Contractor as failure to Complete the Work would most likely cause each of them to incur much greater costs and damages than would be incurred if the Work were Completed. If Contractor believes that Owner has breached the Contract and that such breach is preventing or delaying Contractor's performance as directed by Owner, then Contractor must submit notice as required by Section 3.18, above.

4.5.8 CLAIMS FOR CONCEALED OR UNKNOWN CONDITIONS

4.5.8.1 *Trenches or Excavations Less Than Four Feet Below the Surface*

If Contractor encounters conditions at the Site which are subsurface or otherwise concealed physical conditions, which differ materially from those indicated in the Contract Documents, or unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall give notice to the Owner promptly before conditions are disturbed and in no event later than ten (10) days after first observance of the conditions. If Contractor believes that such conditions differ materially and will cause an increase in the Contractor's cost of, time required for, or performance of any part of the Work, Contractor must comply with the provisions above for Notice of Potential Change, Change Order Request, and Claims (beginning with Section 4.5.1).

4.5.8.2 ***Trenches or Excavations Greater Than Four Feet Below the Surface***

Pursuant to Public Contract Code section 7104, when any excavation or trenching extends greater than four feet below the surface:

4.5.8.2.1 The Contractor shall promptly, and before the following conditions are disturbed, notify the public entity, in writing, of any:

(1) Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law.

(2) Subsurface or latent physical conditions at the site differing from those indicated by information about the site made available to bidders prior to the deadline for submitting bids.

(3) Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

4.5.8.2.2 The public entity shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work shall issue a change order under the procedures described in the Contract.

4.5.8.2.3 In the event that a dispute arises between the public entity and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any deadline for Completion provided by the Contract, but shall proceed with all Work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

4.5.9 **INJURY OR DAMAGE TO PERSON OR PROPERTY**

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, any of the other party's employees or agents, or others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding ten (10) days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. For a Notice of Potential Change, COR and Claim for additional cost or time related to this injury or damage, Contractor shall follow Section 4.5.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 SUBCONTRACTOR

A Subcontractor is a person or entity, who has a contract with the Contractor to perform a portion of the Work at the Site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor. To the extent that the term Trade Contractor is utilized in the Contract Documents, it shall have the same meaning as the term "Subcontractor."

5.1.2 SUB-SUBCONTRACTOR

A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the Site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

5.1.3 SPECIALTY CONTRACTORS

If a Subcontractor is designated as a "Specialty Contractor" as defined in section 7058 of the Business and Professions Code, all of the Work outside of that Subcontractor's specialty shall be performed in compliance with the Subletting and Subcontracting Fair Practices Act, Public Contract Code sections 4100, et seq.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 ASSIGNMENT OR SUBSTITUTION - CONSENT OF OWNER

In accordance with Public Contract Code sections 4107 and 4107.5, no Contractor whose bid is accepted shall, without the written consent of the Owner: substitute any person or entity as a Subcontractor in place of the Subcontractor designated in the original bid; permit any such Subcontract to be assigned or transferred, or allow it to be performed by any person or entity other than the original Subcontractor listed in the original bid; sublet or subcontract any portion of the Work in excess of one-half of one percent (0.5%) of the Contractor's total bid as to which its original bid did not designate a Subcontractor. Any assignment or substitution made without the prior written consent of the awarding authority shall be void, and the assignees shall acquire no rights in the Contract. Any consent, if given, shall not relieve Contractor or its

Subcontractors from their obligations under the terms of the Contract Documents.

5.2.2 **GROUNDS FOR SUBSTITUTION**

Pursuant to Public Contract Code section 4107 and the procedure set forth therein, no Contractor whose bid is accepted may request to substitute any person or entity as a Subcontractor in place of a Subcontractor listed in the original bid except in the following instances:

A. When the Subcontractor listed in the bid after having a reasonable opportunity to do so, fails or refuses to execute a written contract for the scope of work specified in the subcontractor's bid and at the price specified in the subcontractor's bid, when that written contract, based upon the general terms, conditions, plans and specifications for the Project involved or the terms of that Subcontractor's written bid, is presented to the Subcontractor by the Contractor;

B. When the listed Subcontractor becomes insolvent or the subject of an order for relief in bankruptcy;

C. When the listed Subcontractor fails or refuses to perform his or her Subcontract;

D. When the listed Subcontractor fails or refuses to meet the bond requirements of the prime contractor set forth in Public Contract Code section 4108.

E. When the Contractor demonstrates to the awarding authority, or its duly authorized officer, subject to the further provisions of Public Contract Code section 4107.5, that the name of the Subcontractor was listed as the result of inadvertent clerical error;

F. When the listed Subcontractor is not licensed pursuant to the Contractors License Law; or

G. When the awarding authority, or its duly authorized officer, determines that the Work being performed by the listed Subcontractor is substantially unsatisfactory and not in substantial accordance with the plans and specifications, or the Subcontractor is substantially delaying or disrupting the progress of the Work.

H. When the listed Subcontractor is ineligible to work on a public works project pursuant to Section 1777.1 of the Labor Code.

I. When the awarding authority determines that a listed Subcontractor is not a responsible contractor.

5.2.2.1 ***No Change in Contract.*** Any substitutions of Subcontractors shall not result in any increase in the Contract Sum or result in the granting of any extension of time for a Milestone Deadline or the Completion of the Work.

5.2.2.2 ***Substitution Due to Clerical Error.*** The Contractor, as a condition of asserting a claim of inadvertent clerical error in the listing of a Subcontractor, shall, pursuant to Public Contract Code section 4107.5, within two (2) working days after the time of the prime bid opening by the awarding authority, give written notice to the awarding authority and copies of such notice to both the Subcontractor it claims to have listed in error, and the intended Subcontractor who had bid to the Contractor prior to bid opening. Any listed Subcontractor who has been notified by the Contractor in accordance with the provisions of this section as to an inadvertent clerical error, shall be allowed six (6) working days from the time of the prime bid opening within which to submit to the awarding authority and to the Contractor written objection to the Contractor's claim of inadvertent clerical error.

In all other cases, the Contractor must make a request in writing to the awarding authority for the substitution of a subcontractor, giving reasons therefore. The awarding authority shall mail a written notice to the listed Subcontractor giving reasons for the proposed substitution. The listed Subcontractor shall have five (5) working days from the date of such notice within which to file with the awarding authority written objections to the substitution.

Failure to file written objections pursuant to the provisions of this section within the times specified herein shall constitute a complete waiver of objection to the substitution by the listed Subcontractor and, where the ground for substitution is an inadvertent clerical error, an agreement by the listed Subcontractor that an inadvertent clerical error was made.

If written objections are filed, the awarding authority shall give five (5) days notice to the Contractor and to the listed Subcontractor of a hearing by the awarding authority on the Contractor's request for substitution as provided in Public Contract Code section 4107. The determination by the awarding authority shall be final.

5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all obligations and responsibilities, which the Contractor, by the Contract Documents, assumes toward the Owner. Each subcontract agreement shall preserve and protect the rights of the Owner under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound. Upon written request of the Subcontractor, the Contractor shall identify to the Subcontractor the terms and conditions of the proposed subcontract agreement, which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such

documents available to their respective proposed Sub-subcontractors.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

A. Assignment is effective only after termination of the Contract with the Contractor by the Owner for cause pursuant to Article 14 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and

B. Assignment is subject to the prior rights of the surety, if any, obligated under any bond relating to the Contract.

5.5 SUBCONTRACTOR'S RESPONSIBILITIES

Every Subcontractor is bound to the following provisions, unless specifically noted to the contrary in the Subcontractor's contract subject to the limitations of section 5.3.

5.5.1 SUPERVISION BY SUBCONTRACTORS

Subcontractors shall efficiently supervise their Work, using their best skill and attention. Each of them shall carefully study and compare all Drawings, Specifications, and other instructions, shall at once report to Contractor any error or omission which any of them may discover, and shall subsequently proceed with the Work in accordance with instructions from the Contractor concerning such error or omission. Each Subcontractor shall be fully responsible for and shall bear the full risk of loss of all of its property.

5.5.2 DISCIPLINE AND ORDER

Each Subcontractor shall at all times enforce strict discipline and good order among its Subcontractors, material or equipment suppliers, or their agents, employees, and invitees, and shall establish and maintain surveillance over the activities of each of the foregoing to minimize any disturbance, damage, pollution, or unsightly conditions relative to property areas adjacent to or in the vicinity of the Site. The Contractor shall have the right to remove from the Work any employee of a Subcontractor for any reason including, without limitation, incompetence or carelessness.

5.5.3 DEFECTS DISCOVERED

Should the proper and accurate performance of the Work depend upon the proper and accurate performance of other work not included in its Contract, each Subcontractor shall use all necessary means to discover any defect in such other work and shall allow the Contractor, the Owner and Architect, or other Subcontractors as Contractor elects, a reasonable amount of time to remedy such defects. If the Subcontractor should proceed with its Work, it shall be considered

to have accepted such other work, unless the Subcontractor shall have proceeded pursuant to instructions in writing by the Contractor over its written objection.

5.5.4 SUBCONTRACTOR INFORMATION

Each Subcontractor shall submit to the Owner, the Contractor, or the Architect, as the case may be, promptly when requested by any of the foregoing, information with respect to the names, responsibilities, and titles of the principal members of its staff, the adequacy of the Subcontractor's equipment and the availability of necessary materials and supplies. Subcontractor shall fully cooperate with Contractor in its periodic review of the adequacy of Subcontractor's supervision, personnel, and equipment, and the availability of necessary materials and supplies and shall promptly comply with the requirements of the Contractor with respect thereto.

5.5.5 TEMPORARY STRUCTURES

Each Subcontractor shall furnish at its expense its own temporary facilities and storage except those specifically agreed to be furnished to it by the Contractor in the Subcontract Agreement. Subcontractor's material storage rooms and field offices, etc., will be placed in locations designated by the Contractor. When it becomes necessary due to the progress of the Work for the Subcontractor to relocate its field operations, it will do so in an expeditious manner and at no additional cost to Contractor or Owner. The construction of material storage rooms and field offices, etc., will be of fire resistive material only, such as concrete or gypsum block, rated drywall, or sheet metal.

5.5.6 CHARGES TO SUBCONTRACTOR

Each Subcontractor may be subject to the Contractor's reasonable charges for hoisting, repair to other work caused by the fault or negligence of Subcontractor, removal of Subcontractor's rubbish, and clean-up occasioned by Subcontractor.

5.5.7 FINES IMPOSED

Subcontractor shall comply with and pay any fines or penalties imposed for violation of any applicable law, ordinance, rule, regulation, Environmental Impact Report mitigation requirement, and lawful order of any public authority, including, without limitation, all OSHA and California OSHA requirements and those of other authorities having jurisdiction of the safety of persons or property.

5.5.8 PROJECT SIGNS

Each Subcontractor shall not display on or about the Project any sign, trademark, or other advertisement. The Owner will permit a single Project sign, which shall be subject to the Owner's prior and sole discretion and approval, as to all matters including, without limitation, size, location, material, colors, style and size of printing, logos and trademarks (if any), text, and

selection of names to be displayed.

5.5.9 REMEDIES FOR FAILURE TO PERFORM

Without limitation of any other right or remedy available to Contractor under the Contract Documents or at law, should: the Subcontractor fail to perform its portion of the Work in a skilled and expeditious manner in accordance with the terms of the Contract Documents with sufficient labor, materials, equipment, and facilities; delays the progress of the job or otherwise fail in any of its obligations; or either a receiver is appointed for the Subcontractor or the Subcontractor is declared to be bankrupt or insolvent, and such appointment, bankruptcy, or insolvency proceedings or declaration is not set aside within thirty (30) days, then the Contractor, upon three (3) days notice to the Subcontractor (subject to the requirements of Pub. Contracts Code, § 4107), may provide such labor, materials, or perform such work and recover the cost plus profit and overhead from monies due or to become due thereafter to the Subcontractor. The Contractor may terminate the employment of the Subcontractor, taking possession of its tools, materials, and equipment related to the Work and cause the entire portion of the Subcontractor's Work to be finished either by another Subcontractor or through the Contractor's own forces.

5.5.10 DISPUTES NOT TO AFFECT WORK

In the event of any dispute as to whether or not any portion of the Work is within the scope of the Work to be performed by a Subcontractor, or any dispute as to whether or not the Subcontractor is entitled to a Change Order for any Work requested of it or entitled to payment, the Subcontractor shall continue to proceed diligently with the performance of the Work. Regardless of the size or nature of the dispute, the Subcontractor shall not under any circumstances cease or delay performance of its portion of the Work during the existence of the dispute. The Contractor shall continue to pay the undisputed amounts called for under the Subcontract Agreement during the existence of the dispute. Any party stopping or delaying the progress of the Work because of a dispute shall be responsible in damages to the Owner, the Architect, and the Contractor for any losses suffered as a result of the delay.

5.5.11 APPLICATION FOR PAYMENT

Contractor agrees to advise the Subcontractor if any documentation in connection with the Subcontractor's application for payment has not been accepted or is in any way unsatisfactory.

5.5.12 COMPLIANCE WITH PROCEDURES

Each Subcontractor shall comply with all procedures established by the Contractor for coordination among the Owner, the Owner's consultants, Architect, Contractor, and the various Subcontractors for coordination of the Work with all local municipal authorities, government agencies, utility companies, and any other agencies with jurisdiction over all or any portion of the Work. The Subcontractor shall cooperate fully with all of the foregoing parties and authorities.

5.5.13 **ON-SITE RECORD KEEPING**

Subcontractor shall comply with all on-Site record keeping systems established by the Contractor and shall, upon the request of the Contractor, provide the Contractor with such information and reports as the Contractor may deem appropriate. Without limitation of the foregoing, the Subcontractor shall assemble all required permits and certificates so that they are readily accessible at the Site.

5.5.14 **NON-EXCLUSIVE OBLIGATIONS**

The specific requirements of Article 5 are not intended to exclude the obligation of the Subcontractor to comply with any of the other provisions of the General Conditions and the other Contract Documents which are relevant to the proper performance of its portion of the Work.

ARTICLE 6

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 **OWNER'S RIGHTS**

The Owner reserves the right to perform Project work related to the Contract with the Owner's own forces, or to award separate contracts in connection with such other work or other construction or operations on the Site under conditions of the Contract identical or substantially similar to these including those portions related to insurance. Upon the election to perform such work with its own forces or by separate contracts, the Owner shall notify the Contractor. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall proceed pursuant to Section 4.5 in the Contract Documents.

6.1.2 **DESIGNATION AS CONTRACTOR**

When separate contracts are awarded for different portions of the Project or other construction or operations on the Site, the term "Contractor" in the Contract Documents in each of those contracts shall mean the contractor who executes each separate Owner/Contractor agreement.

6.1.3 **CONTRACTOR DUTIES**

Although the Owner shall have overall responsibility for coordination and scheduling of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, Contractor shall cooperate with Owner. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the

schedules to be used by the Contractor until subsequently revised.

6.1.4 OWNER OBLIGATIONS

Unless otherwise provided in the Contract Documents, when the Owner performs work related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations, and to have the same rights, which apply to the Contractor under the General Conditions, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10 and 12.

6.2 MUTUAL RESPONSIBILITY

6.2.1 DELIVERY AND STORAGE

The Contractor shall afford the Owner and separate contractors reasonable opportunity for delivery and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the separate contractors' construction and operations with theirs as required by the Contract Documents.

6.2.2 NOTICE BY CONTRACTOR

If part of the Contractor's Work depends upon proper execution or results from work by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Owner patent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acknowledgment that the Owner's or separate contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3 COSTS INCURRED

Costs, expenses, and damages caused by delays, improperly timed activities, defective construction, or damages to another's work/Work or property shall be borne by the party responsible. Should Contractor cause damage to the work or property of any other contractor on the Project, or to the Project or the property of a third party, or cause any delay to any such contractor or third party, the Contractor shall defend, indemnify and hold Owner harmless for such damage or delay under Section 3.16, above. Owner may withhold from progress payments and/or retention for the cost of such damage or delay.

6.2.4 CORRECTION OF DAMAGE

The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors.

6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Section 3.13, the Owner may clean up and allocate the cost among those responsible as the Owner determines to be just.

ARTICLE 7

CHANGES IN THE WORK

7.1 CHANGES

7.1.1 NO CHANGES WITHOUT AUTHORIZATION

The Owner reserves the right to change the Work by making such alterations, deviations, additions to, or deletions from the plans and specifications, as may be deemed by the Owner to be necessary or advisable for the proper Completion or construction of the Work contemplated, and Owner reserves the right to require Contractor to perform such work. No adjustment will be made in the Contract unit price of any Contract item regardless of the quantity ultimately required.

Owner shall compensate Contractor with additional money or additional time, or both, as warranted under the Contract Documents for any extra work ordered by the Owner to be performed by Contractor; but such "extra work" shall not include any work or expense (a) that was known by, should have been known by, or was reasonably foreseeable to Contractor at the time of bidding, or (b) for which Contractor is responsible under the Contract Documents. Contractor shall follow the provisions of the Contract Documents, including General Conditions sections 4.5, 7.6, 7.7, and 8.4, when requesting additional money or additional time for such extra work. Contractor shall expeditiously perform all extra work upon direction, even if no agreement has been reached on extra time or money. For all such changes resulting in a credit to Owner, Contractor shall follow Sections 7.5 and 7.7 in providing the credit to Owner. Contractor shall bring all potential credits to the Owner's attention.

There shall be no change whatsoever in the drawings, specifications, or in the Work or payments under the Contract Documents without an executed Change Order, Construction Change Directive, or order by the Owner pursuant to Section 7.1.2. Owner shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the same shall have been properly requested under Section 4.5 and authorized by, and the cost thereof approved in writing by, Change Order or Construction Change Directive. Owner shall not be liable for, and Contractor shall bear the burden of, any post-bid escalation in the costs of construction, whether or not foreseeable; but Contractor will retain the benefit of any post-bid cost decreases, whether or not foreseeable, and will retain the right to request additional compensation for cost increases incurred due to Owner delay. No extension of time for performance of the Work shall be allowed hereunder unless request for such extension is properly made under Section 4.5 and such time is thereof approved

in writing by Change Order or Construction Change Directive. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.

7.1.2 AUTHORITY TO ORDER MINOR CHANGES

The Owner has authority to order minor changes in the Work not involving any adjustment in the Contract Sum, an extension of the Contract Time, or a change which is inconsistent with the intent of the Contract Documents. Such changes shall be effected by written Construction Change Directive and shall be binding on the Contractor. The Contractor shall carry out such written orders promptly.

7.2 CHANGE ORDERS ("CO")

A CO is a written instrument signed by the Owner and the Contractor, stamped (or sealed) and signed by Architect, and approved by the Owner's Governing Board and DSA, stating the agreement of Owner and Contractor upon all of the following:

A. A change in the Work;

B. The amount of the adjustment in the Contract Sum, if any; and

C. The extent of the adjustment in the Contract Time, if any.

Unless expressly stated otherwise in the CO, any CO executed by Owner and Contractor constitutes and includes full and complete money and time (including but not limited to, adjustments to money and time) for all costs and effects caused by any of the changes described within it. Unless expressly stated otherwise in the CO, in consideration for the money received for the changes described in the CO, Contractor waives all Claims for all costs and effects caused by any of the changes, including but not limited to labor, equipment, materials, delay, extra work, overhead (home and field), profit, direct costs, indirect costs, acceleration, disruption, impaired productivity, time extensions, and any the costs and effects on Subcontractors and suppliers of any tier.

7.3 CONSTRUCTION CHANGE DIRECTIVES ("CCD")

7.3.1 DEFINITION

A CCD is a written unilateral order signed by the Owner directing performance of the Work or a change in the Work. The CCD may state an adjustment in the Contract Sum, Contract Time, or Milestone Deadline. The Owner may by CCD, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions pursuant to Section 7.1.1.

7.3.2 USE TO DIRECT CHANGE

A CCD shall be used in the absence of agreement on the terms of a CO. If Contractor disagrees with the terms of a CCD, it shall nevertheless perform the work directed by the CCD, but it may pursue the Notice of Potential Change, COR and Claim procedures of Section 4.5 if Contractor believes it is entitled to changes in the Contract Sum or Contract Time.

7.4 REQUEST FOR INFORMATION ("RFI")

7.4.1 DEFINITION

An RFI is a written request prepared by the Contractor asking the Owner to provide additional information necessary to clarify an item which the Contractor feels is not clearly shown or called for in the drawings or specifications, or to address problems which have arisen under field conditions.

7.4.2 SCOPE

The RFI shall reference all the applicable Contract Documents including specification section, detail, page numbers, drawing numbers, and sheet numbers, etc. The Contractor shall make suggestions and/or interpretations of the issue raised by the RFI. An RFI cannot modify the Contract Sum, Contract Time, or the Contract Documents.

7.4.3 RESPONSE TIME

Unless Owner expressly directs otherwise in writing, Contractor shall submit RFIs directly to the Architect, with copies forwarded to the Owner. Contractor shall submit a revised and updated priority schedule with each RFI. The Architect shall endeavor to follow the Contractor's requested order of priorities. The Owner and Contractor agree that an adequate time period for the Architect (or other designated recipient of the RFI) to respond to an RFI is generally fourteen (14) calendar days after the Architect's receipt of an RFI, unless the Owner and Contractor agree otherwise in writing. However, in all cases, the Architect shall take such time, whether more or less than 14 days, as is necessary in the Architect's professional judgment to permit adequate review and evaluation of the RFI. If Contractor informs the Architect that it needs a response to an RFI expedited to avoid delay to the critical path, the Architect shall provide a response as quickly as reasonably possible. The total time required for the Architect to respond is subject to the complexity of the RFI, the number of RFI's submitted concurrently and the reprioritization of pending RFI's submitted by the Contractor, among other things. If Contractor believes that the Architect's response results in a change in the Work that warrants additional money or time, or that Architect's response was unreasonably delayed and caused delay to the Work's critical path, Contractor shall follow the procedures for additional money or time under Section 4.5. No presumption shall arise as to the timeliness of the response if the response is more than fourteen (14) days after the Architect's receipt of the RFI. Contractor shall review the Contract Documents before submitting an RFI to ensure that the information is not already in the Contract Documents. To compensate the Owner for time and costs incurred for each time the information was already in the Contract Documents, Owner may withhold $100 from progress payments or

retention in addition to any other remedies which Owner may have the right to pursue.

7.4.4 **COSTS INCURRED**

The Contractor shall be invoiced by the Owner for any costs incurred for professional services, which shall be withheld from progress payments or retention, if an RFI requests an interpretation or decision of a matter where the information sought is equally available to the party making such request.

7.5 **REQUEST FOR PROPOSAL ("RFP")**

7.5.1 **DEFINITION**

An RFP is Owner's written request asking the Contractor to submit to the Owner an estimate of the effect, including credits, of a proposed change on the Contract Sum and the Contract Time.

7.5.2 **SCOPE**

An RFP shall contain adequate information, including any necessary drawings and specifications, to enable Contractor to provide the cost breakdowns required by section 7.7. The Contractor shall not be entitled to any additional money for preparing a response to an RFP, whether ultimately accepted or not.

7.6 **CHANGE ORDER REQUEST** ("COR")

7.6.1 **DEFINITION**

A COR is any written request prepared by the Contractor asking the Owner for additional money or time, including a "proposed change order" or "PCO." However, a Claim (see Sections 4.5.3-4.5.6) is not a COR. See Section 4.5.2 for additional COR requirements. The COR shall include all information necessary to establish the Contractor's entitlement to additional money or time.

7.6.2 **CHANGES IN PRICE**

A COR shall include breakdowns per section 7.7 to validate any proposed change in Contract Sum.

7.6.3 **CHANGES IN TIME**

Where a change in a Milestone Deadline or Contract Time is requested, a COR shall also include delay analysis to validate any proposed change, and shall meet all requirements in these General Conditions, including but not limited to Section 8.4. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Work schedule as defined in section 3.9 and Division 1 of the Specifications.

7.7 PRICE OF CHANGE ORDERS

7.7.1 SCOPE

Any COR shall provide in writing to the Owner, the Architect and any construction manager, the effect of the proposed CO upon the Contract Sum and the actual cost of construction, which shall include a complete itemized cost breakdown of all labor and material showing actual quantities, hours, unit prices, wage rates, required for the change, and the effect upon the Contract Time of such CO.

7.7.2 DETERMINATION OF COST

The amount of the increase or decrease in the Contract Sum resulting from a CO, if any, shall be determined in one or more of the following ways as applicable to a specific situation:

A. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

B. Unit prices stated in the Contractor's original bid, the Contract Documents, or subsequently agreed upon between the Owner and the Contractor;

C. Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

D. By cost of material and labor and percentage of overhead and profit. If the value is determined by this method the following requirements shall apply:

1. **Daily Reports by Contractor**.

a) General: At the close of each working day, the Contractor shall submit a daily report to the Inspector of Record and any construction manager, on forms approved by the Owner, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day, the location of the work, and for other services and expenditures when authorized concerning extra work items. An attempt shall be made to reconcile the report daily, and it shall be signed by the Inspector of Record and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the report. Reports by Subcontractors or others shall be submitted through the Contractor.

b) Labor: Show names of workers, classifications, and hours worked.

c) Materials: Describe and list quantities of materials used.

d) Equipment: Show type of equipment, size, identification number,

and hours of operation, including, if applicable, loading and transportation.

e) Other Services and Expenditures: Describe in such detail as the Owner may require.

2. **Basis for Establishing Costs**.

a) Labor will be the actual cost for wages prevailing locally for each craft or type of workers at the time the extra work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. The use of a labor classification, which would increase the extra work cost, will not be permitted unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

b) Materials shall be at invoice or lowest current price at which such materials are locally available and delivered to the Site in the quantities involved, plus sales tax, freight, and delivery.

The Owner reserves the right to approve materials and sources of supply or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the Owner.

c) Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of $100 or less.

Regardless of ownership, the rates to be used in determining equipment rental costs shall not exceed listed rates prevailing locally at equipment rental agencies or distributors at the time the work is performed.

The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.

Necessary loading and transportation costs for equipment used on the extra work shall be included. If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the Owner than holding it at the work Site, it shall be returned unless the Contractor elects to keep it at the work Site at no expense to the Owner.

All equipment shall be acceptable to the Inspector of Record, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and modifications shall be used to classify equipment,

and equipment shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

d) Other Items. The Owner may authorize other items which may be required on the extra work. Such items include labor, services, material, and equipment which are different in their nature from those required by the Work, and which are of a type not ordinarily available from the Contractor or any of the Subcontractors. Invoices covering all such items in detail shall be submitted with the Application for Payment.

e) Invoices. Vendors' invoices for material, equipment rental, and other expenditures shall be submitted with the COR. If the Application for Payment is not substantiated by invoices or other documentation, the Owner may establish the cost of the item involved at the lowest price which was current at the time of the Daily Report.

f) Overhead, premiums and profit. For overhead, including direct and indirect costs, submit with the COR and include: home office overhead, off-Site supervision, CO preparation/negotiation/research for Owner initiated changes, time delays, project interference and disruption, additional guaranty and warranty durations, on-Site supervision, additional temporary protection, additional temporary utilities, additional material handling costs, and additional safety equipment costs.

7.7.3 **FORMAT FOR PROPOSED COST CHANGE**

The following format shall be used as applicable by the Owner and the Contractor to communicate proposed additions and deductions to the Contract.

Work Performed by Subcontractors:

	EXTRA	**CREDIT**
A. Material (attach itemized quantity and unit cost plus sales tax, invoices, receipts, truck tags, etc., for force account work)	_____	_____
B. Labor (attach itemized hours and rates, daily logs, certified payroll, etc.)	_____	_____
C. Equipment (attach any invoices)	_____	_____
D. Subtotal	_____	_____

E. Add Subcontractor's overhead and profit, not to exceed ten percent (10%) of item D.	_____	_____
F. Subtotal	_____	_____
G. General Contractor's Overhead and Profit, not to exceed five percent (5%) of Item F.	_____	_____
H. Subtotal	_____	_____
I. Bonds and insurance, not to exceed one and a half percent (1.5%) of Item H.	_____	_____
J. TOTAL	_____	_____
K. TIME in calendar days (zero unless indicated; "TBD" not permitted)	_____	_____

Work Performed by Contractor:

	EXTRA	**CREDIT**
A. Material (attach itemized quantity and unit cost plus sales tax, invoices, receipts, truck tags, etc., for force account work)	_____	_____
B. Labor (attach itemized hours and rates, daily logs, certified payroll, etc.)	_____	_____
C. Equipment (attach any invoices)	_____	_____
D. Subtotal	_____	_____
E. Add Contractor's overhead and profit, not to exceed fifteen percent (15%) of item D.	_____	_____
F. Subtotal	_____	_____
G. Bonds and insurance, not to exceed one percent (1.5%) of Item I.	_____	_____

H.	TOTAL	_____	_____
I.	TIME in calendar days (zero unless indicated; "TBD" not permitted)	_____	_____

For any claimed overhead costs (whether field overhead (i.e., general conditions costs) or home office overhead) pursuant to Section 8.4.2 below, Contractor may not recover any mark ups for overhead or profit.

It is expressly understood that the value of such extra work or changes, as determined by any of the aforementioned methods, expressly includes (1) any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the project or resulting from delay to the project, and (2) any costs of preparing a COR, including but not limited to delay analysis. Any costs or expenses not included are deemed waived.

7.7.4 DISCOUNTS, REBATES, AND REFUNDS

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the Contractor's cost in determining the actual cost of construction for purposes of any change, addition, or omissions in the Work as provided herein.

7.7.5 ACCOUNTING RECORDS

With respect to portions of the Work performed by COs and CCDs on a time-and-materials, unit-cost, or similar basis, the Contractor shall keep and maintain cost-accounting records satisfactory to the Owner, which shall be available to the Owner on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

7.7.6 NOTICE REQUIRED

Contractor shall submit a written Notice of Potential Change for additional money or time pursuant to section 4.5.1.

7.7.7 APPLICABILITY TO SUBCONTRACTORS

Any requirements under this Article 7 shall be equally applicable to COs or CCDs issued to Subcontractors by the Contractor to the same extent required of the Contractor.

7.8 WAIVER OF RIGHT TO CLAIM MONEY OR TIME

Failure to demand money based on costs, or time extensions, as part of a COR constitutes a complete waiver of Contractor's right to claim the omitted money or time. All money or time for

an issue must be included in the COR at the time submitted.

ARTICLE 8

TIME

8.1 DEFINITIONS

8.1.1 CONTRACT TIME

Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Completion of the Work.

8.1.2 NOTICE TO PROCEED

Contractor shall not commence the Work until it receives a Notice to Proceed from Owner. The date of commencement of the Work is the date established in the Notice to Proceed. The date of commencement shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

8.1.3 DAYS

The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.2 HOURS OF WORK

8.2.1 SUFFICIENT FORCES

Contractors and Subcontractors shall furnish sufficient forces to ensure the prosecution of the Work, including Work directed pursuant to a CCD (see Section 7.3, above), in accordance with the Construction Schedule.

8.2.2 PERFORMANCE DURING WORKING HOURS

Work shall be performed during regular working hours except that in the event of an emergency or when required to perform the Work in accordance with job progress, Work may be performed outside of regular working hours with the advance written consent of the Owner.

8.2.3 LABOR CODE APPLICATION

As provided in Article 3 (commencing at § 1810), Chapter 1, Part 7, Division 2 of the Labor Code, eight (8) hours of labor shall constitute a legal day's work. The time of service of any worker employed at any time by the Contractor or by any Subcontractor on any subcontract under this Contract, upon the Work or upon any part of the Work contemplated by this Contract, is limited and restricted to eight (8) hours during any one calendar day and forty (40) hours

during any one calendar week, except as hereinafter provided. Notwithstanding the provision hereinabove set forth, Work performed by employees of Contractors in excess of eight (8) hours per day and forty (40) hours during any one week shall be permitted upon this public work with compensation provided for all hours worked in excess of eight (8) hours per day at not less than one and one-half (1-1/2) times the basic rate of pay.

Contractor or subcontractor shall pay to the Owner a penalty of Twenty-five Dollars ($25.00) for each worker employed in the execution of this Contract by the Contractor, or by any Subcontractor, for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any calendar day and forty (40) hours in any one (1) calendar week, in violation of the provisions of Article 3 (commencing at § 1810), Chapter 1, Part 7, Division 2 of the Labor Code, unless compensation for the workers so employed by Contractor is not less than one and one-half (1-1/2) times the basic rate of pay for all hours worked in excess of eight (8) hours per day.

8.2.4 COSTS FOR AFTER HOURS INSPECTIONS

If the work done after hours is required by the Contract Documents to be done outside the Contractor's or the Inspector of Record's regular working hours, the costs of any inspections, if required to be done outside normal working hours, shall be borne by the Owner.

If the Owner allows the Contractor to do work outside regular working hours for the Contractor's own convenience, the costs of any inspections required outside regular working hours, among other remedies, shall be invoiced to the Contractor by the Owner and withheld from progress payments and/or retention. Contractor shall give Owner at least 48 hours notice prior to working outside regular working hours.

If the Contractor elects to perform work outside the Inspector of Record's regular working hours, costs of any inspections required outside regular working hours, among other remedies, may be invoiced to the Contractor by the Owner and withheld from progress payments and/or retention.

8.2.5 TIME FOR COMMENCEMENT BY SUBCONTRACTORS

Unless otherwise provided in the Contract Documents, all Subcontractors shall commence their Work within two (2) consecutive business days after notice to them by the Contractor and shall prosecute their Work in accordance with the progress of the Work.

8.3 PROGRESS AND COMPLETION

8.3.1 TIME OF THE ESSENCE

Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Milestone Deadlines and Contract Time are reasonable periods for performing the Work.

8.3.2 NO COMMENCEMENT WITHOUT INSURANCE

The Contractor shall not knowingly, except by agreement or instruction of the Owner, in writing, commence operations on the Site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.

8.3.3 EXPEDITIOUS COMPLETION

The Contractor shall proceed expeditiously to perform the Work, including Work directed pursuant to a CCD (see Section 7.3, above), with adequate forces, labor, materials, equipment, services and management, shall achieve all Milestone Deadlines, and shall achieve Completion within the Contract Time.

8.4 EXTENSIONS OF TIME - LIQUIDATED DAMAGES

Contractor waives all rights and remedies as to any delay experienced during the Work (including any right to rescind the Contract and any right to refuse to perform the Contract) except for the rights and remedies expressly allowed by the Contract (including but not limited to time extensions and delay damages pursuant to this Section 8.4.1 and Section 8.4.2 below, and termination pursuant to Section 14.1 below).

8.4.1 CONDITIONS ALLOWING FOR EXTENSIONS OF TIME TO COMPLETE THE WORK ONLY (EXCUSABLE DELAY)

The Contractor shall be granted a reasonable time extension under the Contract Documents, including but not limited to Sections 3.18 and 4.5 and Article 7, for excusable delays, which are those delays that meet each and every of the following conditions:

(a) The delay was beyond the control of Contractor and its subcontractors and material suppliers;

(b) The delay was caused by events that were not reasonably foreseeable to Contractor at the time of bidding;

(c) All float in the schedule had been used, and the delay impacted and delayed the controlling items of Work (i.e., the as-built critical path, as determined from the as-planned schedule and the actual progress of the Work), thus delaying the achievement of a Milestone Deadline or the Completion of the whole Work within the Contract Time;

(d) The delay was not caused by Contractor or its subcontractors or suppliers, including but not limited to their breaches of contract or the standard of care;

(e) The delay was not associated with loss of time resulting from the necessity of submittals to Owner for approval, or from necessary Owner surveys, measurements, inspections and testing; and

(f) The delay could not have been prevented or mitigated by the exercise of care, prudence, foresight, and diligence by Contractor.

To be entitled to a time extension for excusable delay caused by weather, the Contractor must establish, in addition to (a)-(f) above, that the weather delay to the critical path exceeded the number of weather days required to be included in the schedule (see Section 3.9.1, above). For example, if the schedule included two calendar days of weather delay for a particular month, and the Contractor establishes five calendar days of actual weather delay to the critical path, then the Contractor may be entitled to a time extension of three calendar days.

Excusable delays may include acts of God, acts of public enemy, acts of the Owner or anyone employed by it, acts of another contractor in performance of a contract (other than this Contract) with the Owner, fires, floods, epidemics, quarantine restrictions, labor disputes, weather, unforeseen site conditions, or delays of subcontractors due to such causes. Owner shall take into consideration other relevant factors such as concurrent delays. Contractor has the burden of proving that any delay was excusable.

8.4.2 COMPENSABLE DELAY (TIME AND MONEY)

Compensable delays are those excusable delays for which Contractor is also entitled to money. To be compensable, an excusable delay must be one for which the Owner is responsible, where the delay was unreasonable under the circumstances involved, and where the delay was not within the contemplation of the parties; ***however***, Contractor shall not be entitled to monetary compensation when (a) Contractor could have reasonably anticipated the delay and avoided or minimized the cost impacts of it, (b) there was a concurrent delay which does not qualify for monetary compensation under this paragraph, (c) the cause of the delay was reasonably unforeseen by the Owner or the delay was caused by factors beyond the control of the Owner, including but not limited to a delay under Section 2.2.8 above or a delay caused by a utility company's failure to perform despite Owner's reasonable arrangements for such performance; or (d) any other defense available to Owner under law or equity applies. Contractor has the burden of proving that any delay was excusable and compensable, including an analysis that establishes non-concurrency. Compensation shall be limited to field overhead (i.e., general conditions) and home office overhead, as may be allowed by law.

8.4.3 NOTICE BY CONTRACTOR REQUIRED; PROCEDURES FOR DEMANDING ADDITIONAL TIME OR MONEY

For notice and other required procedures related to requests by Contractor for additional time or money related to delay, Contractor shall comply with the Contract Documents, including but not limited to Sections 3.18 and 4.5, and Article 7, above.

8.4.4 EARLY COMPLETION

Regardless of the cause therefore, the Contractor may not maintain any Claim or cause of action against the Owner for damages incurred as a result of its failure or inability to Complete its Work on the Project in a shorter period than established in the Contract Documents, the parties stipulating that the period set forth in the Contract Documents is a reasonable time within which to perform the Work on the Project.

8.4.5 LIQUIDATED DAMAGES

Failure to Complete the Work within the Contract Time and in the manner provided for by the Contract Documents, or failure to complete any specified portion of the Work by a milestone deadline, shall subject the Contractor to liquidated damages as described in Article III of the Agreement and the Contract Documents. Accordingly, the parties agree that the amount set forth in the Agreement shall be presumed to be the amount of damages which the Owner shall directly incur as a result of each calendar day by which Completion of the Work is delayed beyond the Contract Time as adjusted by Change Orders.

In addition, delaying another contractor's work on the Project or causing delay to the *completion* of the Project shall subject the Contractor to liquidated damages as described in Article III of the Agreement and the Contract Documents. Accordingly, the parties agree that the amount set forth in the Agreement shall be presumed to be the amount of damages which the Owner shall directly incur as a result of each calendar day by which Contractor delays the work of others on the Project or *completion* of the Project itself.

If liquidated damages accrue as described above, the Owner, in addition to all other remedies provided by law, shall have the right to assess and withhold as provided in Article III of the Agreement and the Contract Documents.

8.5 GOVERNMENT APPROVALS

Owner shall not be liable for any delays or damages related to the time required to obtain government approvals.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement, later adjusted by Change Orders and Construction Change Directives, and is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2 COST BREAKDOWN

9.2.1 REQUIRED INFORMATION

On forms approved by the Owner, the Contractor shall furnish the following:

A. Within ten (10) days of the mailing, faxing or delivering of the Notice of Award of the Contract, a detailed breakdown of the Contract Sum (Schedule of Values) for the Work. Each item in the schedule of values shall include its proper share of the overhead and profit.

B. Within ten (10) days of the mailing, faxing or delivering of the Notice of Award of the Contract, a schedule of estimated monthly payment requests (cash flow) due the Contractor showing the values and construction time of the various portions of the Work to be performed by it and by its Subcontractors or material and equipment suppliers containing such supporting evidence as to its correctness as the Owner may require;

C. Five (5) days prior to the submission of a pay request, an itemized breakdown of work done for the purpose of requesting partial payments;

D. Within ten (10) days of the mailing, faxing or delivering of the Notice of Award of the Contract, the name, address, telephone number, fax number, license number and classification, and (for all projects over Twenty-Five Thousand Dollars ($25,000)) the public works contractor registration number of all of its Subcontractors and of all other parties furnishing labor, material, or equipment for its Contract, along with the amount of each such subcontract or the price of such labor, material, and equipment needed for its entire portion of the Work.

9.2.2 OWNER ACCEPTANCE REQUIRED

The Owner shall review all submissions received pursuant to paragraph 9.2.1 in a timely manner. All submissions must be accepted by the Owner before becoming the basis of any payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 PROCEDURE

On or before the fifth (5th) day of each calendar month during the progress of the portion of the Work for which payment is being requested, the Contractor shall submit to the Architect, unless there is a construction manager for the Project or the Owner directs otherwise, an itemized Application for Payment for operations completed in accordance with the Schedule of Values through the end of the previous calendar month. Such application shall be notarized, if required, and supported by the following:

A. The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;

B. The amount being requested with the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;

C. The balance that will be due to each of such entities after said payment is made;

D. A certification that the Record Drawings and Annotated Specifications are current;

E. The Owner approved additions to and subtractions from the Contract Sum and Time;

F. A summary of the retentions (each Application shall provide for retention, as set out in Article 9.6);

G. Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the Owner may require from time to time;

H. The percentage of Completion of the Contractor's Work by line item in the schedule of values;

I. A statement showing all payments made by the Contractor for labor and materials on account of the Work covered in the preceding Application for Payment. Such applications shall not include requests for payment of amounts the Contractor does not intend to pay to subcontractors or others because of a dispute or other reason;

J. Conditional and unconditional waivers and releases in exchange for progress payments, including final progress payments, in compliance with Civil Code sections 8132-8138;

K. Contractor's monthly reports, daily reports, and monthly schedule updates for all months of Work prior to the Application for Payment that Contractor has not previously submitted;

L. Certification that all required certified payroll records have been submitted to the DIR; and

M. A report regarding the status of all stop payment notices that have been submitted, or a statement that no stop payment notices have been submitted.

9.3.2 **PURCHASE OF MATERIALS AND EQUIPMENT**

As the Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from Owner, to assure that there will be no delays, payment by the Owner for stored material shall be made only in unusual circumstances where the Architect specifically recommends, and Owner specifically approves the payment in writing. If payments are to be made on account of materials and equipment not incorporated in the Work, but delivered and suitably stored at the Site or at some other location agreed upon in writing by the Owner, the payments shall be conditioned upon submission by the Contractor, Subcontractor, or vendor of bills of sale and such other documents satisfactory to the

Owner to establish the Owner's title to such materials or equipment free of all liens and encumbrances, and otherwise protect the Owner's interest, including, without limitation, provision of applicable insurance and transportation to the Site. All stored items shall be inventoried, specified by identification numbers (if applicable), released to the Owner by sureties of the Contractor and the Subcontractor and, if stored off-Site, stored only in a bonded warehouse.

9.3.3 **WARRANTY OF TITLE**

The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work. Transfer of title to Work does not constitute a waiver by Owner of any defects in the Work.

9.4 **REVIEW OF PROGRESS PAYMENT**

9.4.1 **OWNER ACCEPTANCE**

The Owner will, within seven (7) days after receipt of the Contractor's Application for Payment, either accept such payment or notify the Contractor in writing of the Owner's reasons for withholding acceptance in whole or in part.

9.4.2 **OWNER'S REVIEW**

The review of the Contractor's Application for Payment by the Owner will be based, at least in part, on the Owner's observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated. The review is also subject to an evaluation of the Work for conformance with the Contract Documents, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to Completion, and to specific qualifications expressed by the Owner. The Owner may reject the Application for Payment if it is not complete under section 9.3. The issuance of a Certificate for Payment will constitute a representation that the Contractor is entitled to payment in the amount certified, subject to any withholdings under Section 9.5.1 or any specific qualifications Owner expresses in the Certificate for Payment. However, Contractor's entitlement to payment may be affected by subsequent evaluations of the Work for conformance with the Contract Documents, test and inspections and discovery of minor deviations from the Contract Documents correctable prior to Completion. The issuance of a Certificate for Payment will not be a waiver by the Owner of any defects in the Work covered by the Application for Payment, nor will it be a representation that the Owner has:

A. Made exhaustive or continuous on-Site inspections to check the quality or

quantity of the Work;

B. Reviewed construction means, methods, techniques, sequences, or procedures;

C. Reviewed copies of requisitions received from Subcontractors, material and equipment suppliers, and other data requested by the Owner to substantiate the Contractor's right to payment; or

D. Made an examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5 DECISIONS TO WITHHOLD PAYMENT

9.5.1 REASONS TO WITHHOLD PAYMENT

The Owner may withhold from a progress payment, in whole or in part, to such extent as may be necessary to protect the Owner due to any of the following:

A. Defective or incomplete Work not remedied;

B. Stop Payment Notices. For any stop payment notice, the Owner shall withhold the amount stated in the stop payment notice, the stop notice claimant's anticipated interest and court costs and an amount to provide for the Owner's reasonable cost of any litigation pursuant to the stop payment notice. For any stop payment notice action the parties resolve before judgment is entered, Owner has the right to permanently withhold for any reasonable cost of litigation for that stop payment notice, even if it exceeds the amount originally withheld by Owner for the estimated reasonable cost of litigation. However, if (1) the Contractor at its sole expense provides a bond or other security satisfactory to the Owner in the amount of at least one hundred twenty-five percent (125%) of the claim, in a form satisfactory to the Owner, which protects the Owner against such claim, and (2) the Owner chooses to accept the bond, then Owner would release the withheld stop payment notice funds to the Contractor, except that Owner may permanently withhold for any reasonable cost of litigation. Any stop payment notice release bond shall be executed by a California admitted, fiscally solvent surety, completely unaffiliated with and separate from the surety on the payment and performance bonds, that does not have any assets pooled with the payment and performance bond sureties.

C. Liquidated damages against the Contractor, whether already accrued or estimated to accrue in the future;

D. Reasonable doubt that the Work can be Completed for the unpaid balance of any Contract Sum or within the Contract Time;

E. Damage to the property or work of the Owner, another contractor, or

subcontractor;

F. Unsatisfactory prosecution of the Work by the Contractor;

G. Failure to store and properly secure materials;

H. Failure of the Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, monthly progress schedules, shop drawings, submittal schedules, schedule of values, product data and samples, proposed product lists, executed change orders, and verified reports;

I. Failure of the Contractor to maintain record drawings;

J. Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment;

K. Unauthorized deviations from the Contract Documents;

L. Failure of the Contractor to prosecute the Work in a timely manner in compliance with established progress schedules and Completion deadlines;

M. Subsequently discovered evidence or observations nullifying the whole or part of a previously issued Certificate for Payment;

N. Failure by Contractor to pay Subcontractors or material suppliers as required by Contract or law, which includes but is not limited to Contractor's failure to pay prevailing wage and any assessment of statutory penalties;

O. Overpayment to Contractor on a previous payment;

P. Credits owed to Owner for reduced scope of work or work that Contractor will not perform, including credits for any unspent allowance;

Q. The estimated cost of performing work pursuant to Section 2.4;

R. Actual damages related to false claims by Contractor;

S. Breach of any provision of the Contract Documents;

T. Owner's potential or actual loss, liability or damages caused by the Contractor, including defense costs and attorneys' fees incurred due to Contractor's failure to defend an action pursuant to the indemnity provisions in the Contract Documents; and

U. As permitted by other provisions in the Contract or as otherwise allowed by law,

including statutory penalties Owner or other entities assessed against Contractor. (See e.g., Labor Code section 1813 (working hours) or Public Contract Code section 4110 (subcontractor listings and substitutions))

Owner may, but is not required to, provide to Contractor written notice of the items for which Owner is withholding amounts from a progress payment.

To claim a breach of contract or violation of law based on wrongful withholding by the Owner from a progress payment or based on a late progress payment, or if Contractor otherwise disputes any progress payment or lack thereof, within fifteen (15) days of the alleged breach of contract, violation of law, or late or disputed progress payment Contractor shall submit a Claim pursuant and subject to Sections 4.5.3-4.5.6. The Contractor need not submit a Notice of Potential Change or a Change Order Request.

For any withhold amount based on an estimate where the actual amount later becomes known and certain, no later than the final accounting for the Contract the Owner will release any amount withheld over that certain and known amount. If the certain and known amount exceeds the amount previously withheld, Owner may withhold additional amounts from Contractor to cover the excess amount. If available funds are not sufficient, Contractor shall pay Owner the difference.

Despite any withholding from a progress payment, or any other dispute about a progress payment, Contractor shall continue to expeditiously perform the Work pursuant to the Contract Documents, including but not limited to General Conditions sections 4.5.8, 7.1.1, 8.3.1, and 8.3.3.

9.5.2 PAYMENT AFTER CURE

When Contractor removes or cures the grounds for withholding amounts, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

9.5.3 OVERPAYMENT AND/OR FAILURE TO WITHHOLD

Neither Owner's overpayment to Contractor, nor Owner's failure to withhold an amount from payment that Owner had the right to withhold, shall constitute a waiver by Owner of its rights to withhold those amounts from future payments to Contractor or to otherwise pursue recovery of those amounts from Contractor.

9.6 PROGRESS PAYMENTS

9.6.1 PAYMENTS TO CONTRACTOR

Progress payments shall be made in accordance with Public Contract Code sections 7201, 9203, and 20104.50. Unless otherwise stated in the Contract Documents, within thirty (30) days after

receipt of an undisputed and properly submitted Application for Payment ("properly submitted" means in compliance with the law and the Contract Documents, including submittal of all documents required to accompany the Application [see Section 9.3.1, above]), Contractor shall be paid a sum equal to ninety-five percent (95%) of the undisputed value of the Work performed up to the last day of the previous month, less the aggregate of previous payments; and Owner shall withhold the other five percent (5%) of the undisputed value of the Work as retainage (or "retention"). The value of the Work completed shall be an estimate only, no inaccuracy or error in said estimate shall operate to release the Contractor, or any bondsman, from damages arising from such Work or from enforcing each and every provision of this Contract, and the Owner shall have the right subsequently to correct any error made in any estimate for payment. Contractor shall base an Application for Payment only on the original Contract Sum plus any fully executed and Board-approved Change Orders. Contractor shall not include Notices of Potential Claims, CORs, Claims or disputed amounts.

The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for work performed, so long as any lawful or proper direction given by the Owner concerning the Work, or any portion thereof, remains uncomplied with. Payment shall not be a waiver of any such direction.

9.6.2 **PAYMENTS TO SUBCONTRACTORS**

No later than ten (10) days after receipt of payment from Owner, pursuant to Business and Professions Code section 7108.5, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.6.3 **PERCENTAGE OF COMPLETION OR PAYMENT INFORMATION**

The Owner will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of Completion or amounts applied for by the Contractor, and action taken thereon by the Owner, on account of portions of the Work done by such Subcontractor.

9.6.4 **NO OBLIGATION OF OWNER FOR SUBCONTRACTOR PAYMENT**

The Owner shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

9.6.5 **PAYMENT TO SUPPLIERS**

Payment to material or equipment suppliers shall be treated in a manner similar to that provided in paragraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 PAYMENT NOT CONSTITUTING APPROVAL OR ACCEPTANCE

An accepted Application for Payment, issuance of a Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance or approval of any portion of the Work, especially any Work not in accordance with the Contract Documents.

9.6.7 JOINT CHECKS

Owner shall have the right, if necessary for the protection of the Owner, to issue joint checks made payable to the Contractor and Subcontractors and/or material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. However, Owner has no duty to issue joint checks. In no event shall any joint check payment be construed to create any contract between the Owner and a Subcontractor of any tier, any obligation from the Owner to such Subcontractor, or rights in such Subcontractor against the Owner.

9.7 COMPLETION OF THE WORK

9.7.1 CLOSE-OUT PROCEDURES

When the Contractor considers that the Work is Complete and submits a written notice to Owner requesting an inspection of the Work, the Owner shall review the Work and prepare and submit to the Contractor a comprehensive list of items to be Completed or corrected (the "Punch List"). The Punch List shall include all outstanding obligations of Contractor, including training, start-up, testing, and submission to Owner of all required documentation (e.g., written guarantees, warranties, invoices, as-built drawings, manuals, bonds, and the documents described in Sections 9.3 and 9.9). The Contractor and/or its Subcontractors shall proceed promptly to Complete and correct items on the Punch List. Failure to include an item on the Punch List does not alter the responsibility of the Contractor to Complete all Work (including the omitted item) in accordance with the Contract Documents, and to Complete or correct the Work so long as the statute of limitations (or repose) has not run.

When the Contractor believes the Punch List Work is Complete and in accordance with the Contract Documents, it shall then submit a request for an additional inspection by the Owner to determine Completion. Owner shall again inspect the Work and inform the Contractor of any items that are not complete or correct. Contractor shall promptly Complete or correct items until no items remain.

After the Work, including all Punch List Work, is inspected and informally deemed by the Owner to be Complete, the Owner's governing body may formally accept the Work as Complete at a meeting of the governing body. Warranties required by the Contract Documents shall commence on the date of Contractor's Completion of the Work (see Sections 3.5, 12.2.5, and 12.2.6).

Owner may record a Notice of Completion as allowed by Civil Code section 9200 *et seq*.

9.7.2 COSTS OF MULTIPLE INSPECTIONS

More than two (2) requests by Contractor to make inspections to confirm Completion as required under paragraph 9.7.1 shall be considered an additional service of Owner, and all subsequent costs will be invoiced to Contractor and withheld from remaining payments.

9.8 PARTIAL OCCUPANCY OR USE

The Owner may occupy or use any completed, or partially completed, portion of the Work at any stage prior to acceptance, or prior to Completion if there is no formal acceptance. Occupancy or use of any portion of the Work, or the whole Work, shall not constitute approval or acceptance of it, nor shall such occupancy or use relieve Contractor of any of its obligations under the Contract Documents regarding that portion of, or the whole, Work.

The Owner and the Contractor shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents. When the Contractor considers a portion complete, the Contractor may request an inspection of that portion and preparation of a Punch List by the Owner for that portion, as set forth for the entire Work under paragraph 9.7.1; however, such inspection and Punch List shall not act as any form of approval or acceptance of that portion of the Work, or of any Work not complying with the requirements of the Contract, and that portion shall be subject to subsequent inspections and Punch Lists.

Immediately prior to such partial occupancy or use, the Owner, the Architect and the Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.9 FINAL PROGRESS PAYMENT AND RELEASE OF RETENTION

9.9.1 FINAL APPLICATION FOR PROGRESS PAYMENT

When, pursuant to Section 9.7.1, the Owner finds all of the Work is Completed in accordance with the Contract Documents, it shall so notify Contractor, who shall then submit to the Owner its final Application for Payment.

Upon receipt and approval of such final Application for Payment, the Owner shall issue a final Certificate of Payment, based on its knowledge, information, and belief, and on the basis of its observations, inspections, and all other data accumulated or received by the Owner in connection with the Work, that such Work has been Completed in accordance with the Contract Documents. If required to do so under Labor Code section 1773.3(d), Owner shall withhold final payment.

9.9.2 PROCEDURES FOR APPLICATION FOR FINAL PROGRESS PAYMENT

The Application for Final Progress Payment pursuant to Section 9.9.1 shall be accompanied by

the same details as set forth in Section 9.3, and in addition, the following conditions must be fulfilled:

A. The Work shall be Complete, and the Contractor shall have made, or caused to have been made, all corrections to the Work which are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of Owner required under the Contract.

B. Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work, and Contractor delivered them to the Owner.

C. The Contractor shall deliver to the Owner (i) reproducible final Record Drawings and Annotated Specifications showing the Contractor's Work "as built," with the Contractor's certification of the accuracy of the Record Drawings and Annotated Specifications, (ii) all warranties and guarantees, (iii) operation and maintenance instructions, manuals and materials for equipment and apparatus, and (iv) all other documents required by the Contract Documents.

D. Contractor shall provide extensive assistance in the utilization of any equipment or system such as initial start-up or testing, adjusting and balancing, preparation of operation and maintenance manuals and training personnel for operation and maintenance.

Acceptance of Final Progress Payment shall constitute a complete waiver of Claims except for those previously identified in writing and identified by that payee as unsettled at the time of Final Progress Payment.

9.9.3 **RELEASE OF RETAINAGE**

Owner shall withhold not less than 5% of the Contract Sum ("retainage," or "retention") until Completion and acceptance of the Project, per Public Contract Code section 9203.

Owner may withhold from release or payment of retainage up to 150% of disputed amounts, including but not limited to the issues listed in Section 9.5. If retainage is held in an escrow account pursuant to an escrow agreement under Public Contract Code section 22300 (see Section 9.10) and Owner withholds from release of retainage based on a breach of the Contract, or other default, by Contractor, Owner may withdraw the withheld retainage from the escrow account.

Owner shall release the undisputed retainage within sixty (60) days after Completion of the Project. For this purpose, "Completion" is defined in Public Contract Code section 7107(c). No interest shall be paid on any retainage, or on any amounts withheld, except as provided to the contrary in any Escrow Agreement and General Conditions between the Owner and the

Contractor under Public Contract Code section 22300.

To claim a breach of contract or violation of law based on wrongful withholding by the Owner from retention or based on a late payment or late release of retention, or if Contractor otherwise disputes any payment or release of retention or lack thereof, within fifteen (15) days of the alleged breach of contract, violation of law, or late or disputed payment/release of retention Contractor shall submit a Claim pursuant and subject to Sections 4.5.3-4.5.6. The Contractor need not submit a Notice of Potential Change or a Change Order Request.

9.10 SUBSTITUTION OF SECURITIES

In accordance with section 22300 of the Public Contract Code, the Owner will permit the substitution of securities for any retention monies withheld by the Owner to ensure performance under the Contract. At the request and expense of the Contractor, securities equivalent to the amount withheld shall be deposited with the Owner, or with a state or federally chartered bank as the escrow agent, who shall then pay such retention monies to the Contractor. Upon Completion of the Contract, the securities shall be returned to the Contractor if Owner has no basis to withhold under the Contract Documents.

Securities eligible for investment under this section shall include those listed in Government Code section 16430, bank or savings and loan certificates of deposit, interest-bearing, demand-deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the Owner.

The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon.

Any escrow agreement entered by Owner and Contractor pursuant to Public Contract Code section 22300, shall be substantially similar to the form set forth in Public Contract Code section 22300.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 CONTRACTOR RESPONSIBILITY

The Contractor shall have responsibility for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. Each Contractor shall designate a responsible member of its organization whose duties shall include loss and accident prevention, and who shall have the responsibility and full authority to enforce the program. This person shall attend meetings with the representatives of the various Subcontractors employed to ensure that all employees understand and comply with the programs. Contractor will ensure that his employees and Subcontractors cooperate and coordinate safety matters with any

other contractors on the Project to form a joint safety effort.

10.1.2 SUBCONTRACTOR RESPONSIBILITY

Subcontractors have the responsibility for participating in, and enforcing, the safety and loss prevention programs established by the Contractor for the Project, which will cover all Work performed by the Contractor and its Subcontractors. Each Subcontractor shall designate a responsible member of its organization whose duties shall include loss and accident prevention, and who shall have the responsibility and full authority to enforce the program. This person shall attend meetings with the representatives of the various Subcontractors employed to ensure that all employees understand and comply with the programs.

10.1.3 COOPERATION

All Subcontractors and material or equipment suppliers, shall cooperate fully with Contractor, the Owner, and all insurance carriers and loss prevention engineers.

10.1.4 ACCIDENT REPORTS

Subcontractors shall promptly report in writing to the Contractor all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on or off the Site, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger. Contractor shall thereafter promptly report the facts in writing to the Owner giving full details of the accident.

10.1.5 FIRST-AID SUPPLIES AT SITE

The Contractor will provide and maintain at the Site first-aid supplies for minor injuries.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 THE CONTRACTOR

The Contractor shall take reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury, or loss to:

A. Employees on the Work and other persons who may be affected thereby;

B. The Work, material, equipment, tools, construction equipment, and machinery to be incorporated therein or necessary for the proper execution and Completion of the Work, whether in storage on or off the Site, under the care, custody, or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

C. Other property at the Site or adjacent thereto such as trees, shrubs, lawns, walks, pavement, roadways, structures, and utilities not designated for removal,

relocation, or replacement in the course of construction.

10.2.2 CONTRACTOR NOTICES

The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on the safety of persons or property or their protection from damage, injury, or loss.

10.2.3 SAFETY BARRIERS AND SAFEGUARDS

The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

10.2.4 USE OR STORAGE OF HAZARDOUS MATERIAL

When use or storage of explosives, other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. The Contractor shall notify the Owner any time that explosives or hazardous materials are expected to be stored on Site. Location of storage shall be coordinated with the Owner and local fire authorities.

10.2.5 FINGERPRINTING

At its own expense, Contractor shall comply with all fingerprinting requirements under law and Contract, including but not limited to the requirements of Education Code section 45125.2 and the Independent Contractor Student Contact Form which is a part of the Contract. Contractor shall hold harmless, defend and indemnify the Owner under section 3.16, for any costs, including attorneys' fees, Owner incurs from Contractor's failure to comply.

10.3 PROTECTION OF WORK AND PROPERTY

10.3.1 PROTECTION OF WORK

The Contractor and Subcontractors shall continuously protect the Work, the Owner's property, and the property of others, from damage, injury, or loss until the earlier of formal acceptance of the Work or Completion of the Work. The Contractor and Subcontractors shall make good any such damage, injury, or loss, except such as may be solely due to, or caused by, agents or employees of the Owner; except that for projects not solely funded through revenue bonds, (a) Contractor shall not be responsible for damages caused by a tidal wave to the extent that the damages exceed 5% of the Contract Sum, and (b) Contractor shall not be responsible for damages caused by an earthquake above 3.5 on the Richter Scale in magnitude to the extent that the damages exceed 5% of the Contract Sum, per Public Contract Code §7105(a).

10.3.2 PROTECTION FOR ELEMENTS

The Contractor will remove all mud, water, or other elements as may be required for the proper protection and prosecution of its Work. The Contractor shall at all times provide heat, coverings, and enclosures necessary to maintain adequate protection against weather so as to preserve the Work, materials, equipment, apparatus, and fixtures free from injury or damage.

10.3.3 SHORING AND STRUCTURAL LOADING

The Contractor shall not impose structural loading upon any part of the Work under construction or upon existing construction on or adjacent to the Site in excess of safe limits, or loading such as to result in damage to the structural, architectural, mechanical, electrical, or other components of the Work. The design of all temporary construction equipment and appliances used in construction of the Work and not a permanent part thereof, including, without limitation, hoisting equipment, cribbing, shoring, and temporary bracing of structural steel, is the sole responsibility of the Contractor. All such items shall conform to the requirements of governing codes and all laws, ordinances, rules, regulations, and orders of all authorities having jurisdiction. The Contractor shall take special precautions, such as shoring of masonry walls and temporary tie bracing of structural steel work, to prevent possible wind damage during construction of the Work. The installation of such bracing or shoring shall not damage or cause damage to the Work in place or the Work installed by others. Any damage which does occur shall be promptly repaired by the Contractor at no cost to the Owner.

10.3.4 CONFORMANCE WITHIN ESTABLISHED LIMITS

The Contractor and Subcontractors shall confine their construction equipment, the storage of materials, and the operations of workers to the limits indicated by laws, ordinances, permits, and the limits established by the Owner, and shall not unreasonably encumber the premises with construction equipment or materials.

10.3.5 SUBCONTRACTOR ENFORCEMENT OF RULES

Subcontractors shall enforce the Owner's and the Contractor's instructions, laws, and regulations regarding signs, advertisements, fires, smoking, the presence of liquor, and the presence of firearms by any person at the Site.

10.3.6 SITE ACCESS

The Contractor and the Subcontractors shall use only those ingress and egress routes designated by the Owner, observe the boundaries of the Site designated by the Owner, park only in those areas designated by the Owner, which areas may be on or off the Site, and comply with any parking control program established by the Owner such as furnishing license plate information and placing identifying stickers on vehicles.

10.3.7 PROTECTION OF MATERIALS

The Contractor and the Subcontractors shall receive, count, inspect for damage, record, store, and protect construction materials for the Work and Subcontractors shall promptly send to the Contractor evidence of receipt of such materials, indicating thereon any shortage, change, or damage (failure to so note shall constitute acceptance by the Subcontractor of financial responsibility for any shortage).

10.4 EMERGENCIES

10.4.1 EMERGENCY ACTION

In an emergency affecting the safety of persons or property, the Contractor shall take any action necessary, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional money or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Section 4.5 and Article 7.

10.4.2 ACCIDENT REPORTS

The Contractor shall promptly report in writing to the Owner all accidents arising out of or in connection with the Work, which caused death, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner.

10.5 HAZARDOUS MATERIALS

10.5.1 DISCOVERY OF HAZARDOUS MATERIALS

In the event the Contractor encounters or suspects the presence on the Site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or any other material defined as being hazardous by section 25249.5 of the California Health and Safety Code, which (a) has not been rendered harmless, and (b) the handling or removal of which is not within the scope of the Work, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and the Architect in writing, whether such material was generated by the Contractor, another contractor, or the Owner. The Work in the affected area shall not thereafter be resumed, except by written agreement of the Owner and the Contractor, if in fact the material is asbestos, polychlorinated biphenyl (PCB), or other hazardous material, and has not been rendered harmless. The Work in the affected area shall be resumed only in the absence of asbestos, polychlorinated biphenyl (PCB), or other hazardous material, or when it has been rendered harmless by written agreement of the Owner and the Contractor.

10.5.2 HAZARDOUS MATERIAL WORK LIMITATIONS

In the event that the presence of hazardous materials is suspected or discovered on the Site, the Owner shall retain an independent testing laboratory to determine the nature of the material

encountered and whether corrective measures or remedial action is required. The Contractor shall not be required pursuant to Article 7 to perform without consent any Work in the affected area of the Site relating to asbestos, polychlorinated biphenyl (PCB), or other hazardous material, until any known or suspected hazardous material has been removed, or rendered harmless, or determined to be harmless by Owner, as certified by an independent testing laboratory and/or approved by the appropriate government agency.

10.5.3 INDEMNIFICATION BY OWNER FOR HAZARDOUS MATERIAL NOT CAUSED BY CONTRACTOR

In the event the presence of hazardous materials on the Site is not caused by the Contractor, Owner shall pay for all costs of testing and remediation, if any, and shall compensate Contractor for any delay or additional costs incurred in accordance with the applicable provisions of Articles 7 and 8 herein. Owner shall defend, indemnify and hold harmless the Contractor and its agents, officers, directors and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with or arising out of, or relating to, the performance of the Work in the area affected by the hazardous material, except to the extent the claims, damages, losses, costs, or expenses were caused by Contractor's active negligence, sole negligence or willful misconduct. By providing this indemnification, Owner does not waive any immunities.

10.5.4 NATURALLY OCCURRING ASBESTOS

If the Site is found to contain naturally occurring asbestos (asbestos naturally contained in rocks which can become airborne when released "NOA"), in addition to complying with applicable provisions in sections 10.5.1-10.5.3 above, Contractor shall comply with, and be solely responsible for, all applicable NOA requirements of the California Air Resources Board (CARB), California Department of Industrial Relations, California Division of Occupational Safety and Health (Cal/OSHA), any local air quality management district with jurisdiction over the Site, the County, and all other applicable federal, State and local governmental entities. This compliance and responsibility includes, but is not limited to, dust control mitigation measures and a monitoring plan.

10.5.5 INDEMNIFICATION BY CONTRACTOR FOR HAZARDOUS MATERIAL CAUSED BY CONTRACTOR

In the event the presence of hazardous materials on the Site is caused by Contractor, Subcontractors, materialmen or suppliers, the Contractor shall pay for all costs of testing and remediation, if any, and shall compensate the Owner for any additional costs incurred as a result of the generation of hazardous material on the Project Site. In addition, the Contractor shall defend, indemnify and hold harmless Owner and its agents, officers, and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with, arising out of, or relating to, the presence of hazardous material on the Site, except to the extent the claims, damages, losses, costs, or expenses were caused by Owner's active negligence, sole negligence or willful misconduct.

10.5.6 **TERMS OF HAZARDOUS MATERIAL PROVISION**

The terms of this Hazardous Material provision shall survive the Completion of the Work and/or any termination of this Contract.

10.5.7 **ARCHEOLOGICAL MATERIALS**

In the event the Contractor encounters or reasonably suspects the presence on the Site of archeological materials, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and the Architect in writing. The Work in the affected area shall not thereafter be resumed, except after Contractor's receipt of written notice from the Owner.

ARTICLE 11

INSURANCE AND BONDS

11.1. CONTRACTOR'S LIABILITY INSURANCE

11.1.1 **LIABILITY INSURANCE REQUIREMENTS**

11.1.1 By the earlier of the deadline set forth in the Instructions to Bidders or the commencement of the Work and within limits acceptable to the Owner, the Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in California as admitted carriers with a financial rating of at least A+, Class XII status as rated in the most recent edition of Best's Insurance Reports such commercial general liability insurance per occurrence for bodily injury, personal injury and property damage as set forth in the Agreement and automobile liability insurance per accident for bodily injury and property damage combined single limit as set forth in the Agreement as will protect the Contractor from claims set forth below, which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations are by the Contractor, by a Subcontractor, by Sub-subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

11.1.1.1 claims for damages because of bodily injury (including emotional distress), sickness, disease, or death of any person other than the Contractor's employees. This coverage shall be provided in a form at least as broad as Insurance Services Office (ISO) Form CG 0001 11188;

11.1.1.2 claims for damages arising from personal or advertising injury in a form at least as broad as ISO Form CG 0001 11188;

11.1.1.3 claims for damages because of injury or destruction of tangible property, including loss of use resulting therefrom, arising from operations under the Contract Documents; and

11.1.1.4 claims for damages because of bodily injury, death of a person, or property damage arising out of the ownership, maintenance, or use of a motor vehicle, all mobile equipment, and vehicles moving under their own power and engaged in the Work; and

11.1.1.5 claims involving blanket contractual liability applicable to the Contractor's obligations under the Contract Documents, including liability assumed by and the indemnity and defense obligations of the Contractor and the Subcontractors; and

11.1.1.6 claims involving Completed Operations, Independent Contractors' coverage, and Broad Form property damage, without any exclusions for collapse, explosion, demolition, underground coverage, and excavating. (XCU)

If commercial general liability insurance or another insurance form with a general aggregate limit is used, either the general aggregate limit shall apply separately to the project location (with the ISO CG 2501 or insurer's equivalent endorsement provided to the Owner) or the general aggregate limit shall be twice the required occurrence limit.

Any deductible or self-insured retention must be declared to and approved by the Owner. At the option of the Owner, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Owner, its Board of Trustees, members of its Board of Trustees, officers, employees, agents and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

11.1.2 SUBCONTRACTOR INSURANCE REQUIREMENTS

The Contractor shall require its Subcontractors and any Sub-subcontractors to take out and maintain similar public liability insurance and property damage insurance, in a company or companies lawfully authorized to do business in California as admitted carriers with a financial rating of at least A+, Class XII status as rated in the most recent edition of Best's Insurance Reports, in like amounts and scope of coverage.

11.1.3 OWNER'S INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

11.1.4 ADDITIONAL INSURED ENDORSEMENT REQUIREMENTS

The Contractor shall name, on any policy of insurance, the Owner and the Architect as additional insureds. Subcontractors shall name the Contractor, the Owner and the Architect as additional insureds. The Additional Insured Endorsement included on all such insurance policies shall state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the additional insureds have other insurance which is applicable to the loss, such other insurance shall be excess to any policy of insurance required herein. The amount of the insurer's liability shall not be reduced by the existence of such other insurance.

11.1.5 WORKERS' COMPENSATION INSURANCE

During the term of this Contract, the Contractor shall provide workers' compensation insurance for all of the Contractor's employees engaged in Work under this Contract on or at the Site of the Project and, in case any of the Contractor's work is sublet, the Contractor shall require the Subcontractor to provide workers' compensation insurance for all the Subcontractor's employees engaged in Work under the subcontract. Any class of employee or employees not covered by a Subcontractor's insurance shall be covered by the Contractor's insurance. In case any class of employees engaged in Work under this Contract on or at the Site of the Project is not protected under the Workers' Compensation laws, the Contractor shall provide or cause a Subcontractor to provide adequate insurance coverage for the protection of those employees not otherwise protected. The Contractor shall file with the Owner certificates of insurance as required under this Article and in compliance with Labor Code section 3700.

If the contractor fails to maintain such insurance, the Owner may take out compensation insurance which the Owner might be liable to pay under the provisions of the Act by reason of an employee of the Contractor being injured or killed, and withhold from progress payments and/or retention the amount of the premium for such insurance.

11.1.6 BUILDER'S RISK/"ALL RISK" INSURANCE

11.1.6.1 COURSE-OF-CONSTRUCTION INSURANCE REQUIREMENTS

Unless provided by Owner at Owner's sole discretion, Contractor, during the progress of the Work and until final acceptance of the Work by Owner upon Completion of the entire Contract, shall maintain Builder's Risk/Course-of-Construction insurance satisfactory to the Owner, issued on a completed value basis on all insurable Work included under the Contract Documents. This insurance shall insure against all risks, including but not limited to the following perils: Vandalism, theft, malicious mischief, fire, sprinkler leakage, civil authority, sonic boom, explosion, collapse, flood including tidal wave (however, for projects not solely funded through revenue bonds, Contractor is only required to provide insurance for damages caused by a tidal wave up to 5% of the Contract Sum [except as provided in Section 11.1.6.2, below; see Public Contract Code §7105(a)]), earthquake (however, for projects not solely funded through revenue bonds, Contractor is only required to provide insurance for damages caused by an earthquake above 3.5 magnitude on the Richter Scale up to 5% of the Contract Sum [except as provided in

Section 11.1.6.3, below; see Public Contract Code §7105(a)]), wind, hail, lightning, smoke, riot or civil commotion, debris removal (including demolition) and reasonable compensation for the Architect's services and expenses required as a result of such insured loss. This insurance shall provide coverage in an amount not less than the full cost to repair, replace or reconstruct the Work. Such insurance shall include the Owner, the Architect, and any other person or entity with an insurable interest in the Work as an additional named insured.

The Contractor shall submit to the Owner for its approval all items deemed to be uninsurable under the Builder's Risk/Course-of Construction insurance. The risk of the damage to the Work due to the perils covered by the Builder's Risk/Course-of-Construction insurance, as well as any other hazard which might result in damage to the Work, is that of the Contractor and the surety, and no claims for such loss or damage shall be recognized by the Owner, nor will such loss or damage excuse the Complete and satisfactory performance of the Contract by the Contractor.

11.1.6.2 TIDAL WAVE INSURANCE

If the Contract is not solely funded through revenue bonds and Owner accepts an alternate bid by Contractor for insurance coverage for a tidal wave, Contractor shall maintain, in effect during the Work and until final acceptance of the Work by Owner upon Completion of the entire Contract, insurance providing coverage for loss, destruction or damage arising out of or caused by tidal wave and other similar acts of God. This insurance shall provide coverage in an amount not less than the full cost to repair, replace or reconstruct the Work.

11.1.6.3 EARTHQUAKE INSURANCE

If the Contract is not solely funded through revenue bonds and Owner accepts an alternate bid by Contractor for insurance coverage for an earthquake over 3.5 on the Richter Scale, Contractor shall maintain, in effect during the Work and until final acceptance of the Work by Owner upon Completion of the entire Contract, insurance providing coverage for loss, destruction or damage arising out of or caused by earthquake and/or other earth movement, whether seismic or volcanic in origin, over 3.5 on the Richter Scale in magnitude. This insurance shall provide coverage in an amount not less than the full cost to repair, replace or reconstruct the Work**.**

11.1.7 **CONSENT OF INSURER FOR PARTIAL OCCUPANCY OR USE**

Partial occupancy or use in accordance with the Contract Documents shall not commence until the insurance company providing property insurance has consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company and shall, without mutual consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of the insurance.

11.1.8 **FIRE INSURANCE**

Before the commencement of the Work, the Contractor shall procure, maintain, and cause to be maintained at the Contractor's expense, fire insurance on all Work included under the Contract

Documents, insuring the full replacement value of such Work as well as the cost of any removal and demolition necessary to replace or repair all Work damaged by fire. The amount of fire insurance shall be subject to approval by the Owner and shall be sufficient to protect the Work against loss or damage in full until the Work is accepted by the Owner. Should the Work being constructed be damaged by fire or other causes during construction, it shall be replaced in accordance with the requirements of the drawings and specifications without additional expense to the Owner.

11.1.9 **OTHER INSURANCE**

The Contractor shall provide all other insurance required to be maintained under applicable laws, ordinances, rules, and regulations.

11.1.10 **PROOF OF CARRIAGE OF INSURANCE**

The Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract until all required insurance, certificates, and an Additional Insured Endorsement and Declarations Page have been obtained and delivered in duplicate to the Owner for approval subject to the following requirements:

(a) Certificates and insurance policies shall include the following clause:

> This policy shall not be non-renewed, canceled, or reduced in required limits of liability or amounts of insurance until notice has been mailed to the Owner. Date of cancellation or reduction may not be less than thirty (30) days after the date of mailing notice.

(b) Certificates of insurance shall state in particular those insured, the extent of insurance, location and operation to which the insurance applies, the expiration date, and cancellation and reduction notices.

(c) Certificates of insurance shall clearly state that the Owner and the Architect are named as additional insureds under the policy described and that such insurance policy shall be primary to any insurance or self-insurance maintained by Owner and any other insurance carried by the Owner with respect to the matters covered by such policy shall be excess and non-contributing.

(d) The Contractor and its Subcontractors shall produce a certified copy of any insurance policy required under this Section upon written request of the Owner.

11.1.11 **COMPLIANCE**

In the event of the failure of any contractor to furnish and maintain any insurance required by this Article, the Contractor shall be in default under the Contract. Compliance by Contractor

with the requirement to carry insurance and furnish certificates, policies, Additional Insured Endorsement and Declarations Page evidencing the same shall not relieve the Contractor from liability assumed under any provision of the Contract Documents, including, without limitation, the obligation to defend and indemnify the Owner and the Architect.

11.2 PERFORMANCE AND PAYMENT BONDS

11.2.1 BOND REQUIREMENTS

Unless otherwise specified in the Contract Documents, prior to commencing any portion of the Work, the Contractor shall apply for and furnish Owner separate payment and performance bonds for its portion of the Work which shall cover 100% faithful performance of and payment of all obligations arising under the Contract Documents and/or guaranteeing the payment in full of all claims for labor performed and materials supplied for the Work. All bonds shall be provided by a corporate surety authorized and admitted to transact business in California. All bonds shall be submitted on the Owner's approved form.

To the extent, if any, that the Contract Sum is increased in accordance with the Contract Documents, the Contractor shall cause the amount of the bonds to be increased accordingly and shall promptly deliver satisfactory evidence of such increase to the Owner. To the extent available, the bonds shall further provide that no change or alteration of the Contract Documents (including, without limitation, an increase in the Contract Sum, as referred to above), extensions of time, or modifications of the time, terms, or conditions of payment to the Contractor will release the surety. If the Contractor fails to furnish the required bond, the Owner may terminate the Contract for cause.

11.2.2 SURETY QUALIFICATION

Only bonds executed by admitted Surety insurers as defined in Code of Civil Procedure section 995.120 shall be accepted. The surety insurers must, unless otherwise agreed to by Owner in writing, at the time of issuance of the bonds, have a rating not lower than "A-" as rated by A.M. Best Company, Inc. or other independent rating companies. Owner reserves the right to approve or reject the surety insurers selected by Contractor and to require Contractor to obtain bonds from surety insurers satisfactory to the Owner.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 UNCOVERING WORK FOR REQUIRED INSPECTIONS

If a portion of the Work is covered contrary to the Owner's request or to requirements specifically expressed in the Contract Documents, Contractor must, if required in writing by the Owner, uncover it for the Owner's observation and replace the removed work at the Contractor's

expense without change in the Contract Sum or Time.

12.1.2 COSTS FOR INSPECTIONS NOT REQUIRED

If a portion of the Work has been covered which the Owner has not specifically requested to observe prior to its being covered, the Owner may request to see such work, and it shall be uncovered by the Contractor. If such work is in accordance with the Contract Documents, costs of uncover and replacement shall, by appropriate Change Order, be paid by the Owner. If such work is not in accordance with Contract Documents, the Contractor shall pay such costs, unless the condition was caused by the Owner or a separate contractor, in which event the Owner shall be responsible for payment of such costs to the Contractor.

12.2 CORRECTION OF WORK; WARRANTY

12.2.1 CORRECTION OF REJECTED WORK

The Contractor shall promptly correct the work rejected by the Owner for failing to conform to the requirements of the Contract Documents, until the statutes of limitation (or repose) and all warranties have run, as applicable, and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting the rejected work, including additional testing, inspections, and compensation for the Owner's expenses and costs incurred.

12.2.2 REMOVAL OF NONCONFORMING WORK

The Contractor shall remove from the Site portions of the Work which are not in accordance with the requirements of the Contract Documents and are not corrected by the Contractor or accepted or approved by the Owner.

12.2.3 OWNER'S RIGHTS IF CONTRACTOR FAILS TO CORRECT

If the Contractor fails to correct nonconforming work within a reasonable time, the Owner may correct it in accordance with Section 2.4. As part of Owner's correction of the work, the Owner may remove any portion of the nonconforming Work and store any salvageable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten (10) days after written notice, the Owner may upon ten (10) additional days written notice sell such material or equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's and other professionals and representatives' services and expenses, made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contractor shall be invoiced for the deficiency or Owner may withhold such costs from payment pursuant to Section 9.5. If progress payments or retention then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

12.2.4 COST OF CORRECTING THE WORK

The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or separate contractors, whether completed or partially completed, caused by the Contractor's correction or removal of the nonconforming work.

12.2.5 WARRANTY CORRECTIONS (INCLUDES REPLACEMENT)

Pursuant to the warranty in Sections 3.5 and 9.7.1, if within one (1) year after the Completion of the Work or within a longer time period for an applicable special warranty or guarantee required by the Contract Documents, any of the Work does not comply with the Contract Documents, the Contractor shall correct it after receipt of Owner's written notice to do so, unless the Owner has previously waived in writing such right to demand correction. Contractor shall correct the Work promptly, and passage of the applicable warranty period shall not release Contractor from its obligation to correct the Work if Owner provided the written notice within the applicable warranty period. Contractor's obligation to correct the warranty item continues until the correction is made. After the correction is made to Owner's satisfaction, a new warranty period of the same length as the original warranty period shall run on the corrected work. The obligations under this paragraph 12.2.5 shall survive acceptance of the Work under the Contract and termination of the Contract.

12.2.6 NO TIME LIMITATION

Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one (1) year as described in Sections 3.5, 9.7.1, and 12.2.5 relates only to the specific warranty obligation of the Contractor to correct the Work after the date of commencement of warranties, and has, for example, no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, or to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations under the Contract Documents.

12.3 NONCONFORMING WORK AND WITHHOLDING THE VALUE OF IT

If it is found at any time before Completion of the Work that the Contractor has varied from the Contract Documents in materials, quality, form, finish, or in the amount or value of the materials or labor used, the Owner may, in addition to other remedies in the Contract Documents or under law and as allowed by law, accept the improper Work. The Owner may withhold from any amount due or to become due Contractor that sum of money equivalent to the difference in value between the Work performed and that called for by the Drawings and Specifications. The Owner shall determine such difference in value. No structural-related Work shall be accepted that is not in conformance with the Contract Documents.

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

The Owner and the Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole or in part without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE

In the absence of specific notice requirements in the Contract Documents, any written notice required by the Contract Documents shall be deemed to have been duly served if delivered in person to the individual, member of the firm or entity, or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified or overnight mail to the last business address known to the party giving notice. Owner shall, at Contractor's cost, timely notify Contractor of Owner's receipt of any third party claims relating to the Contract pursuant to Public Contract Code section 9201.

13.4 RIGHTS AND REMEDIES

13.4.1 DUTIES AND OBLIGATIONS CUMULATIVE

Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

13.4.2 NO WAIVER

No action or failure to act by the Owner, Inspector of Record, Architect or any construction manager shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed to in a written amendment to the Contract.

13.5 TESTS AND INSPECTIONS

13.5.1 COMPLIANCE

Tests, inspections, and approvals of portions of the Work required by the Contract Documents will comply with Title 24, and with all other laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction.

13.5.2 INDEPENDENT TESTING LABORATORY

The Owner will select and pay an independent testing laboratory to conduct all tests and inspections, including shipping or transportation costs or expenses (mileage and hours). Selection of the materials required to be tested shall be made by the laboratory and not by the Contractor. However, if Contractor requests that the Owner use a different testing laboratory and Owner chooses to approve such request, Contractor shall reimburse the Owner for any additional shipping or transportation costs or expenses (mileage and hours). Owner may invoice such costs or expenses to the Contractor or withhold such costs or expenses from progress payments and/or retention.

13.5.3 ADVANCE NOTICE TO INSPECTOR OF RECORD

The Contractor shall notify the Inspector of Record a sufficient time in advance of its readiness for required observation or inspection so that the Inspector of Record may arrange for same. The Contractor shall notify the Inspector of Record a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents which must, by terms of the Contract Documents, be tested in order that the Inspector of Record may arrange for the testing of the material at the source of supply.

13.5.4 TESTING OFF-SITE

Any material shipped by the Contractor from the source of supply, prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said Inspector of Record that such testing and inspection will not be required, shall not be incorporated in the Work.

13.5.5 ADDITIONAL TESTING OR INSPECTION

If the Inspector of Record, the Architect, the Owner, or public authority having jurisdiction determines that portions of the Work require additional testing, inspection, or approval not included under section 13.5.1, the Inspector of Record will, upon written authorization from the Owner, make arrangements for such additional testing, inspection, or approval. The Owner shall bear such costs except as provided in section 13.5.6.

13.5.6 COSTS FOR RETESTING

If such procedures for testing, inspection, or approval under sections 13.5.1, 13.5.2 and 13.5.5 reveal failure of the portions of the Work to comply with requirements established by the

Contract Documents, the Contractor shall bear all costs arising from such failure, including those of re-testing, re-inspection, or re-approval, including, but not limited to, compensation for the Architect's services and expenses. Any such costs shall be paid by the Owner, invoiced to the Contractor, and, among other remedies, can be withheld from progress payments and/or retention.

13.5.7 COSTS FOR PREMATURE TEST

In the event the Contractor requests any test or inspection for the Project and is not completely ready for the inspection, the Contractor shall be invoiced by the Owner for all costs and expenses resulting from that testing or inspection, including, but not limited to, the Architect's fees and expenses, and the amount of the invoice can among other remedies, be withheld from progress payments and/or retention.

13.5.8 TESTS OR INSPECTIONS NOT TO DELAY WORK

Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 [INTENTIONALLY LEFT BLANK]

13.7 TRENCH EXCAVATION

13.7.1 TRENCHES GREATER THAN FIVE FEET

Pursuant to Labor Code section 6705, if the Contract Sum exceeds $25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, submit to the Owner or a registered civil or structural engineer employed by the Owner a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

13.7.2 EXCAVATION SAFETY

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the Owner or by the person to whom authority to accept has been delegated by the Owner.

13.7.3 NO TORT LIABILITY OF OWNER

Pursuant to Labor Code section 6705, nothing in this Article shall impose tort liability upon the Owner or any of its employees.

13.7.4 NO EXCAVATION WITHOUT PERMITS

The Contractor shall not commence any excavation work until it has secured all necessary permits including the required CAL OSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

13.8 WAGE RATES

13.8.1 WAGE RATES

Pursuant to the provisions of Article 2 (commencing at § 1770), Chapter 1, Part 7, Division 2, of the Labor Code, the governing board of the Owner has obtained the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public work is to be performed for each craft, classification, or type of worker needed for this Project from the Director of Industrial Relations ("Director"). These rates are on file with the Clerk of the Owner's governing board, and copies will be made available to any interested party on request. The Contractor shall post a copy of such wage rates at the Site.

13.8.2 HOLIDAY AND OVERTIME PAY

Holiday and overtime work, when permitted by law, shall be paid for at a rate of at least one and one-half (1½) times the above specified rate of per diem wages, unless otherwise specified. Holidays shall be defined in the Collective Bargaining Agreement applicable to each particular craft, classification, or type of worker employed.

13.8.3 WAGE RATES NOT AFFECTED BY SUBCONTRACTS

The Contractor shall pay and shall cause to be paid each worker engaged in the Work not less than the general prevailing rate of per diem wages determined by the Director, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor and such workers.

13.8.4 CHANGE IN PREVAILING WAGE DURING BID OR CONSTRUCTION

If during the period this bid is required to remain open, the Director of Industrial Relations determines that there has been a change in any prevailing rate of per diem wages in the locality in which this public work is to be performed, such change shall not alter the wage rates discussed in the Notice to Bidders or the Contract subsequently awarded.

13.8.5 FORFEITURE AND PAYMENTS

Pursuant to Labor Code section 1775, the Contractor and any subcontractor under the Contractor shall as a penalty to the Owner, forfeit not more than Two Hundred Dollars ($200.00) for each calendar day, or portion thereof, for each worker paid less than the prevailing rate of per diem wages, determined by the Director, for such craft or classification in which such worker is employed for any public work done under the Agreement by the Contractor or by any

Subcontractor under it. Minimum penalties shall apply, as also provided in Civil Code section 1775. The amount of the penalty shall be determined by the Labor Commissioner and shall be based on both of the following: (1) whether the failure of the contractor or subcontractor to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily corrected upon being brought to the attention of the contractor or subcontractor; and (2) whether the contractor or subcontractor has a prior record of failing to meet its prevailing wage obligations. The difference between such prevailing rate of per diem wage and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing rate of per diem wage shall be paid to each work by the Contractor or subcontractor. Labor Code section 1777.1 shall also apply.

13.8.6 MINIMUM WAGE RATES

Any worker employed to perform Work, which Work is not covered by any craft or classification listed in the general prevailing rate of per diem wages determined by the Director, shall be paid not less than the minimum rate of wages specified therein for the craft or classification which most nearly corresponds to the Work to be performed by them, and such minimum wage rate shall be retroactive to time of initial employment of such person in such craft or classification.

13.8.7 PER DIEM WAGES

Pursuant to Labor Code section 1773.1, per diem wages includes employer payments for health and welfare, pension, and vacation pay.

13.8.8 POSTING OF WAGE RATES AND OTHER REQUIRED JOB SITE NOTICES

The Contractor shall post at appropriate conspicuous points on the Site, a schedule showing all determined minimum wage rates and all authorized deductions, if any, from unpaid wages actually earned and all other required job site notices as prescribed by regulation.

13.9 RECORD OF WAGES PAID: INSPECTION

13.9.1 APPLICATION OF LABOR CODE

Pursuant to section 1776 of the Labor Code:

(a) Each Contractor and subcontractor shall keep accurate payroll records, showing the name, address, social security number, work classification, and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the public work. Each payroll record shall contain or be verified by a written declaration that is made under penalty of perjury, stating both of the following:

(1) The information contained in the payroll record is true and correct.

(2) The employer has complied with the requirements of sections 1771, 1811

and 1815 for any work performed by his or her employees on the public works project.

(b) The payroll records enumerated under subdivision (a) shall be certified and shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

(1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.

(2) A certified copy of all payroll records enumerated in subdivision (a) shall be made available for inspection or furnished upon request to a representative of the Owner and the Division of Labor Standards Enforcement of the Department of Industrial Relations ("DIR") and as may be required by the Labor Commissioner under Labor Code section 1771.4. The Contractor and each subcontractor shall furnish a certified copy of all payroll records directly to the Labor Commissioner monthly or more frequently, if so specified in the Agreement and in a format the Labor Commissioner prescribes.

(3) A certified copy of all payroll records enumerated in subdivision (a) shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through either the body awarding the contract or the Division of Labor Standards Enforcement of the DIR. If the requested payroll records have not been provided pursuant to paragraph (2), the requesting party shall, prior to being provided the records, reimburse the costs of the preparation by the contractor, subcontractors, and the entity through which the request was made. The public may not be given access to such records at the principal office of the Contractor.

(c) Unless required as of January 1, 2015, to be furnished directly to the Labor Commissioner under Labor Code section 1771.4(a)(3), the certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement of the DIR or shall contain the same information as the forms provided by the division. The payroll records may consist of printouts of payroll data that are maintained as computer records, if the printouts contain the same information as the forms provided by the division and the printouts are verified in the manner specified in (a) above.

(d) A Contractor or subcontractor shall file a certified copy of the records enumerated in subdivision (a) with the entity that requested such records within 10 days after receipt of a written request.

(e) Except as provided in subdivision (f), any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the awarding body or the Division of Labor Standards Enforcement of the DIR shall be marked or obliterated to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor awarded the Contract or the

subcontractor performing the Contract shall not be marked or obliterated. Any copy of records made available for inspection by, or furnished to, a multiemployer Taft-Hartley trust fund (29 U.S.C. Sec. 186(c)(5) that requests the records for the purposes of allocating contributions to participants shall be marked or obliterated only to prevent disclosure of an individual's full social security number, but shall provide the last four digits of the social security number. Any copy of records made available for inspection by, or furnished to, a joint labor-management committee established pursuant to the federal Labor Management Cooperation Act of 1978 (29 U.S.C. Sec. 175a) shall be marked or obliterated only to prevent disclosure of an individual's social security number.

(f) Notwithstanding any other provision of law, agencies that are included in the Joint Enforcement Strike Force on the Underground Economy established pursuant to Section 329 of the Unemployment Insurance Code and other law enforcement agencies investigating violations of law shall, upon request, be provided nonredacted copies of certified payroll records. Any copies of records or certified payroll made available for inspection and furnished upon request to the public by an agency included in the Joint Enforcement Strike Force on the Underground Economy or to a law enforcement agency investigating a violation of law shall be marked or redacted to prevent disclosure of an individual's name, address, and social security number. An employer shall not be liable for damages in a civil action for any reasonable act or omission taken in good faith in compliance with this subsection.

(g) The contractor shall inform the body awarding the contract of the location of the records enumerated under subdivision (a), including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.

(h) The contractor or subcontractor has 10 days in which to comply subsequent to receipt of written notice requesting the records enumerated in subdivision (a). In the event that the Contractor or subcontractor fails to comply within the 10-day period, he or she shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit One Hundred Dollars ($100.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Labor Standards Enforcement of the DIR, these penalties shall be withheld from progress payments then due. A contractor is not subject to a penalty assessment pursuant to this section due to the failure of the subcontractor to comply with this section.

13.10 APPRENTICES

13.10.1 APPRENTICE WAGES AND DEFINITIONS

All apprentices employed by the Contractor to perform services under the Contract shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he or she is employed, and shall be employed only at the work of the craft or trade to which he or she

is registered. Only apprentices, as defined in section 3077 of the Labor Code, who are in training under apprenticeship standards and written apprenticeship agreements under Chapter 4 (commencing with § 3070) of Division 3, are eligible to be employed under this Contract. The employment and training of each apprentice shall be in accordance with the apprenticeship standards and apprentice agreements under which he or she is training. Contractor shall pay apprentices for any preemployment activities, as set forth in Labor Code section 1777.5.

13.10.2 APPRENTICE LABOR POOL

When the Contractor to whom the Contract is awarded by the Owner, or any Subcontractor under him or her, in performing any of the Work under the Contract or subcontract, employs workers in any apprenticeable craft or trade, the Contractor and Subcontractor shall apply to the joint apprenticeship committee administering the apprenticeship standards of the craft or trade in the area of the Site of the Project, for a certificate approving the Contractor or Subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, approval as established by the joint apprenticeship committee or committees shall be subject to the approval of the Administrator of Apprenticeship. The joint apprenticeship committee or committees, subsequent to approving the subject Contractor or Subcontractor, shall arrange for the dispatch of apprentices to the Contractor or Subcontractor in order to comply with this section. Every Contractor and Subcontractor shall submit the contract award information to the applicable joint apprenticeship committee which shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices to be employed, and the approximate dates the apprentices will be employed. There shall be an affirmative duty upon the joint apprenticeship committee or committees administering the apprenticeship standards of the crafts or trade in the area of the Site of the public work, to ensure equal employment and affirmative action and apprenticeship for women and minorities. Contractors or Subcontractors shall not be required to submit individual applications for approval to local joint apprenticeship committees provided they are already covered by the local apprenticeship standards. The ratio of work performed by apprentices to journeymen, who shall be employed in the craft or trade on the Project, may be the ratio stipulated in the apprenticeship standards under which the joint apprenticeship committee operates, but, except as otherwise provided in this section, in no case shall the ratio be less than one (1) hour of apprentice work for every five (5) hours of labor performed by a journeyman. However, the minimum ratio for the land surveyor classification shall not be less than one (1) apprentice for each five (5) journeymen.

13.10.3 JOURNEYMAN/APPRENTICE RATIO; COMPUTATION OF HOURS

Any ratio shall apply during any day or portion of a day when any journeyman, or the higher standard stipulated by the joint apprenticeship committee, is employed at the job Site and shall be computed on the basis of the hours worked during the day by journeymen so employed, except for the land surveyor classification. The Contractor shall employ apprentices for the number of hours computed as above before the end of the Contract. However, the Contractor shall endeavor, to the greatest extent possible, to employ apprentices during the same time period that the journeymen in the same craft or trade are employed at the job Site. Where an hourly apprenticeship ratio is not feasible for a particular craft or trade, the Division of Apprenticeship

Standards, upon application of a joint apprenticeship committee, may order a minimum ratio of not less than one (1) apprentice for each five (5) journeymen in a craft or trade classification.

13.10.4 JOURNEYMAN/APPRENTICE RATIO

The Contractor or Subcontractor, if he or she is covered by this section upon the issuance of the approval certificate, or if he or she has been previously approved in the craft or trade, shall employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the apprenticeship standards. Upon proper showing by the Contractor that he or she employs apprentices in the craft or trade in the state on all of his or her contracts on an annual average of not less than one (1) hour of apprentice work for every five (5) hours of labor performed by a journeyman, or in the land surveyor classification, one (1) apprentice for each five (5) journeymen, the Division of Apprenticeship Standards may grant a certificate exempting the Contractor from the 1-to-5 hourly ratio as set forth in this section. This section shall not apply to contracts of general contractors or to contracts of specialty contractors not bidding for work through a general or prime contractor, when the contracts of general contractors or those specialty contractors involve less than Thirty Thousand Dollars ($30,000) or twenty (20) working days. Any work performed by a journeyman in excess of eight (8) hours per day or forty (40) hours per week, shall not be used to calculate the hourly ratio required by this section.

13.10.4.1 ***Apprenticeable Craft or Trade.*** "Apprenticeable craft or trade" as used in this Article means a craft or trade determined as an apprenticeable occupation in accordance with the rules and regulations prescribed by the California Apprenticeship Council. The joint apprenticeship committee shall have the discretion to grant a certificate, which shall be subject to the approval of the Administrator of Apprenticeship, exempting a Contractor from the 1-to-5 ratio set forth in this Article when it finds that any one of the following conditions is met:

A. Unemployment for the previous three-month period in the area exceeds an average of fifteen percent (15%).

B. The number of apprentices in training in such area exceeds a ratio of 1-to-5.

C. There is a showing that the apprenticeable craft or trade is replacing at least one-thirtieth (1/30) of its journeymen annually through the apprenticeship training, either on a statewide basis or on a local basis.

D. Assignment of an apprentice to any work performed under this contract would create a condition which would jeopardize his or her life or the life, safety, or property of fellow employees or the public at large or if the specific task to which the apprentice is to be assigned is of such a nature that training cannot be provided by a journeyman.

13.10.5 RATIO EXEMPTION

When exemptions are granted to an organization which represents Contractors in a specific trade from the 1-to-5 ratio on a local or statewide basis, the member Contractors will not be required to

submit individual applications for approval to local joint apprenticeship committees, if they are already covered by the local apprenticeship standards.

13.10.6 APPRENTICE FUND

A Contractor to whom the Contract is awarded or any Subcontractor under him or her, who, in performing any of the work under the Contract, employs journeymen or apprentices in any apprenticeable craft or trade and who is not contributing to a fund or funds to administer and conduct the apprenticeship program in any such craft or trade in the area of the Site of the Project, to which fund or funds other contractors in the area of the Site of the Project are contributing, shall contribute to the fund or funds in each craft or trade in which he or she employs journeymen or apprentices on the Project in the same amount or upon the same basis and in the same manner as the other contractors do, but where the trust fund administrators are unable to accept the funds, contractors not signatory to the trust agreement shall pay a like amount to the California Apprenticeship Council. The Contractor or Subcontractor may add the amount of the contributions in computing his or her bid for the contract. The Division of Labor Standards Enforcement is authorized to enforce the payment of the contributions to the fund or funds as set forth in the Labor Code section 227.

13.10.7 PRIME CONTRACTOR COMPLIANCE

The responsibility of compliance with section 13.10 and section 1777.5 of the Labor Code for all apprenticeable occupations is with the Contractor.

13.10.8 DECISIONS OF JOINT APPRENTICESHIP COMMITTEE

All decisions of the joint apprenticeship committee under this section13.10 and Labor Code section 1777.5 are subject to Labor Code section 3081.

13.10.9 NO BIAS

It shall be unlawful for an employer or a labor union to refuse to accept otherwise qualified employees as registered apprentices on any public works on the grounds of race, religious creed, color, national origin, ancestry, sex, or age, except as provided in the Labor Code section 3077.

13.10.10 VIOLATION OF LABOR CODE

Pursuant to Labor Code sections 1777.1 and 1777.7, in the event a Contractor or Subcontractor fails to comply with the provisions of this section 13.10 and Labor Code section 1777.5, penalties shall apply, including among other things:

(a) If a Contractor or Subcontractor willfully fails to comply, the Labor Commissioner may deny to the contractor or subcontractor, and to its responsible officers, the right to bid on, or be awarded or perform work as a subcontractor on, any public works project for a period of up to one year for the first violation and for a period of up to three years for the second and subsequent violation. Each period of

debarment shall run from the date the determination of noncompliance by the Labor Commissioner becomes a final order.

(b) A contractor or subcontractor who violates section 1777.5 shall forfeit as a civil penalty an amount not exceeding the sum of One Hundred Dollars ($100) for each full calendar day of noncompliance. Upon receipt of a determination that a civil penalty has been imposed, the awarding body shall enforce the penalty, which includes withholding the amount of the civil penalty from the contract progress payments or retention then due or to become due.

(c) In lieu of the penalty provided, the Labor Commissioner may for a first time violation and with the concurrence of an applicable apprenticeship program, order the contractor or subcontractor to provide apprentice employment equivalent to the work hours that would have been provided for apprentices during the period of noncompliance.

(d) Any funds withheld by the awarding body pursuant to this section shall be deposited in the General Fund.

(e) The interpretation and enforcement of section 1777.5 and this section shall be in accordance with the regulations of the California Apprenticeship Council.

Pursuant to Public Contract Code section 6109, no contractor or subcontractor may bid on, be awarded, or perform work as a subcontractor on a public works project if ineligible to bid or work on, or be awarded, a public works project pursuant to section 1777.1 of the Labor Code.

13.11 ASSIGNMENT OF ANTITRUST CLAIMS

13.11.1 APPLICATION

Pursuant to Public Contract Code section 7103.5 and Government Code section 4552, in entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the Owner all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act, (15 U.S.C. § 15) or under the Cartwright Act (Chapter 2 [commencing with § 16700] of Part 2 of Division 7 of the Bus. & Prof. Code), arising from the purchase of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders Final Progress Payment to the Contractor, without further acknowledgment by the parties. If the Owner receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Chapter 11 (commencing with § 4550) of Division 5 of Title 1 of the Government Code, the assignor may, upon demand, recover from the Owner any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the Owner as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

13.11.2 **ASSIGNMENT OF CLAIM**

Upon demand in writing by the assignor, the Owner shall, within one (1) year from such demand, reassign the cause of action assigned pursuant to this Article if the assignor has been or may have been injured by the violation of law for which the cause of action arose and the Owner has not been injured thereby or the Owner declines to file a court action for the cause of action.

13.12 **AUDIT**

Pursuant to and in accordance with the provisions of Government Code section 8546.7, or any amendments thereto, all books, records, and files of the Owner, the Contractor, or any Subcontractor connected with the performance of this Contract involving the expenditure of state funds in excess of Ten Thousand Dollars ($10,000.00), including, but not limited to, the administration thereof, shall be subject to the examination and audit of the Office of the Auditor General of the State of California for a period of three (3) years after release of all retention under this Contract. Contractor shall preserve and cause to be preserved such books, records, and files for the audit period. During the progress of the Work and for three (3) years after Completion of the Work, Owner shall also have the right to an audit of all of Contractor's books, records, subcontracts, material and equipment contracts, files, and information related to the Contract, and Contractor must cooperate by producing all requested items within seven (7) days.

13.13 **STORM WATER DISCHARGE PERMIT**

If applicable, the Contractor shall file a Notice of Intent to comply with the terms of the general permit to discharge storm water associated with construction activity (WQ Order No. 920-08-DWQ). The Notice of Intent must be sent to the following address along with the appropriate payment (warrant to be furnished by the Owner upon request by the Contractor, allow warrant processing time.): California State Water Resources Control Board, Division of Water Quality, Storm Water Permit Unit, P.O. Box 1977, Sacramento, CA 95812-1977. The Contractor may also call the State Water Board's Construction Activity Storm Water Hotline at (916) 657-1146. The Notice of Intent shall be filed prior to the start of any construction activity.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 **TERMINATION BY THE CONTRACTOR FOR CAUSE**

Contractor may not terminate performance for convenience. Contractor may only terminate performance for cause if the Work is stopped by others for a period of one hundred eighty (180) consecutive days through no act or fault of the Contractor, a Subcontractor of any tier, their agents or employees, or any other persons performing portions of the Work for whom the Contractor is contractually responsible, **and** the Work was stopped by others for one of the following reasons: (A) Issuance of an order of a court or other public authority having jurisdiction which requires Owner to stop all Work; or (B) an act of government, such as a declaration of national emergency, making material unavailable which requires Owner to stop all

Work. If such grounds exist, the Contractor may serve written notice of such grounds on Owner and demand a meet-and-confer conference to negotiate a resolution in good faith within twenty (20) days of Owner's receipt of such notice. If such conference does not lead to resolution and the grounds for termination still exist, Contractor may terminate the Contract and recover from the Owner payment for Work executed and for reasonable verified costs with respect to materials, equipment, tools, construction equipment, and machinery, including reasonable overhead, profit, and damages for the Work executed, but excluding overhead (field and home office) and profit for (i) Work not performed and (ii) the period of time that the Work was stopped.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 GROUNDS FOR TERMINATION

The Owner may terminate performance of the Contract if the Contractor:

A. Refuses or fails to supply enough properly skilled workers or proper materials, or refuses or fails to take steps to adequately prosecute the Work to meet a Milestone Deadline or to Complete within the Contract Time;

B. Fails to make payment to Subcontractors for materials or labor in accordance with Public Contract Code section 10262 or Business and Professions Code section 7108.5, as applicable;

C. Violates Labor Code section 1771.1(a), subject to the provisions of Labor Code section 1771.1(f);

D. Disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction; or

E. Otherwise is in breach of the Contract Documents.

14.2.2 NOTIFICATION OF TERMINATION

When any of the above reasons exist, the Owner may, without prejudice to any other rights or remedies of the Owner, give notice to Contractor of the grounds for termination and demand cure of the grounds within seven (7) days (a "Notice of Intent to Terminate"). If Contractor fails to **either** (a) completely cure the grounds for termination within seven (7) days **or** (b) reasonably commence cure of the grounds for termination within seven (7) days and reasonably continue to cure the grounds for termination until such cure is complete, then Owner may terminate the performance of Contract effective immediately upon service of written Notice of Termination and may, subject to any prior rights of Contractor's surety on the performance bond ("Surety"):

A. Take possession of the Site and of all material, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

B. Accept assignment of subcontracts pursuant to section 5.4; and

C. Complete the Work by whatever reasonable method the Owner may deem expedient, including tender of completion to the Surety.

14.2.3 **PAYMENTS**

If the Owner terminates performance of the Contract for one of the reasons stated in section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is Complete.

If the unpaid balance of the Contract Sum exceeds costs of Completing the Work, including compensation for professional services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. This payment obligation shall survive Completion of the Work.

14.2.4 **WRONGFUL TERMINATION**

To claim a breach of contract or violation of law based on alleged wrongful termination for cause by the Owner, or if Contractor otherwise seeks any payment or damages related to a termination, within fifteen (15) days of the alleged breach of contract, violation of law, or wrongful termination Contractor shall submit a Claim pursuant and subject to Sections 4.5.3-4.5.6. The Contractor need not submit a Notice of Potential Change or a Change Order Request.

14.2.5 **INCLUSION OF TERMINATION FOR CONVENIENCE**

Any purported termination by Owner for cause under this section 14.2, which is revoked or determined to not have been for cause, shall be deemed to have been a termination for convenience effective as of the same date as the purported termination for cause.

14.3 SUSPENSION OR TERMINATION BY THE OWNER FOR CONVENIENCE

14.3.1 **SUSPENSION BY OWNER**

The Owner may, without cause, order the Contractor in writing to suspend, delay, or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.3.1.1 ***Adjustments.*** An adjustment shall be made for increases in the cost of performance of the Contract, including profit on the increased cost of performance caused by suspension, delay, or interruption. No adjustment shall be made to the extent:

A. That performance is, was or would have been so suspended, delayed, or interrupted by another cause for which the Contractor is responsible; or

B. That an equitable adjustment is made or denied under another provision of this Contract.

14.3.1.2 ***Adjustments for Fixed Cost.*** Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.

14.3.2 **TERMINATION BY THE OWNER FOR CONVENIENCE**

14.3.2.1 The Owner may, at any time, terminate performance of the Contract for the Owner's convenience and without cause.

14.3.2.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

1. Cease operations as directed by the Owner in the notice;

2. Take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

3. Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

14.3.2.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination.

14.4 NOT A WAIVER

Any suspension or termination by Owner of performance by Contractor for convenience or cause under this Article 14 shall not act as a waiver of any claims by Owner against Contractor or others for damages based on breach of contract, negligence or other grounds.

14.5 MUTUAL TERMINATION FOR CONVENIENCE

The Contractor and the Owner may mutually agree in writing to terminate performance of this Contract for convenience. The Contractor shall receive payment for all Work performed to the date of termination in accordance with the provisions of Article 9.

14.6 EARLY TERMINATION

Notwithstanding any provision herein to the contrary, if for any fiscal year of this Contract the governing body of the Owner fails to appropriate or allocate funds for future periodic payments under the Contract after exercising reasonable efforts to do so, the Owner may upon thirty (30) days' notice, order Work on the Project to cease. The Owner will remain obligated to pay for the Work already performed but shall not be obligated to pay the balance remaining unpaid beyond the fiscal period for which funds have been appropriated or allocated and for which the Work has not been done.

DIVISION 01 SPECIFICATIONS

for Design-Bid-Build Contract

Oakland Unified School District

If any provision in these Division 01 specifications conflicts with any provision in the other Contract Documents, then the provision in the other Contract Document shall control.

01 11 00

01 21 00

01 22 00

DOCUMENT 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS, AND CONFLICTS:

If any provision in these Division 01 specifications conflicts with any provision in the other Contract Documents, then the provision in the other Contract Document shall control.

All Contract Documents (see General Conditions §1.1.1) should be reviewed for applicable provisions related to the provisions in this document, including without limitation General Conditions and Agreement.

1.02 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

The Work of this Contract consists of the following:

1. Demolish the existing five portables
2. Place six new portables with five on concrete foundations, and 6th on wood foundation.
3. Modification to new portables includes connecting doors between portables, new interior walls, and new interior finishes. Work includes associated site work.

1.03 CONTRACTS

Contractor will perform the Work under a single, fixed-price competitively bid Contract.

1.04 WORK BY OTHERS

A. Work on the Project that will be performed by others concurrent with the Work of this Contract:

(1) Placing 6 portables on site.

1.05 CODES, REGULATIONS, AND STANDARDS

A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the Owner and the Architect.

B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

1.06 PROJECT RECORD DOCUMENTS:

A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:

(1) Record Drawings.

(2) Specifications.

(3) Addenda.

(4) Change Orders and other modifications to the Contract.

(5) Reviewed shop drawings, product data, and samples.

(6) Field test records.

(7) Inspection certificates.

(8) Manufacturer's certificates.

B. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.

C. Contractor shall record information concurrent with construction progress.

D. Specifications: Contractor shall legibly mark and record at each product section of the Specifications the description of the actual product(s) installed, including the following:

(1) Manufacturer's name and product model and number.

(2) Product substitutions or alternates utilized.

(3) Changes made by Addenda and Change Orders and written directives.

1.07 EXAMINATION OF EXISTING CONDITIONS

A. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site or of the streets or roads approaching the Site.

B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.

C. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract

Documents, Contractor shall immediately report same to the Owner and the Architect.

D. Should any existing conditions such as deterioration or noncomplying construction be discovered that is not covered by the DSA approved documents wherein the finished work will not comply with Title 24, California Code of Regulations, a construction change document, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work.

1.08 CONTRACTOR'S USE OF PREMISES

A. Contractor shall have use of the premises for the execution of the Work.

B. Coordinate use of the premises under the direction of the Owner.

C. If unoccupied and only with Owner's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work, provided, however, that Contractor shall adhere to any limitations or restrictions set forth by Owner in its written approval for use of the building(s). If the Owner chooses to beneficially occupy any building(s), Contractor must obtain the Owner's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.

If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor.

D. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.

E. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.

F. No one other than those directly involved in the demolition and construction, or specifically designated by the Owner or the Architect shall be permitted in the areas of work during demolition and construction activities.

G. The Contractor shall install the construction security fence and maintain that it will be locked when not in use. Keys to this fencing will be provided to the Owner.

1.09 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work.

Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the Owner's satisfaction.

B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the Owner for disposition of same as indicated in the General Conditions.

1.10 UTILITY SHUTDOWNS AND INTERRUPTIONS

A. Contractor shall give the Owner a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. The Owner will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services shall be performed by the Contractor.

B. Contractor shall obtain Owner's written approval in advance of deliveries of material or equipment or other activities that may conflict with Owner's use of the building(s) or adjacent facilities.

1.11 STRUCTURAL INTEGRITY

A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.

B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation the Agreement and General Conditions § 3.8.

A. General Conditions;

B. Special Conditions.

1.02 SUMMARY:

A. Section includes administrative and procedural requirements governing allowances.

(1) Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor by Owner. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

(1) Unit-cost allowances.

(2) Specific scope allowances.

(3) General contingency allowances.

C. Related Requirements:

(1) Section 01 22 00 “Alternatives and Unit Pricing” for procedures for using unit prices.

(2) Section 01 40 00 “Quality Requirements” for procedures governing the use of allowances for testing and inspecting.

1.03 SELECTION AND PURCHASE:

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.04 ACTION SUBMITTALS:

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.05 INFORMATIONAL SUBMITTALS:

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.06 COORDINATION:

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.07 UNIT-COST ALLOWANCES:

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

(1) If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

D. At Project closeout, credit unused amounts remaining in the unit-cost allowance to Owner.

1.08 SPECIAL AND GENERAL (CONTINGENCY) ALLOWANCES:

A. Use an allowance only as directed by Owner.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under an allowance are included in the allowance. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Authorization of use of funds from the allowance will include Contractor's related costs and reasonable overhead and profit margins, per Article 7 of the General Conditions. Contractor must sign an expenditure approval form.

D. An allowance may only be increased by a change order approved by the owner's governing body. At Project closeout, credit unused amounts remaining in an allowance to Owner.

1.09 ADJUSTMENT OF ALLOWANCES:

A. Allowance Adjustment: To request payment from an allowance, Contractor must comply with all requirements in Section 4.5 in the General Conditions. Owner has sole discretion whether to issue a change order or authorize payment from an allowance. Any time extension must be granted by change order. If an allowance is fully spent, then a change order must be used. To adjust allowance amounts, prepare an expenditure approval based on the difference between purchase amount and the allowance. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

(1) Include installation costs in purchase amount only where indicated as part of the allowance.

(2) If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

(3) Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.

(4) Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

(1) Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or

extent of work has changed from what could have been foreseen from information in the Contract Documents.

(2) No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 EXAMINATION:

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 PREPARATION:

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.03 SCHEDULE OF ALLOWANCES IN CONTRACT (DELETE F NOT APPLICABLE)

A. Allowance No. 1: Quantity Allowance: _____ (insert item and quantity)

(1) Coordinate quantity allowance adjustment with unit-price requirements in Section 01 22 00 "Alternatives and Unit Pricing."

B. Allowance No. 2: Scope Allowance: _____ (insert dollar amount and scope)

C. Allowance No. 3: Owner’s Allowance: Include a contingency allowance of $_____.00 for use according to Owner's written instructions.

END OF SECTION

DOCUMENT 01 22 00

ALTERNATES AND UNIT PRICING

PART 1 – ALTERNATES

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document.

1.02 DESCRIPTION

The items of work indicated below propose modifications to, substitutions for, additions to and/or deletions from the various parts of the Work specified in other Sections of the Specifications. The acceptance or rejection of any of the alternates is strictly at the option of the Owner subject to Owner's acceptance of Contractor's stated prices contained in this Proposal.

1.03 GENERAL

Where an item is omitted, or scope of Work is decreased, all Work pertaining to the item whether specifically stated or not, shall be omitted and where an items is added or modified or where scope of Work is increased, all Work pertaining to that required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

1.04 BASE BID

The Base Bid includes all work required to construct the Project completely and in accordance with the Contract Documents.

PART 2 - UNIT PRICING

2.01 GENERAL

Contractor shall completely state all required figures based on Unit Prices listed below. Where scope of Work is decreased, all Work pertaining to the item, whether specifically stated or not, shall be omitted and where scope of Work is increased, all work pertaining to that item required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

2.02 UNIT PRICES

Based on the estimated quantities, furnish unit prices for each of the named items on a square foot, lineal foot, or per each basis, as applies. Unit prices shall include all labor,

materials, services, profit, overhead, insurance, bonds, taxes, and all other incidental costs of Contractor, subcontractors, and supplier(s).

END OF SECTION

DOCUMENT 01 25 13

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. Instructions to Bidders; and

B. General Conditions.

1.02 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT (See General Conditions § 3.11):

A. Catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, utility, and appearance to those specified may be reviewed subject to the provisions of the General Conditions.

B. Wherever more than one manufacturer's product is specified, the first-named product is the basis for the design used in the Work and the use of alternative-named manufacturers' products or substitutes may require modifications in that design. If such alternatives are proposed by Contractor and are approved by the Owner and/or the Architect, Contractor shall assume all costs required to make necessary revisions and modifications of the design resulting from the substitutions requested by the Contractor.

C. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and "or approved equal," supporting data for the second product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitutions.

D. If the Owner and/or Architect, in reviewing proposed substitute materials and equipment, require revisions or corrections to be made to previously accepted Shop Drawings and supplemental supporting data to be resubmitted, Contractor shall promptly do so. If any proposed substitution is judged by the Owner and/or Architect to be unacceptable, the specified material or equipment shall be provided.

E. Samples may be required. Tests required by the Owner and/or Architect for the determination of quality and utility shall be made at the expense of Contractor, with acceptance of the test procedure first given by the Owner.

~~F.~~ In reviewing the supporting data submitted for substitutions, the Owner and/or Architect will use for purposes of comparison all the characteristics of the specified material or equipment as they appear in the manufacturer's published data even though all the characteristics may not have been particularly mentioned in the Contract Documents.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 29 00

PAYMENT AND CONDITIONAL AND UNCONDITIONAL WAIVER AND RELEASE FORMS

1.01. GENERAL INFORMATION

Contractor shall comply with all provisions in the Contract Documents related to payments and requests for changes in contract price, especially General Conditions Articles 4, 7, and 9.

1.02. MAKING PAYMENT

The owner should make payment directly to the Contractor. Payment should not be made to any other party unless specifically indicated on this form.

CONDITIONAL WAIVER AND RELEASE
ON PROGRESS PAYMENT
(Civil Code Section 8132)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Through Date: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: _____

Amount of Check: $_____

Check Payable to: _____

Exceptions

This document does not affect any of the following:

(1) Retentions.

(2) Extras for which the claimant has not received payment.

(3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:

Date(s) of waiver and release: _____

Amount(s) of unpaid progress payment(s): $_____

(4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT

(Civil Code Section 8134)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Through Date: _____

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has received the following progress payment: $_____

Exceptions

This document does not affect any of the following:

(1) Retentions.

(2) Extras for which the claimant has not received payment.

(3) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

CONDITIONAL WAIVER AND RELEASE
ON FINAL PAYMENT
(Civil Code Section 8136)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check:

Amount of Check: $_____

Check Payable to: _____

Exceptions

This document does not affect any of the following: _____

Disputed claims for extras in the amount of: $_____

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

(Civil Code Section 8138)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for all labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has been paid in full.

Exceptions

This document does not affect any of the following: _____

Disputed claims for extras in the amount of: $_____

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

DOCUMENT 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY:

A. This section described general procedural requirements for ongoing submittals.

(1) Construction progress schedules.

(2) Schedule of values.

(3) Product data and manufacturers' literature.

(4) Shop drawings.

(5) Samples.

(6) Manufacturers' certificates.

(7) Excess materials and attic stock.

B. Related Requirements.

(1) Section 01 40 00: Test reports, manufacturer's field reports, and mock-ups.

(2) Section 01 78 39: Closeout requirements including Project Record Documents.

(3) Section 01 78 36: Warranties.

1.02 GENERAL SUBMITTAL PROCEDURES (see General Conditions § 3.11):

A. Submittals: Transmit each item using form approved by Architect; submit sample to Architect and Owner for approval prior to use.

(1) Identify Project, Contractor, subcontractor, major supplier.

(a) Attach sequential identification number for each new submittal.

(b) Identify each resubmittal using original submittal number and sequential identification clearly indicating item is resubmitted.

(2) Identify pertinent Drawing sheet and detail number, and Specification section number as appropriate.

(3) Identify deviations from Contract Documents.

(4) Provide space for Contractor and Architect review stamps.

(5) Contractor: Review and stamp submittals from subcontractors prior to submitting to Architect, and Owner

(a) Review submittals and indicate where conflicts occur with Contract Documents and with work of other subcontractors.

(b) Return submittals that vary significantly from Contract Documents for correction and resubmittal prior to submitting to Architect and Owner. Submittals that vary significantly from Contract Documents and that fail to indicate thorough Contractor review prior to submission to Architect and Owner will be returned without review.

(c) Cursory review and stamping of subcontractor submittal by Contractor shall not be acceptable.

B. Initial Schedules: Submit initial progress schedule and schedule of value in duplicate within 15 working days after award of Contract.

(1) After review by Owner and Architect revise and resubmit where required.

C. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.

D. After Owner and Architect review of submittal, revise and resubmit as required, identify changes made since previous submittal.

E. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply.

1.03 TYPES OF SUBMITTALS:

A. General: Project requires various types of submittals to maintain communications, minimize misunderstandings, avoid unnecessary conflicts, and to ensure complete documentation for Project Record Documents.

(1) Maintain complete set of submittals including required revisions.

B. Construction Schedules: Submit construction progress schedules for Design Team and Owner review and to maintain entire team up-to-date on construction activities.

C. Schedule of Values: Submit schedule of values indicating division of Work, subcontractors to perform work, products being used, and values attributed to each to inform Design Team and Owner.

D. Action Submittals: Submittals relating to product data and manufacturer's literature, shop drawings, and samples for Owner review and comment; do not begin fabrication, delivery, or installation until Owner review is complete.

E. Information Submittals: Submittals relating to certifications, qualifications, reports, including test reports, and instructions are for information; Owner may choose to comment but action is not generally anticipated.

(1) Manufacturer installation instructions and recommendations shall be considered information submittals.

F. Design/Build Submittals: Where portion of Work requires design by specialized professionals, submit information necessary to ensure work complies with Contract Documents along with certifications signed by qualified professional.

(1) Calculations: Do not submit calculations unless specifically required by Contract Documents; submit calculations required by applicable authorities directly to applicable authorities.

(a) Submit certification by qualified professional indicating required calculations have been prepared and work conforms to Contract Documents and applicable codes and regulations.

G. Maintenance Materials Submittals: Compile maintenance information and materials during Work to ensure complete set of documents, maintenance manuals, and operation instructions.

H. Closeout Submittals: Compile closeout submittals, organize, and submit to Owner prior to or at time of Completion. Project will not be considered Complete until closeout submittals have been received by Owner.

1.04 CONSTRUCTION PROGRESS SCHEDULES (see General Conditions § 3.9):

A. Submit construction progress schedule with separate item for each major trade and operation, identifying first day of each week.

(1) Show complete sequence of construction by activity, identifying work of separate stages and logically grouped activities.

(2) Show projected percentage of completion for each item of Work as of time of each application for payment.

(3) "Submittal Schedule": Show Contractor submittal dates required for shop drawings, product data, and samples, and product delivery dates; deliver to Architect and Owner per approved "Submittal Schedule."

(a) "Submittal Schedule" may be incorporated into construction progress schedule or may be separate, Contractor option.

(b) Review Period: Architect and Owner will be expedient in review however, Contractor shall schedule submittals recognizing possibility Architect may reject and may require resubmittal.

(c) Contract extension shall not be allowed for Contractor's failure to properly schedule submittals to allow for Architect requiring resubmittal.

B. Progress Schedule Format: The schedule and updates shall conform, at a minimum, to industry standards for (a) critical path scheduling and (b) facilitation of Owner's project management and evaluation of Contractor Claims for additional money or time.

(1) Submit revised progress schedules with each application for payment reflecting changes since previous submittal, not less than monthly.

1.05 SCHEDULE OF VALUES:

A. Submit typed schedule on AIA Form G703 or another Owner and Architect pre-approved 8-1/2" by 11" paper format; Contractor's standard media-driven printout will be considered on request. Submit within 15 days after award of Contract.

B. Format: Table of Contents of this Project Manual, with modifications as pre-approved by Owner and Architect; identify each line item with number and title of major specification sections.

C. Include in each line item a directly proportional amount of Contractor overhead and profit.

D. Revise schedule to list change orders for each application for payment.

1.06 PRODUCT DATA/MANUFACTURERS' LITERATURE (see General Conditions § 3.11):

A. Action Submittals: Mark each copy to identify applicable Products, models, options, and other data; supplement manufacturers' standard data to provide information unique to the Work.

B. Information Submittals: Contractor shall obtain and furnish to the Owner three (3) complete sets of manuals containing the manufacturers' instructions for maintenance and operation of each item of equipment and apparatus furnished

under the Contract Documents and any additional data specifically requested under the various sections of the specifications for each division of the Work.

Maintain copy of manufacturer installation instructions and recommendations in Contractor's field office for review.

C. Product data shall be submitted as electronic PDF files unless otherwise noted or approved by Architect and Owner in advance.

(1) Where paper copies are permitted submit number of copies Contractor requires, plus two copies to be retained by Architect and Owner.

1.07 SHOP DRAWINGS (see General Conditions § 3.11):

A. Shop drawings shall be submitted as designated in the General Conditions.

1.08 SAMPLES:

A. Submit full range of manufacturers' standard colors, textures, and patterns for Architect's and Owner's selection.

B. Submit samples to illustrate functional characteristics of product, with integral parts and attachment devices.

C. Coordinate submittal of different categories for interfacing work. Include identification on each sample, giving full information.

D. Submit number of samples required by Contractor plus two to be retained by Architect and Owner.

(1) Maintain one set of approved samples at Project Field office.

E. Sizes: Provide following sizes unless otherwise specified.

(1) Flat or Sheet Products: Minimum 6" square, maximum 12" by 12".

(2) Linear Products: Minimum 6", maximum 12" long.

(3) Bulk Products: Minimum one pint, maximum one gallon.

F. Full size samples may be used in the Work upon approval.

1.09 MANUFACTURER'S CERTIFICATES:

A. Submit certificates, in duplicate in accordance with requirements of each Specification section.

1.10 EXCESS MATERIALS AND ATTIC STOCK

A. Excess Materials: Excess materials shall be considered property of Owner; inform Owner of extent of excess materials and methods required for handling and storage; remove from site excess materials not required by Owner for maintenance stock.

B. Attic Stock: Owner may choose to obtain additional attic stock for maintenance purposes where excess materials are not considered adequate.

(1) Owner may require as much as 5% extra materials for maintenance purposes. Exact amount of each material shall be determined by Owner based on following meeting and additional costs determined by Contractor.

(a) Contractor shall be prepared to order up to 5% extra materials on items that may not be readily available in future such as custom colors, off-shore manufacture, anticipated life span under 5 years, and potential for damage.

1) Do not order extra attic stock until extent is determined and agreed to by Owner including which materials require extra stock and exactly how much those materials will cost including shipping and handling.

(b) Excess Materials: Furnish excess materials only for materials that have a shelf-life of more than three years.

(2) Meeting: Conduct meeting prior to beginning Work to discuss extent of materials Owner would like to receive at project closeout for attic stock for maintenance materials; where available include personnel from Owner's maintenance crew.

(a) Estimate amount of excess materials to be anticipated to be ordered in addition to materials for handling and storage and how those materials will be invoiced and identified regarding material and location in Project. Determine area necessary for adequate storage, handling, and identifying excess materials and attic stock and discuss with Owner.

(b) Submit information regarding equipment necessary for handling of excess materials and attic stock due to weight, size, and storage requirements.

(c) Assist Owner in determining where on-site or off-site additional attic stock for maintenance purposes will be delivered and stored.

(3) Additional Costs: After meeting submit to Owner detailed listing of additional costs for each material Owner may like to receive for attic stock and assist Owner in modifying listing to determine acceptable final costs.

(a) Include unit prices for desired attic stock where excess materials are not adequate for Owner maintenance stock.

(4) Final Completion: Ensure attic stock has been received, identified, cataloged, and stored at locations agreed upon with Owner based on Change Order indicating amounts finally agreed to by Owner.

END OF SECTION

DOCUMENT 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. See all Contract Documents, including General and Supplementary Conditions and other Division 01 Specifications.

1.02 SUMMARY:

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

(1) General coordination procedures.

(2) Coordination drawings.

(3) Requests for Information (RFIs).

(4) Project web site.

(5) Project meetings.

(6) Web-Based Project Information Management System (PIM)

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related requirements:

(1) Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.

(2) Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

(3) Section 01 77 00 "Contract Closeout and Final Cleaning" for coordinating closeout of the Contract.

1.03 DEFINITIONS:

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

B. DSA: Division of the State Architect: The governing agency for the Project.

C. PIM: Web-Based Project Information Management System.

1.04 INFORMATIONAL SUBMITTALS:

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

(1) Name, address, and telephone number of entity performing subcontract or supplying products.

(2) Number and title of related Specification Section(s) covered by subcontract.

(3) Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 7 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

(1) Post copies of list in project meeting room, in temporary field office, on Project Web site (PIM), and by each temporary telephone. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES:

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

(1) Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

(2) Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

(3) Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different sections, that depend on each other for proper installation, connection, and operation.

(1) Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

(2) Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.

(3) Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

(1) Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

(1) Preparation of Contractor's construction schedule.

(2) Preparation of the schedule of values.

(3) Installation and removal of temporary facilities and controls.

(4) Delivery and processing of submittals.

(5) Progress meetings.

(6) Pre-installation conferences.

(7) Project closeout activities.

(8) Startup and adjustment of systems.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

(1) Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.06 COORDINATION DRAWINGS:

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

(1) Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

(a) Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

(b) Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

(c) Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

(d) Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

(e) Show location and size of access doors required for access to concealed dampers, valves, and other controls.

(f) Indicate required installation sequences.

(g) Indicate dimensions shown on the drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

(1) Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

(2) Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on drawings. Indicate areas of conflict between light fixtures and other components.

(3) Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.

(4) Structural Penetrations: Indicate penetrations and openings required for all disciplines.

(5) Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

(6) Mechanical and Plumbing Work: Show the following:

(a) Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.

(b) Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.

(c) Fire-rated enclosures around ductwork.

(7) Electrical Work: Show the following:

(a) Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.

(b) Light fixture, exit light, emergency battery pack, smoke detector, and other fire- alarm locations.

(c) Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.

(d) Location of pull boxes and junction boxes, dimensioned from column center lines.

(8) Fire-Protection System: Show the following:

(a) Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

(9) Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

(10) Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 3300 "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

(1) File Preparation Format: Same digital data software program, version, and operating system as original Drawings.

(2) File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.

(3) Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

(a) Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.

(b) Digital Data Software Program: Drawings are available in Autodesk 'Revit.'

(c) Contractor shall execute a data licensing agreement in the form of AIA Document C106.

1.07 REQUESTS FOR INFORMATION (RFIs) (see General Conditions § 7.4):

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

(1) Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.

(2) Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

(1) Project name.

(2) Project number.

(3) Date.

(4) Name of Contractor.

(5) Name of Architect.

(6) RFI number, numbered sequentially.

(7) RFI subject.

(8) Specification Section number and title and related paragraphs, as appropriate.

(9) Drawing number and detail references, as appropriate.

(10) Field dimensions and conditions, as appropriate.

(11) Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI. An RFI cannot modify the Contract Sum, Contract Time, or the Contract Documents.

(12) Contractor's signature.

(13) Attachments: Include sketches, descriptions, measurements, photos, product data, shop drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

(a) Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Form generated from web-based project information management system with substantially the same content as indicated above, acceptable to Architect.

(1) Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow fourteen (14) calendar days for Architect's response for each RFI.

RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

(1) The following Contractor-generated RFIs will be returned without action:

(a) Requests for approval of submittals.

(b) Requests for approval of substitutions.

(c) Requests for approval of Contractor's means and methods.

(d) Requests for coordination information already indicated in the Contract Documents.

(e) Requests for adjustments in the Contract Time or the Contract Sum.

(f) Requests for interpretation of Architect's actions on submittals.

(g) Incomplete RFIs or inaccurately prepared RFIs.

(2) Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

E. RFI Log: RFI log will be maintained in project's web-based project information management system. Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log during all Project Meetings. Use software log that is part of Project Web site.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

(1) Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

(2) Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.08 WEB-BASED PROJECT INFORMATION MANAGEMENT SYSTEM:

A. Unless otherwise approved, use Owner's Web-Based Project Information Management System for purposes of managing project communication and documentation until Final Completion.

(1) Software: Procore (https://www.procore.com/index.php)

(2) Functions include, but are not limited to the following:

(a) Meeting agendas and minutes.

(b) Contract modifications forms and logs.

(c) RFI forms and logs.

(d) Calendar management.

(e) Submittals forms and logs.

(f) Payment application forms.

(g) Drawing and specification revision hosting, viewing, and updating.

(f) Archiving functions.

(g) ASI forms and logs.

(3) The Procore project management software cost is hosted by the Owner, there is no cost to the GC, subcontractors, design consultants, Architect, CM, etc. to use the software. The GC and subcontractor's will be required to enter information and upload documents into the tool to allow for the work flow management throughout the project, which does have an overhead cost element to the entities involved. The bidders should familiarize themselves with all the functionality of the Procore software training or user manuals available to them via the internet prior to bidding. Basic training (conference call) on the functionality of the management tool will be scheduled for the awarded bidder.

(4) Project Information Management System Training: Owner will schedule and conduct a Project Information Management System Training session before the start of construction.

(a) Attendees: All representatives of Owner and Contractor who will be directly interacting with the system shall attend.

(b) Additional representative introduced at later dates shall be trained by Owner and Contractor independent of Architect.

1.09 PROJECT MEETINGS (see General Conditions § 3.2.5):

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

(1) Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

(2) Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

(3) Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

(4) Project Information Management System includes functions to format the agenda, notify attendees, record meeting minutes, and convert minutes from meeting into next meeting's agenda.

B. Preconstruction Conference: Owner will schedule and conduct Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

(1) Conduct the conference to review responsibilities and personnel assignments.

(2) Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

(3) Agenda: Discuss items of significance that could affect progress, including the following:

(a) Tentative construction schedule.

(b) Phasing.

(c) Critical work sequencing and long-lead items.

(d) Designation of key personnel and their duties.

(e) Lines of communications.

(f) Procedures for processing field decisions and Change Orders.

(g) Procedures for RFIs.

(h) Procedures for testing and inspecting.

(i) Procedures for processing Applications for Payment.

(j) Distribution of the Contract Documents.

(k) Submittal procedures.

(l) Sustainable design requirements.

(m) Preparation of record documents.

(n) Use of the premises and existing building.

(o) Work restrictions.

(p) Working hours.

(q) Owner's occupancy requirements.

(r) Responsibility for temporary facilities and controls.

(s) Procedures for moisture and mold control.

(t) Procedures for disruptions and shutdowns.

(u) Construction waste management and recycling.

(v) Parking availability.

(w) Office, work, and storage areas.

(x) Equipment deliveries and priorities.

(y) First aid.

(z) Security.

(aa) Progress cleaning.

(bb) Division of the State Architect (DSA) procedures and requirements.

1) DSA required documentation

2) DSA deferred-approval submittal review and approval procedures and requirements.

3) DSA Field Inspector procedures and authority.

(4) Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

(1) Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner's Commissioning Authority of scheduled meeting dates.

(2) Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

(a) Contract Documents.

(b) Options.

(c) Related RFIs.

(d) Related Change Orders.

(e) Purchases.

(f) Deliveries.

(g) Submittals.

(h) Sustainable design requirements.

(i) Review of mockups.

(j) Possible conflicts.

(k) Compatibility requirements.

(l) Time schedules.

(m) Weather limitations.

(n) Manufacturer's written instructions.

(o) Warranty requirements.

(p) Compatibility of materials.

(q) Acceptability of substrates.

(r) Temporary facilities and controls.

(s) Space and access limitations.

(t) Regulations of authorities having jurisdiction.

(u) Testing and inspecting requirements.

(v) Installation procedures.

(w) Coordination with other work.

(x) Required performance results.

(y) Protection of adjacent work.

(z) Protection of construction and personnel.

(3) Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

(4) Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

(5) Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

(6) Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

(a) Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, especially the General Conditions and Agreement.

1.02 PROGRESS MEETINGS:

A. Contractor shall schedule and hold regular weekly progress meetings after a minimum of one week's prior written notice of the meeting date and time to all Invitees as indicated below.

B. Location: Contractor's field office, or mutually agreed on other location.

C. The Contractor shall notify and invite the following entities ("Invitees"):

(1) Owner Representative.

(2) Contractor.

(3) Contractor's Project Manager.

(4) Contractor's Superintendent.

(5) Subcontractors, as appropriate to the agenda of the meeting.

(6) Suppliers, as appropriate to the agenda of the meeting.

(7) Construction Manager, if any.

(8) Architect

(9) Engineer(s), if any and as appropriate to the agenda of the meeting.

(10) Others, as appropriate to the agenda of the meeting.

D. The Owner's, the Architect's, and/or an engineer's Consultants will attend at their discretion, in response to the agenda.

E. The Owner representative, the Construction Manager, and/or another Owner Agent shall take and distribute meeting notes to attendees and other concerned parties. If exceptions are taken to anything in the meeting notes, those exceptions shall be stated in writing to the Owner within three (3) working days following Owner's distribution of the meeting notes.

(1) At the Owner's discretion, the Contractor may be requested to take and distribute meeting notes to attendees and other concerned parties.

1.03 PRE-INSTALLATION/PERFORMANCE MEETING:

A. Contractor shall schedule a meeting prior to the start of each of the following portions of the Work: cutting and patching of plaster and roofing, and other weather-exposed and moisture-resistant products. Contractor shall invite all Invitees to this meeting, and others whose work may affect or be affected by the quality of the cutting and patching work.

B. Contractor shall review in detail prior to this meeting, the manufacturer's requirements and specifications, applicable portions of the Contract Documents, shop drawings, and other submittals, and other related work. At this meeting, invitees shall review and resolve conflicts, incompatibilities, or inadequacies discovered or anticipated.

C. Contractor shall review in detail Project conditions, schedule, requirements for performance, application, installation, and quality of completed Work, and protection of adjacent Work and property.

D. Contractor shall review in detail means of protecting the completed Work during the remainder of the construction period.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. See General Conditions § 3.9 and Article 8.

1.02 SUMMARY:

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

(1) Startup construction schedule.

(2) Contractor's construction schedule.

(3) Construction schedule updating reports.

(4) Daily construction reports.

(5) Material location reports.

(6) Site condition reports.

(7) Special reports.

B. Related requirements:

(1) Section 01 33 00 "Submittals" for submitting schedules and reports.

(2) Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.03 DEFINITIONS:

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

(1) Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.

(2) Predecessor Activity: An activity that precedes another activity in the network.

(3) Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Owner.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

(1) Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed on a first come first served basis to meet schedule milestones.

(2) Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

(3) Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.04 INFORMATIONAL SUBMITTALS:

A. Format for Submittals: Submit required submittals in the following format:

(1) PDF electronic file.

(2) Hard copy.

B. Startup construction schedule.

(1) Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1.05 QUALITY ASSURANCE:

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

(1) Review software limitations and content and format for reports.

(2) Verify availability of qualified personnel needed to develop and update schedule.

(3) Review delivery dates for Owner-furnished products.

(4) Review schedule for work of Owner's separate contracts.

(5) Review submittal requirements and procedures.

(6) Review time required for review of submittals and resubmittals.

(7) Review requirements for tests and inspections by independent testing and inspecting agencies.

(8) Review time required for Project closeout and Owner startup procedures.

(9) Review and finalize list of construction activities to be included in schedule.

(10) Review procedures for updating schedule.

1.06 COORDINATION:

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

(1) Secure time commitments for performing critical elements of the Work from entities involved.

(2) Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 – PRODUCTS

2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL (see General Conditions § 3.9)

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

(1) Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

(1) Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

(2) Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery of:

(a) Structural Steel.

(b) Aluminum framed entrances and storefronts.

(3) Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittals" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.

(4) Startup and Testing Time: Include no fewer than 15 days for startup and testing.

(5) Punch List and Completion: Include not more than 30 days for completion of punch list items and Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

(1) Phasing: Arrange list of activities on schedule by phase.

(2) Work under More Than One Contract: Include a separate activity for each contract.

(3) Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

(4) Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 11 00 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.

(5) Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 11 00 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.

(6) Work Restrictions: Show the effect of the following items on the schedule:

(a) Coordination with existing construction.

(b) Limitations of continued occupancies.

(c) Uninterruptible services.

(d) Partial occupancy before Completion.

(e) Use of premises restrictions.

(f) Provisions for future construction.

(g) Seasonal variations.

(h) Environmental control.

(7) Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

(a) Subcontract awards.

(b) Submittals.

(c) Purchases.

(d) Mockups.

(e) Fabrication.

(f) Sample testing.

(g) Deliveries.

(h) Installation.

(i) Tests and inspections.

(j) Adjusting.

(k) Curing.

(l) Building flush-out.

(m) Startup and placement into final use and operation.

(8) Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

(a) Structural completion.

(b) Temporary enclosure and space conditioning.

(c) Permanent space enclosure.

(d) Completion of mechanical installation.

(e) Completion of electrical installation.

(f) Completion.

D. Milestone Deadlines: Include milestone deadlines of the Contract Documents in the schedules, including, but not limited to, the Notice to Proceed, Completion, and the following milestones:

(1) [LIST MILESTONE DEADLINES FROM AGREEMENT]

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

(1) Unresolved issues.

(2) Unanswered Requests for Information.

(3) Rejected or unreturned submittals.

(4) Notations on returned submittals.

(5) Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Contractor is not prosecuting the Work at a rate sufficient to meet the Work schedule or a contractual milestone, or to Complete the Work within the Contract Time as adjusted by change orders, or if the Contractor's actual progress falls behind the Work schedule or it is apparent to Owner that Contractor will not meet contractual milestones or Complete the Work within the Contract Time as adjusted by change orders, the Owner may require that the Contractor prepare and submit a recovery plan and submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.02 BASELINE CONSTRUCTION SCHEDULE (see General Conditions § 3.9)

A. Baseline Construction Schedule: Before the Contractor's commencement of Work or within two (2) weeks of award of the Contract, whichever is earlier, Contractor shall prepare and submit for the Owner's, and any construction manager's, information the baseline construction schedule for the Work, which shall conform to the Contract Documents' requirements.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 30 days of construction. Include skeleton diagram

for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE) (see General Conditions § 3.9)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 15 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

(1) Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

(a) Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Owner's approval of the schedule.

(2) Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

(3) Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

(4) Use calendar days as the unit of time for individual activities.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

(1) Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

(a) Preparation and processing of submittals.

(b) Mobilization and demobilization.

(c) Purchase of materials.

(d) Delivery.

(e) Fabrication.

(f) Utility interruptions.

(g) Installation.

(h) Work by Owner that may affect or be affected by Contractor's activities.

(i) Testing and commissioning.

(j) Punch list and Completion.

(k) Activities occurring following Completion.

(2) Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

(3) Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

(4) Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

(a) Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Baseline Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

(1) Contractor or subcontractor and the Work or activity.

(2) Description of activity.

(3) Main events of activity.

(4) Immediate preceding and succeeding activities.

(5) Early and late start dates.

(6) Early and late finish dates.

(7) Activity duration in workdays.

(8) Total float or slack time.

(9) Average size of workforce.

(10) Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

(1) Identification of activities that have changed.

(2) Changes in early and late start dates.

(3) Changes in early and late finish dates.

(4) Changes in activity durations in workdays.

(5) Changes in the critical path.

(6) Changes in total float or slack time.

(7) Changes in the Contract Time.

2.04 REPORTS

A. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the

differing conditions, together with recommendations for changing the Contract Documents.

2.05 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 – EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE (see General Conditions § 3.9)

A. Contractor's Construction Schedule Updating: Contractor shall submit an updated schedule by the first day of every month, and whenever else requested by the Owner. Each schedule update must include an accurate as-built schedule and the current as-planned schedule, both of which shall conform to the Contract Documents' requirements. Contractor shall submit its daily logs for the prior month with the updated schedule. Each update shall comply fully with the requirements in the Contract Documents for baseline and update schedules.

(1) Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

(2) Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

(3) As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect and Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

(1) Post copies in Project meeting rooms and temporary field offices.

(2) When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

DOCUMENT 01 32 13

SCHEDULING OF WORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation General Conditions § 3.9.

1.02 SECTION INCLUDES:

A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of the Contract Documents, including this Section.

(1) Development of schedule, cost and resource loading of the schedule, payments, and project status reporting requirements of the Contract shall employ computerized Critical Path Method ("CPM") scheduling ("CPM Schedule").

(2) CPM Schedule shall be cost loaded based on payment as approved by Owner.

(3) Submit schedules and reports as specified in the General Conditions.

B. Upon award of Contract, Contractor shall immediately commence development of CPM schedules to ensure compliance with CPM schedule submittal requirements.

1.03 CONSTRUCTION SCHEDULE; HOURS OF WORK:

A. Within five (5) days of being awarded the Contract and before request for first progress payment, the Contractor shall prepare and submit to the Owner a construction progress schedule conforming to the Agreement.

B. The schedule shall be continuously updated, and an updated schedule shall be submitted with each application for progress payment. Each revised schedule shall indicate the work actually accomplished during the previous period and the schedule for completion of the remaining work.

C. The hours of work shall be as follows.

HOURS OF CONSTRUCTION OPERATIONS

Weekdays:	**7:00 a.m. to 2:00 p.m.**	
Weekends:	**7:00 a.m. to 7:00 p.m.**	**(Approved in Advance)**
After hours	**7:00 p.m. to 7:00 a.m.**	**(Approved in Advance)**

1.04 QUALIFICATIONS

A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of E-Builder. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.

(1) The written statement shall identify the individual who will perform CPM scheduling.

(2) Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.

(3) Required level of experience shall include at least two (2) projects of similar nature and scope with value not less than three fourths (¾) of the Contract Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.

B. Owner reserves the right to approve or reject Contractor's scheduler or consultant at any time. Owner reserves the right to refuse replacing of Contractor's scheduler or consultant, if Owner believes replacement will negatively affect the scheduling of Work under this Contract.

1.05 GENERAL

A. Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.

B. Overall time of completion and time of completion for each milestone shown on Progress schedule shall adhere to times in the Contract, unless an earlier (advanced) deadline for Completion is requested by Contractor and agreed to by Owner, and formalized by a Change Order.

(1) Owner is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.

(2) Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.

(3) A schedule showing the work completed in less than the Contract Time, and that has been accepted by Owner, shall be considered to have Project float. Project float is a resource available to both Owner and the Contractor.

C. Ownership Project float: Neither the Owner nor Contractor owns Project float. The Project owns the Project float. As such, liability for delay of Completion rests with the party whose actions, last in time, actually cause delay to Completion.

(1) For example, if Party A uses some, but not all of the Project float and Party B later uses remainder of the Project float as well as additional time beyond the Project float, Party B shall be liable for the time that represents a delay to Completion.

(2) Party A would not be responsible for the time since it did not consume the entire Project float and additional Project float remained; therefore, Completion was unaffected by Party A.

D. Progress schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract CPM Schedule and monitoring actual progress as compared to progress schedule rests with Contractor.

E. Failure of progress schedule to include any element of the Work, or any inaccuracy in progress schedule, will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. Owner's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon Owner, or act to relieve Contractor of its responsibility for means and methods of construction.

F. Software: Use a program specified by the Agreement. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to Owner on compact disk at times requested by Owner.

G. Transmit each item under the form approved by Owner.

(1) Identify Project with Owner Contract number and name of Contractor.

(2) Provide space for Contractor's approval stamp and Owner's review stamps.

(3) Submittals received from sources other than Contractor will be returned to the Contractor without Owner's review.

1.06 [Not Used]

1.07 BASELINE CPM SCHEDULE

A. Submit a detailed proposed baseline CPM schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.

B. Progress schedule shall include or comply with following requirements:

(1) Time scaled, cost and resource (labor and major equipment) loaded CPM schedule.

(2) No activity on schedule shall have duration longer than fifteen (15) calendar days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by Owner.

(a) Activity durations shall be total number of actual calendar days required to perform that activity.

(3) The start and completion dates of all items of Work, their major components, and milestone completion dates, if any.

(4) Owner furnished materials and equipment, if any, identified as separate activities.

(5) Activities for maintaining Project Record Documents.

(6) Dependencies (or relationships) between activities.

(7) Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.

(a) Include time for submittals, re-submittals and reviews by Owner. Coordinate with accepted schedule for submission of shop drawings, samples, and other submittals.

(b) Contractor shall be responsible for all impacts resulting from re-submittal of shop drawings and submittals.

(8) Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.

(a) Include time for fabrication and delivery of manufactured products for the Work.

(b) Show dependencies between procurement and construction.

(9) Activity description; what Work is to be accomplished and where.

(10) The total cost of performing each activity shall be total of labor, material, and equipment, excluding overhead and profit of Contractor. Overhead and profit of the Contractor shall be shown as a separate activity in the schedule. Sum of cost for all activities shall equal total Contract value.

(11) Resources required (labor and major equipment) to perform each activity.

(12) Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.

(13) Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (5) days.

(14) Thirty (30) calendar days for developing punch list(s), completion of punch-list items, and final clean up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.

(15) Interface with the work of other contractors, Owner, and agencies such as, but not limited to, utility companies.

(16) Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which CPM was built.

(a) Also furnish for each Subcontractor, as determined by Owner, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's CPM schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.

(b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.

(c) In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by Owner, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.

(d) Furnish schedule for Contractor/Subcontractor CPM schedule meetings which shall be held prior to submission of baseline CPM schedule to Owner. Owner shall be permitted to attend scheduled meetings as an observer.

(17) Activity durations shall be in calendar days.

(18) Submit with the schedule a list of anticipated non-work days, such as weekends and holidays.

C. Baseline CPM Schedule Review Meeting: Contractor shall, within five (5) days from the Notice to Proceed date, meet with Owner to review the baseline CPM schedule submittal.

(1) Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by Owner, in attendance. The meeting will take place over a continuous one (1) day period.

(2) Owner's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:

(a) Clarifications of Contract Requirements.

(b) Directions to include activities and information missing from submittal.

(c) Requests to Contractor to clarify its schedule.

(3) Within three (3) days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by Owner at the Meeting.

1.08 ADJUSTMENTS TO BASELINE CPM SCHEDULE

A. Adjustments to Baseline CPM Schedule: Contractor shall have adjusted the baseline CPM schedule submittal to address all review comments from original CPM Schedule review meeting and resubmit network diagrams and reports for Owner's review.

(1) Owner, within three (3) days from date that Contractor submitted the revised schedule, will either:

(a) Accept schedule and cost and resource loaded activities as submitted, or

(b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for Owner to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

(2) Owner may accept schedule with conditions that the first monthly CPM Schedule update be revised to correct deficiencies identified.

(3) When schedule is accepted, it shall be considered the "Baseline CPM Schedule" which will then be immediately updated to reflect the current status of the work.

(4) Owner reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

B. Acceptance of Contractor's schedule by Owner will be based solely upon schedule's compliance with Contract requirements.

(1) By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.

(2) Upon submittal of schedule update, updated schedule shall be considered "current" CPM Schedule.

(3) Submission of Contractor's schedule to Owner shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.

C. Submittal of baseline CPM schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.

D. Contractor shall distribute baseline CPM schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to Owner for the record.

1.09 MONTHLY CPM SCHEDULE UPDATE SUBMITTALS

A. Following acceptance of Contractor's baseline CPM schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any anticipated changes to planned activities.

(1) Each schedule update submitted shall be complete, including all information requested for the baseline CPM schedule submittal.

(2) Each update shall continue to show all Work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.

B. A meeting will be held on approximately the twenty fifth (25th) of each month to review the schedule update submittal and progress payment application.

(1) At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.

(2) These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a

minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.

(3) Contractor shall plan on the meeting taking no less than four (4) hours.

C. Within seven (7) calendar days after monthly schedule update meeting, Contractor shall submit the updated CPM schedule update.

D. Within seven (7) calendar days of receipt of above noted revised submittals, Owner will either accept or reject monthly schedule update submittal.

(1) If accepted, percent (%) complete shown in monthly update will be basis for application for payment by the Contractor. The schedule update shall be submitted as part of the Contractor's application for payment.

(2) If rejected, update shall be corrected and resubmitted by Contractor before the application for payment is submitted.

E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to Owner by Contractor under this Contract, nor Owner's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations under this Contract.

1.10 SCHEDULE REVISIONS

A. Updating the schedule to reflect actual progress shall not be considered revisions to the schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.

B. To reflect revisions to the schedule, the Contractor shall provide Owner with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.

C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by Owner. Owner may request further information and justification for schedule revisions and Contractor shall, within three (3) days, provide Owner with a complete written narrative response to Owner's request.

D. If the Contractor's revision is still not accepted by Owner, and the Contractor disagrees with Owner's position, the Contractor has seven (7) calendar days from receipt of Owner's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of Owner's written

rejection of a schedule revision shall be contractually interpreted as acceptance of Owner's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding Owner's position.

E. At Owner's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.11 RECOVERY SCHEDULE

A. If the schedule update shows a completion date seven (7) calendar days beyond the Contract Completion deadline, or individual milestone deadline, the Contractor shall submit to Owner the proposed revisions to recover the lost time within three (3) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work. See General Conditions §3.9.

B. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed by Owner.

C. If the Contractor's revisions are not accepted by Owner, Owner and the Contractor shall follow the procedures in paragraph 1.09.C, 1.09.D and 1.09.E above.

D. At Owner's discretion, the Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.

1.12 TIME IMPACTS EVALUATION ("TIE") FOR CHANGE ORDERS, AND OTHER DELAYS

A. When Contractor is directed to proceed with Work and it feels that it is entitled to a time extension, it shall comply with time extension requirements in the Contract Documents, including submittal of a TIE with a COR that includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable Owner to evaluate the impact of changed Work to the scheduled critical path.

B. Contractor shall be required to comply with the requirements of Paragraph 1.09.A and General Conditions Article 4 and 8 for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.

C. Contractor shall be responsible for all costs associated with the preparation of time extension requests, and the process of incorporating them into the current schedule update. The Contractor shall provide Owner with one (1) hard copy, one (1) electronic and upload into e-Builder, of each TIE.

D. Once agreement has been reached on a time extension request, the Contract Time will be adjusted accordingly by change order. If agreement is not reached on a time extension request, the Contract Time may be extended in an amount Owner allows, and the Contractor may submit a claim for additional time.

1.13 TIME EXTENSIONS

A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts and requests for time extension shall be given in accord with the General Conditions.

B. Where an event for which Owner is responsible impacts the projected Completion, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate Owner-caused time impact. The Contractor shall submit its mitigation plan to Owner within five (5) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.

C. Failure to request time, provide TIE, or provide the mitigation plan as required by the Contract Documents will result in Contractor waiving its right to a time extension and cost to mitigate the delay.

D. No time will be granted under this Contract for cumulative effect of changes.

E. Owner will not be obligated to consider any time extension request unless the Contractor complies with the requirements of the Contract Documents.

F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.

G. If the Contractor does not submit a TIE within the contractually-required time for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

1.14 SCHEDULE REPORTS

A. Submit one (1) hard copy and one (1) electronic copy of the following reports with the baseline CPM schedule, and each monthly update.

B. Required Reports:

(1) Two activity listing reports: one sorted by activity number and one by total Project float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project float, responsibility code, and the logic relationship of activities.

(2) Cost report sorted by activity number including each activity's associated cost, percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.

(3) Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.

(4) Cash flow report calculated by early start, late start, and indicating actual progress. Provide an exhibit depicting this information in graphic form.

(5) Planned versus actual resource (i.e., labor) histogram calculated by early start and late start.

C. Other Reports

In addition to above reports, Owner may request, from month to month, any two of the following reports. Submit one (1) hard copy and one (1) electronic copy of all reports.

(1) Activities by early start.

(2) Activities by late start.

(3) Activities grouped by Subcontractors or selected trades.

(4) Activities with scheduled early start dates in a given time frame, such as fifteen (15) or thirty (30) day outlook.

D. Furnish Owner with one (1) hard copy and one (1) electronic copy of all report files containing all schedule files for each report generated.

1.15 PROJECT STATUS REPORTING

A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM schedule as specified herein. Status reporting shall be in form specified below.

B. Contractor shall prepare monthly written narrative reports of status of Project for submission to Owner. Written status reports shall include:

(1) Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.

(2) Progress made on critical activities indicated on CPM Schedule.

(3) Explanations for any lack of work on critical path activities planned to be performed during last month.

(4) Explanations for any schedule changes, including changes to logic or to activity durations.

(5) List of critical activities scheduled to be performed next month.

(6) Status of major material and equipment procurement.

(7) Any delays encountered during reporting period.

(8) Contractor shall provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.

(a) Actual resource shall be accumulated in field by Contractor, and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in computer-generated monthly and weekly printed reports.

(b) Contractor shall explain all variances and mitigation measures.

(9) Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by Owner at no additional cost.

(10) Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.16 WEEKLY SCHEDULE REPORT

At the weekly progress meeting, the Contractor shall provide and present a time-scaled three (3) week look-ahead schedule that is based and correlated by activity number to the current schedule (i.e., baseline CPM, or schedule update).

1.17 DAILY CONSTRUCTION REPORTS

On a daily basis, Contractor shall submit a daily activity report to Owner for each workday, including weekends and holidays when worked. Contractor shall develop the daily construction reports on a computer-generated database capable of sorting daily

Work, manpower, and manhours by Contractor, Subcontractor, area, sub-area, and change order Work. Upon request of Owner, furnish computer disk of this data base. Obtain Owner's written approval of daily construction report data base format prior to implementation. Include in report:

A. Project name and Project number.

B. Contractor's name and address.

C. Weather, temperature, and any unusual site conditions.

D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to CPM scheduled activities.

E. Worker quantities for its own Work force and for Subcontractors of any tier.

F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

1.18 PERIODIC VERIFIED REPORTS

Contractor shall complete and verify construction reports on a form prescribed by the Division of the State Architect and file reports on the first day of February, May, August, and November during the preceding quarter year; at the completion of the Contract; at the completion of the Work; at the suspension of Work for a period of more than one (1) month; whenever the services of Contractor or any of Contractor's Subcontractors are terminated for any reason; and at any time a special verified report is required by the Division of the State Architect. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation General Conditions §3.11.

1.02 SECTION INCLUDES:

A. Definitions:

(1) Shop Drawings and Product Data are as indicated in the General Conditions and include, but are not limited to, fabrication, erection, layout and setting drawings, formwork and falsework drawings, manufacturers' standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams. In addition, there are other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and all positions conform to the requirement of the Contract Documents, including, without limitation, the Drawings.

(2) "Manufactured" applies to standard units usually mass-produced; "fabricated" means specifically assembled or made out of selected materials to meet design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items, indicated proper relation to adjoining work and amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure.

(3) Manufacturer's Instructions: Where any item of Work is required by the Contract Documents to be furnished, installed, or performed, at a minimum, in accordance with a specified product manufacturer's instructions, the Contractor shall procure and distribute copies of these to the Owner, the Architect, and all other concerned parties and shall furnish, install, or perform the work, at a minimum, in accordance with those instructions.

B. Samples, Shop Drawings, Product Data, and other items as specified, in accordance with the following requirements:

(1) The submittal process shall be as set forth in the General Conditions and this document, unless otherwise directed by the Owner.

(2) Contractor shall submit all Shop Drawings, Product Data, and Samples to the Owner, the Architect, the Project Inspector, and the Construction Manager.

(3) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall submit required information in sufficient time to permit proper consideration and action before ordering any materials or items represented by such Shop Drawings, Product Data, and/or Samples.

(4) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall allow sufficient time so that no delay occurs due to required lead time in ordering or delivery of any item to the Site. Contractor shall be responsible for any delay in progress of Work due to its failure to observe these requirements.

(5) Time for completion of Work shall not be extended on account of Contractor's failure to promptly submit Shop Drawings, Product Data, and/or Samples.

(6) Reference numbers on Shop Drawings shall have Architectural and/or Engineering Contract Drawings reference numbers for details, sections, and "cuts" shown on Shop Drawings. These reference numbers shall be in addition to any numbering system that Contractor chooses to use or has adopted as standard.

(7) When the magnitude or complexity of submittal material prevents a complete review within the stated time frame, Contractor shall make this submittal in increments to avoid extended delays.

(8) Contractor shall certify on submittals for review that submittals conform to Contract requirements. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Also certify that Contractor-furnished equipment can be installed in allocated space.

(9) Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standard of the American Society for Testing and Materials.

(10) Upon demand by Architect or Owner, Contractor shall submit samples of materials and/or articles for tests or examinations and consideration before Contractor incorporates same in Work. Contractor shall be solely responsible for delays due to sample(s) not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples that are of value after testing will remain the property of Contractor.

C. Submittal Schedule:

(1) Contractor shall prepare its proposed submittal schedule that is coordinated with its proposed construction schedule and submit both to the Owner within five (5) days after the date of the Notice to Proceed. Contractor's proposed schedules

shall become the Project Construction Schedule and the Project Submittal Schedule after each is approved by the Owner.

(2) Contractor is responsible for all lost time should the initial submittal be rejected, marked "revised and resubmit," etc.

(3) All Submittals shall be forwarded to the Owner by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those Submittals shall be forwarded to the Owner so as not to delay the Construction Schedule.

1.03 SHOP DRAWINGS:

A. Before commencing installation of any Work, the Contractor shall submit and receive approval of all drawings, descriptive data, and material list(s) as required to accomplish Work.

B. Review of Shop Drawings is regarded as a service to assist Contractor and in all cases original Contract Documents shall take precedence as outlined under General Conditions.

C. No claim for extra time or payment shall be based on work shown on Shop Drawings unless the claim is (1) noted on Contractor's transmittal letter accompanying Shop Drawings and (2) Contractor has complied with all applicable provisions of the General Conditions, including, without limitation, provisions regarding changes and payment, and all required written approvals.

D. Owner and / or Architect shall not review Shop Drawings for quantities of materials or number of items supplied.

E. Owner's and/or Architect's review of Shop Drawing will be general. Owner and/or Architect review does not relieve Contractor of responsibility for accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on Shop Drawings. Shop Drawing reviewed by Owner and/or Architect is not to be construed as approving departures from Contract Documents.

F. Review of Shop Drawings and Schedules does not relieve Contractor from responsibility for any aspect of those Drawings or Schedules that is a violation of local, County, State, or Federal laws, rules, ordinances, or rules and regulations of commissions, boards, or other authorities or utilities having jurisdiction.

G. Before submitting Shop Drawings for review, Contractor shall check Shop Drawings of its subcontractors for accuracy, and confirm that all Work contiguous with and having bearing on other work shown on Shop Drawings is accurately drawn and in conformance with Contract Documents.

H. Submitted drawings and details must bear stamp of approval of Contractor:

(1) Stamp and signature shall clearly certify that Contractor has checked Shop Drawings for compliance with Drawings.

(2) If Contractor submits a Shop Drawing without an executed stamp of approval, or whenever it is evident (despite stamp) that Drawings have not been checked the Owner and/or Architect will not consider them and will return them to the Contractor for revision and resubmission. In that event, it will be deemed that Contractor has not complied with this provision and Contractor shall bear risk of all delays to same extent as if it had not submitted any Shop Drawings or details.

I. Submission of Shop Drawings (in either original submission or when resubmitted with correction) constitutes evidence that Contractor has checked all information thereon and that it accepts and is willing to perform Work as shown.

J. Contractor shall pay for cost of any changes in construction due to improper checking and coordination. Contractor shall be responsible for all additional costs, including coordination. Contractor shall be responsible for costs incurred by itself, the Owner, the Architect, the Project Inspector, the Construction Manager, any other Subcontractor or contractor, etc., due to improperly checked and/or coordination of submittals.

K. Shop Drawings must clearly delineate the following information:

(1) Project name and address.

(2) Specification number and description.

(3) Architect's name and project number.

(4) Shop Drawing title, number, date, and scale.

(5) Names of Contractor, Subcontractor(s) and fabricator.

(6) Working and erection dimensions.

(7) Arrangements and sectional views.

(8) Necessary details, including complete information for making connections with other Work.

(9) Kinds of materials and finishes.

(10) Descriptive names of materials and equipment, classified item numbers, and locations at which materials or equipment are to be installed in the Work. Contractor shall use same reference identification(s) as shown on Contract Drawings.

L. Contractor shall prepare composite drawings and installation layouts when required to solve tight field conditions.

(1) Shop Drawings shall consist of dimensioned plans and elevations and must give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc.

(2) Contractor shall coordinate these composite Shop Drawings and installation layouts in the field between itself and its Subcontractor(s) for proper relationship to the Work, the work of other trades, and the field conditions. The Contractor shall check and approve all submittal(s) before submitting them for final review.

1.04 PRODUCT DATA OR NON REPRODUCIBLE SUBMITTALS:

A. Contractor shall submit manufacturer's printed literature in original form. Any fading type of reproduction will not be accepted. Contract must submit a minimum of two (2) hard copies each, to the Owner and / or Architect. Owner and / or Architect shall return one (1) to the Contractor, who shall reproduce whatever additional copies it requires for distribution.

B. Contractor shall submit one (1) hard copy, one (1) PDF electronic of a complete list of all major items of mechanical, plumbing, and electrical equipment and materials in accordance with the approved Submittal Schedule, except as required earlier to comply with the approved Construction Schedule. Other items specified are to be submitted prior to commencing Work. Contractor shall submit items of like kind at one time in a neat and orderly manner. Partial lists will not be acceptable.

C. Submittals shall include manufacturer's specifications, physical dimensions, and ratings of all equipment. Contractor shall furnish performance curves for all pumps and fans. Where printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on sheet and superfluous information shall be crossed out. If highlighting is used, Contractor shall mark all copies.

D. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information that may be requested.

1.05 SAMPLES:

A. Contractor shall submit for approval Samples as required and within the time frame in the Contract Documents. Materials such as concrete, mortar, etc., which require on-site testing will be obtained from Project Site.

B. Contractor shall submit four (4) samples except where greater or lesser number is specifically required by Contract Documents including, without limitation, the Specifications.

(1) Samples must be of sufficient size and quality to clearly illustrate functional characteristics, with integrally related parts and attachment devices.

(2) Samples must show full range of texture, color, and pattern.

C. Contractor shall make all Submittals, unless it has authorized Subcontractor(s) to submit and Contractor has notified the Owner in writing to this effect.

D. Samples are to be shipped prepaid or hand-delivered to the Owner.

E. Contractor shall mark samples to show name of Project, name of Contractor submitting, Contract number and segment of Work where representative Sample will be used, all applicable Specifications Sections and documents, Contract Drawing Number and detail, and ASTM or FS reference, if applicable.

F. Contractor shall not deliver any material to Site prior to receipt of Owner's and/or Architect's completed written review and approval. Contractor shall furnish materials equal in every respect to approved Samples and execute Work in conformance therewith.

G. Owner's and/or Architect's review, acceptance, and/or approval of Sample(s) will not preclude rejections of any material upon discovery of defects in same prior to final acceptance of completed Work.

H. After a material has been approved, no change in brand or make will be permitted.

I. Contractor shall prepare its Submittal Schedule and submit Samples of materials requiring laboratory tests to specified laboratory for testing not less than ten (10) days before such materials are required to be used in Work.

J. Samples which are rejected must be resubmitted promptly after notification of rejection and be marked "Resubmitted Sample" in addition to other information required.

K. Field Samples and Mock-Ups are to be removed by Contractor at Owner's direction:

(1) Size: As Specified.

(2) Furnish catalog numbers and similar data, as requested.

1.06 REVIEW AND RESUBMISSION REQUIREMENTS:

A. The Owner will arrange for review of Sample(s), Shop Drawing(s), Product Data, and other submittal(s) by appropriate reviewer and return to Contractor as provided below within five (5) days after receipt or within five (5) days after receipt of all related information necessary for such review, whichever is later.

B. One (1) copy of product or materials data will be returned to Contractor with the review status.

C. Samples to be incorporated into the Work will be returned to Contractor, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review, if any. Other Samples will not be returned, but the same notice will be given with respect thereto, and that notice shall be considered a return of the Sample.

D. Contractor shall revise and resubmit any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Sample(s), Shop Drawing(s), Product Data, and other submittal(s), within five (5) days after receipt thereof or within five (5) days after receipt of all related information necessary for such review.

E. Contractor may proceed with any of the Work covered by Sample(s), Shop Drawing(s), Product Data, and other submittal(s) upon its return if designated as no exception taken, or revise as noted, provided the Contractor proceeds in accordance with the Owner and/or the Architect's notes and comments.

F. Contractor shall not begin any of the work covered by a Sample(s), Shop Drawing(s), Product Data, and other submittal(s), designated as revise and resubmit or rejected, until a revision or correction thereof has been reviewed and returned to Contractor.

G. Sample(s), Shop Drawing(s), Product Data, and other submittal(s) designated as revise and resubmit or rejected and requiring resubmittal, shall be revised or corrected and resubmitted to the Owner no later than fourteen (14) days or a shorter period as required to comply with the approved Construction Schedule, after its return to Contractor.

H. Neither the review nor the lack of review of any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) shall waive any of the requirements of the Contract Documents, or relieve Contractor of any obligation thereunder.

I. Owner's and/or Architect's review of Shop Drawings does not relieve the Contractor of responsibility for any errors that may exist. Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 35 13

SITE STANDARDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including without limitation, Safety Precautions and Programs, and Protection of Work and Property;

B. Agreement;

C. Drug-Free Workplace Certification; and

D. Fingerprinting Notice and Acknowledgement.

1.02 REQUIREMENTS OF THE OWNER:

A. Drug-Free Schools and Safety Requirements:

(1) All school sites and other Owner Facilities are “Drug-Free Zones.” No drugs, alcohol and/or smoking are allowed at any time in any buildings and/or grounds on Owner property. No students, staff, visitors, or contractors are to use drugs on these sites.

(2) Smoking and the use of tobacco products by all persons is prohibited on or in Owner property. Owner property includes school buildings, school grounds, school owned vehicles and vehicles owned by others while on Owner property. Contractor shall post: "Non-Smoking Area" in a highly visible location on Site. Contractor may designate a smoking area outside of Owner property within the public right-of-way, provided that this area remains quiet and unobtrusive to adjacent neighbors. This smoking area is to be kept clean at all times.

(3) Contractor shall ensure that no alcohol, firearms, weapons, or controlled substances enter or are used at the Site. Contractor shall immediately remove from the Site and terminate the employment of any employee(s) found in violation of this provision.

B. Language: Unacceptable and/or loud language will not be tolerated. "Cat calls" or other derogatory language toward students or public will not be allowed.

C. Disturbing the Peace (Noise and Lighting):

(1) Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.

(2) The use of radios, etc., shall be controlled to keep all sound at a level that cannot be heard beyond the immediate area of use. Owner reserves the right to prohibit the use of radios at the Site, except for handheld communication radios (e.g., Nextel phones or radios).

(3) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

D. Traffic:

(1) Driving on the Premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on the Premises shall be five (5) miles per hour (maximum) or less if conditions require.

(2) All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by Owner in advance. Any damage will be repaired to the pre-damaged condition by the Contractor.

(3) Owner shall designate a construction entry to the Site. If Contractor requests, Owner determines it is required, and to the extent possible, Owner shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with Owner and at Contractor's expense.

(4) Parking areas shall be reviewed and approved by Owner in advance. No parking is to occur under the drip line of trees or in areas that could otherwise be damaged.

E. All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in individual(s) being suspended or removed from the work force at the discretion of the Owner. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

A. Section includes administrative and procedural requirements for quality assurance and quality control.

(1) Inspection of materials, products, fabrication and installation by DSA Field Representative.

(2) Inspection of materials, products, fabrication and installation by Owner's Inspector of Record

(3) Testing of materials, products, fabrication and installation by Owner's Testing Agency.

(4) Mock ups.

(5) Contractor's quality assurance and control services

(6) Other quality assurance and control services, as applicable.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

(1) Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

(2) Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

(3) Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

(4) Specific test and inspection requirements are not specified in this Section.

(5) Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements or applicable building code requirements.

(a) Testing shall comply with the requirements of:

1) California Building Code, Title 24, Part 1, Chapter 4, Section 4-335.

2) Form DSA-103 “List of Required Structural Tests & Special Inspections– 2016 CBC.”

3) Requirements indicated in specification Sections Division 02 through 33.

4) Other requirements of authorities having jurisdiction.

C. Related Requirements:

(1) Section 01 21 00 "Allowances" for testing and inspecting allowances.

(2) Section 01 32 00 "Construction Progress Documentation" for developing a schedule of required tests and inspections.

(3) Divisions 02 through 33 Sections for specific test and inspection requirements.

1.03 DEFINITIONS:

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with

requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

(1) Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.

(2) Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

(3) Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

(1) Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. DSA: Division of the State Architect; the governing agency having jurisdiction.

L. IOR: Inspector of Record; Inspector certified through the DSA Project Inspector certification program and approved for the project.

1.04 CONFLICTING REQUIREMENTS:

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.05 ACTION SUBMITTALS:

A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

(1) Indicate manufacturer and model number of individual components.

(2) Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.06 INFORMATIONAL SUBMITTALS:

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

(1) Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.

(2) Main wind-force-resisting system or a wind-resisting component listed in the wind- force-resisting system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

(1) Specification Section number and title.

(2) Entity responsible for performing tests and inspections.

(3) Description of test and inspection.

(4) Identification of applicable standards.

(5) Identification of test and inspection methods.

(6) Number of tests and inspections required.

(7) Time schedule or time span for tests and inspections.

(8) Requirements for obtaining samples.

(9) Unique characteristics of each quality-control service.

1.07 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality- control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

(1) Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

(1) Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.

(2) Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."

(3) Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.08 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

(1) Date of issue.

(2) Project title and number.

(3) Name, address, and telephone number of testing agency.

(4) Dates and locations of samples and tests or inspections.

(5) Names of individuals making tests and inspections.

(6) Description of the Work and test and inspection method.

(7) Identification of product and Specification Section.

(8) Complete test or inspection data.

(9) Test and inspection results and an interpretation of test results.

(10) Record of temperature and weather conditions at time of sample taking and testing and inspecting.

(11) Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

(12) Name and signature of laboratory inspector.

(13) Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

(1) Name, address, and telephone number of technical representative making report.

(2) Statement on condition of substrates and their acceptability for installation of product.

(3) Statement that products at Project site comply with requirements.

(4) Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

(5) Results of operational and other tests and a statement of whether observed performance complies with requirements.

(6) Statement whether conditions, products, and installation will affect warranty.

(7) Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

(1) Name, address, and telephone number of factory-authorized service representative making report.

(2) Statement that equipment complies with requirements.

(3) Results of operational and other tests and a statement of whether observed performance complies with requirements.

(4) Statement whether conditions, products, and installation will affect warranty.

(5) Other required items indicated in individual Specification Sections.

1.09 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

(1) Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

(1) NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

(2) NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

(1) Contractor responsibilities include the following:

(a) Provide test specimens representative of proposed products and construction.

(b) Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

(c) Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

(d) Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

(e) Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

(f) When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

(2) Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

(1) Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

(2) Notify Architect seven days in advance of dates and times when mockups will be constructed.

(3) Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.

(4) Demonstrate the proposed range of aesthetic effects and workmanship.

(5) Obtain Architect's approval of mockups before starting work, fabrication, or construction.

(a) Allow seven days for initial review and each re-review of each mockup.

(6) Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

(7) Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

(1) Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

(2) Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.

(3) Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

(1) Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

(2) Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

(a) Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

(3) Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

(4) Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

(5) Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

(6) Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittals."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

(1) Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

(2) Determine the location from which test samples will be taken and in which in-situ tests are conducted.

(3) Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

(4) Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

(5) Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

(6) Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary

services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

(1) Access to the Work.

(2) Incidental labor and facilities necessary to facilitate tests and inspections.

(3) Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

(4) Facilities for storage and field curing of test samples.

(5) Delivery of samples to testing agencies.

(6) Preliminary design mix proposed for use for material mixes that require control by testing agency.

(7) Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

(1) Schedule times for tests, inspections, obtaining samples, and similar activities.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency and/or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and in Statement of Special Inspections attached to this Section, and as follows:

(1) Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.

(2) Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

(3) Submitting a certified written report of each test, inspection, and similar quality- control service to Architect with copy to Contractor and to authorities having jurisdiction.

(4) Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

(5) Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.

(6) Retesting and reinspecting corrected work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

(1) Date test or inspection was conducted.

(2) Description of the Work tested or inspected.

(3) Date test or inspection results were transmitted to Architect.

(4) Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

(1) Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

DOCUMENT 01 41 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation the General Conditions

1.02 DESCRIPTION:

This section covers the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.03 REQUIREMENTS OF REGULATORY AGENCIES:

A. All statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction of the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references in the list below. Contractor shall make available at the Site copies of all the listed documents applicable to the Work as the Owner and/or Architect may request, including, without limitation, applicable portions of the California Code of Regulations ("CCR").

B. This Project shall be governed by applicable regulations, including, without limitation, the State of California's Administrative Regulations for the Division of the State Architect-Structural Safety (DSA/SS), Chapter 4, Part 1, Title 24, CCR, and the most current version on the date the bids are opened and as it pertains to school construction including, without limitation:

(1) Test and testing laboratory per Section 4-335 (Owner shall pay for the testing laboratory.)

(2) Special inspections per Section 4-333(c).

(3) Verified reports per Section 4-365 & 4-343(c).

(4) Duties of the Architect & Engineers shall be per Section 4-333(a) and 4-341.

(5) Duties of the Contractor shall be per Section 4-343.

(6) Addenda and Change Orders per Section 4-338.

Contractor shall keep and make available a copy of Part 1 and 2 of the most current version of Title 24 at the Site during construction.

C. Items of deferred approval shall be clearly marked on the first sheet of the Architect's and/or Engineer's approved Drawings. All items later submitted for approval shall be per Title 24 requirements to the DSA.

(1) Building Standards Administrative Code, Part 1, Title 24, CCR

(2) California Building Code (CBC), Part 2, Title 24, CCR; (Uniform Building code volumes 1-3 and California Amendments).

(3) California Electrical Code (CEC), Part 3, Title 24, CCR; (National Electrical Code and California Amendments).

(4) California Mechanical Code (CMC), Part 4, Title 24, CCR; (Uniform Mechanical Code and California Amendments).

(5) California Plumbing Code (CPC), Part 5, Title 24, CCR; (Uniform Plumbing Code and California Amendments).

(6) California Fire Code (CFC), Part 9, Title 24, CCR; (Fire Plumbing Code and California Amendments).

(7) California Referenced Standards Code, Part 12, Title 24, CCR.

(8) State Fire Marshal Regulations, Public Safety, Title 19, CCR.

(9) Partial List of Applicable NFPA Standards:

(a) NFPA 13 - Automatic Sprinkler System.

(b) NFPA 14 - Standpipes Systems.

(c) NFPA 17A - Wet Chemical System

(d) NFPA 24 - Private Fire Mains.

(e) (California Amended) NFPA 72 - National Fire Alarm Codes.

(f) NFPA 253 - Critical Radiant Flux of Floor Covering System.

(g) NFPA 2001 - Clean Agent Fire Extinguishing Systems.

(10) California Division of the State Architect interpretation of Regulations.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 42 13

ABBREVIATIONS AND ACRONYMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation the General Conditions and Agreement.

1.02 DOCUMENT INCLUDES:

A. Abbreviations used throughout the Contract Documents.

B. Reference to a technical society, organization, or body is by abbreviation, as follows:

1.	AA	Aluminum Association
2.	AAMA	Architectural Aluminum Manufacturers Association
3.	AASHTO	American Association of State Highway and Transportation Officials
4.	ABPA	Acoustical and Board Products Association
5.	ACI	American Concrete Institute
6.	AGA	American Gas Association
7.	AGC	Associated General Contractors
8.	AHC	Architectural Hardware Consultant
9.	AI	Asphalt Institute
10.	AIA	American Institute of Architects
11.	AIEE	American Institute of Electrical Engineers
12.	AISC	American Institute of Steel Construction
13.	AISI	American Iron and Steel Institute
14.	AMCA	Air Moving and Conditioning Association
15.	ANSI	American National Standards Institute
16.	APA	American Plywood Association
17.	ARI	Air Conditioning and Refrigeration Institute
18.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
19.	ASME	American Society of Mechanical Engineers
20.	ASSE	American Society of Structural Engineers
21.	ASTM	American Society of Testing and Materials
22.	AWPB	American Wood Preservers Bureau
23.	AWPI	American Wood preservers Institute
24.	AWS	American Welding Society
25.	AWSC	American Welding Society Code
26.	AWI	Architectural Woodwork Institute
27.	AWWA	American Water Works Association

28.	BIA	Brick Institute of America
29.	CBC	California Building Code
30.	CLFMI	Chain Link Fence Manufacturers Institute
31.	CMG	California Masonry Guild
32.	CRA	California Redwood Association
33.	CRSI	Concrete Reinforcing Steel Institute
34.	CS	Commercial Standards
35.	CSI	Construction Specifications Institute
36.	CTI	Cooling Tower Institute
37.	FGMA	Flat Glass Manufacturer's Association
38.	FIA	Factory Insurance Association
39.	FM	Factory Mutual
40.	FS	Federal Specification
41.	FTI	Facing Title Institute
42.	GA	Gypsum Association
43.	ICC	International Code Council
44.	IEEE	Institute of Electrical and Electronic Engineers
45.	IES	Illumination Engineering Society
46.	LIA	Lead Industries Association
47.	MIA	Marble Institute of America
48.	MLMA	Metal Lath Manufacturers Association
49.	MS	Military Specifications
50.	NAAMM	National Association of Architectural Metal Manufacturers
51.	NBHA	National Builders Hardware Association
52.	NBFU	National Board of Fire Underwriters
53.	NBS	National Bureau of Standards
54.	NCMA	National Concrete Masonry Association
55.	NEC	National Electrical Code
56.	NEMA	National Electrical Manufacturers Association
57.	NFPA	National Fire Protection Association/National Forest Products Association
58.	NMWIA	National Mineral Wool Insulation Association
59.	NTMA	National Terrazzo and Mosaic Association
60.	NWMA	National Woodwork Manufacturer's Association
61.	ORS	Office of Regulatory Services (California)
62.	OSHA	Occupational Safety and Health Act
63.	PCI	Precast Concrete Institute
64.	PCA	Portland Cement Association
65.	PDCA	Painting and Decorating Contractors of America
66.	PDI	Plumbing Drainage Institute
67.	PEI	Porcelain Enamel Institute
68.	PG&E	Pacific Gas & Electric Company
69.	PS	Product Standards
70.	SDI	Steel Door Institute; Steel Deck Institute

71.	SJI	Steel Joist Institute
72.	SSPC	Steel Structures Painting Council
73.	TCA	Tile Council of America
74.	TPI	Truss Plate Institute
75.	UBC	Uniform Building Code
76.	UL	Underwriters Laboratories Code
77.	UMC	Uniform Mechanical Code
78.	USDA	United States Department of Agriculture
79.	VI	Vermiculite Institute
80.	WCLA	West Coast Lumberman's Association
81.	WCLB	West Coast Lumber Bureau
82.	WEUSER	Western Electric Utilities Service Engineering Requirements
83.	WIC	Woodwork Institute of California
84.	WPOA	Western Plumbing Officials Association

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 42 16

QUALITY ASSURANCE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISION

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation the General Conditions and Agreement

1.02 QUALITY ASSURANCE:

A. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more rigid requirements are specified in the Contract Documents, or are required by applicable codes.

B. Contractor shall conform to current reference standard publication date in effect on the date of bid opening.

C. Contractor shall obtain copies of standards unless specifically required not to by the Contract Documents.

D. Contractor shall maintain a copy of all standards at jobsite during submittals, planning, and progress of the specific Work, until final completion, unless specifically required not to by the Contract Documents.

E. Should specified reference standards conflict with Contract Documents, Contractor shall request clarification from the Owner and/or the Architect before proceeding.

F. The contractual relationship of the parties to the Contract shall not be altered from the contractual relationship as indicated in the Contract Documents by mention or inference otherwise in any referenced document.

G. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

END OF SECTION

DOCUMENT 01 42 19

REFERENCES

PART 1 - GENERAL

1.01 SCHEDULE OF REFERENCES:

The following information is intended only for the general assistance of the Contractor, and the Owner does not represent that all of the information is current. It is the Contractor's responsibility to verify the correct information for each of the entities listed.

AA	Aluminum Association 1525 Wilson Blvd., Suite 600 Arlington, VA 22209 www.aluminum.org	703/358-2960

AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005 www.aabchq.com	202/737-0202

AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 550 Schaumburg, IL 60173-4268 www.aamanet.org	847/303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 N Capitol St. NW - Suite 249 Washington, DC 20001 www.transportation.org	202/624-5800

AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709 2215 www.aatcc.org	919/549-8141
ACA	American Coatings Association 1500 Rhode Island Ave., NW Washington DC, 20005 www.paint.org	202/462-6272
ACI	American Concrete Institute 38800 Country Club Dr. Farmington Hills, MI 48331-3439 www.aci-int.org	248/848-3700
ACPA	American Concrete Pipe Association 8445 Freeport Parkway, Suite 350 Irving, TX 75063-2595 www.concrete-pipe.org	972/506-7216
ADC	Air Diffusion Council 1901 N. Roselle Road, Suite 800 Schaumburg, Illinois 60195 www.flexibleduct.org	847/706-6750
AF&PA	American Forest and Paper Association 1111 Nineteenth Street, NW, Suite 800 Washington, DC 20036 www.afandpa.org	202/463-2700

AGA	American Gas Association 400 North Capitol Street, NW Washington, DC 20001 www.aga.org	202/824-7000
AGC	Associate General Contractors of America 2300 Wilson Blvd., Suite 400 Arlington, VA 22201 www.agc.org	703/548-3118
AHA	American Hardboard Association 1210 West Northwest Highway Palatine, IL 60067 domensino.com/AHA/default.htm	847/934-8800
AI	Asphalt Institute 2696 Research Park Drive Lexington, KY 40511-8480 www.asphaltinstitute.org	859/288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 www.aia.org	202/626-7300
AISC	American Institute of Steel Construction One East Wacker Drive Suite 700 Chicago, IL 60601-1802 www.aisc.org	312.670.2400
AIA	American Insurance Association (formerly the National Board of Fire Underwriters) 2101 L Street, NW, Suite 400 Washington, DC 20037 www.aiadc.org	202/828-7100
AISI	American Iron and Steel Institute 25 Massachusetts Ave., NW, Suite 800 Washington, DC 20001 www.steel.org	202/452.7100
AITC	American Institute of Timber Construction 7012 S. Revere Parkway Suite 140 Centennial, CO 80112 www.aitc-glulam.org	303/792.9559

ALI	Associated Laboratories, Inc. P.O. Box 152837 Dallas, TX 75315 www.assoc-labs.com	214/565-0593
ALSC	American Lumber Standards Committee, Inc. P.O. Box 210 Germantown, MD 20875 www.alsc.org	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004 www.amca.org	847/394-0150
ANLA	American Nursery & Landscape Association 1200 G Street NW, Suite 800 Washington, DC 20005 www.anla.org	202/789-2900
ANSI	American National Standards Institute 1899 L Street, NW, 11th Floor Washington, DC, 20036 www.ansi.org	202/293.8020
APA	APA-The Engineered Wood Association 7011 S. 19th Street Tacoma, WA 98466-5333 www.apawood.org	253/565-6600
APA	Architectural Precast Association 6710 Winkler Road, Suite 8 Fort Myers, Florida 33919 www.archprecast.org	239/454-6989
ARI	Air Conditioning and Refrigeration Institute 4100 N. Fairfax Drive, Suite 200 Arlington, VA 22203 www.lightindustries.com/ARI	703/524-8800

ARMA	Asphalt Roofing Manufacturers Association Public Information Department 750 National Press Building 529 14th Street, NW Washington, DC 20045 www.asphaltroofing.org	202/591-2450
ASA	The Acoustical Society of America ASA Office Manager Suite 1NO1 2 Huntington Quadrangle Melville, NY 11747-4502 http://asa.aip.org	516/576-2360
ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 www.asce.org	800/548-2723 703/295-6300
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 636 Eye Street, NW Washington, DC 20001-3736 www.asla.org	202/898-2444
ASME	American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 www.asme.org	800/434-2763
ASPE	American Society of Plumbing Engineers 2980 S River Rd. Des Plaines, IL 60018 http://aspe.org	847/296-0002

ASQ	American Society for Quality P.O. Box 3005 Milwaukee, WI 53201-3005 or 600 North Plankinton Avenue Milwaukee, WI 53203 http://asq.org	800/248-1946 414/272-8575
ASSE	American Society of Sanitary Engineering 901 Canterbury, Suite A Westlake, Ohio 44145 www.asse-plumbing.org	440/835-3040
ASTM	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 www.astm.org	610/832-9500
AWCI	Association of the Wall and Ceiling Industry 513 West Broad Street, Suite 210 Falls Church, VA 22046 www.awci.org	703/538-1600
AWPA	American Wood Protection Association P.O. Box 361784 Birmingham, AL 35236-1784 www.awpa.com	205/733-4077
AWPI	American Wood Preservers Institute 2750 Prosperity Ave. Suite 550 Fairfax, VA 22031-4312 www.arcat.com	800/356-AWPI 703/204-0500
AWS	American Welding Society 8669 Doral Boulevard, Suite 130 Doral, Florida 33166 www.aws.org	800/443-9353 305/443-9353
AWI	Architectural Woodwork Institute 46179 Westlake Drive, Suite 120 Potomac Falls, VA 20165-5874 www.awinet.org	571/323-3636

AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	800/926-7337 303/794 7711
BHMA	Builders Hardware Manufacturers Association 355 Lexington Avenue, 15th floor New York, NY 10017 www.buildershardware.com	212/297-2122
BIA	The Brick Industry Association 1850 Centennial Park Drive, Suite 301 Reston, VA 20191 www.gobrick.com	703/620-0010
CGA	Compressed Gas Association 14501 George Carter Way, Suite 103 Chantilly VA 20151-2923 www.cganet.com	703/788-2700
CISCA	Ceilings & Interior Systems Construction Association 1010 Jorie Blvd, Suite 30 Oak Brook, IL 60523 www.cisca.org	630/584-1919
CISPI	Cast Iron Soil Pipe Institute 1064 Delaware Avenue SE Atlanta, GA 30316 www.cispi.org	404/622-0073
CLFMI	Chain Link Fence Manufacturers Institute 10015 Old Columbia Road, Suite B-215 Columbia, MD 21046 www.associationsites.com/main-pub.cfm?usr=clfma	410/290-6267
CPA	Composite Panel Association 19465 Deerfield Avenue, Suite 306 Leesburg, VA 20176 www.compositepanel.org	703/724-1128
CPSC	Consumer Product Safety Commission 4330 East West Highway Bethesda, MD 20814 www.cpsc.gov	301/504-7923 800/638-2772

CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949 www.calredwood.org	415/382-0662
CRI	Carpet and Rug Institute P.O. Box 2048 Dalton, Georgia 30722-2048 www.carpet-rug.org	706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173 4758 www.crsi.org	847/517-1200
CSI	The Construction Specifications Institute 110 South Union Street, Suite 100 Alexandria VA 22314 www.csinet.org	800/689-2900
CTIOA	Ceramic Tile Institute of America 12061 Jefferson Blvd. Culver City, CA 90230-6219 www.ctioa.org	310/574-7800
DHI	Door and Hardware Institute (formerly National Builders Hardware Association) 14150 Newbrook Dr. Chantilly, VA 20151 www.dhi.org	703/222-2010
DIPRA	Ductile Iron Pipe Research Association 2000 2nd Avenue, South Suite 429 Birmingham, AL 35233 www.dipra.org	205/402-8700
DOC	U.S. Department of Commerce 1401 Constitution Ave., NW Washington, D.C. 20230 www.commerce.gov	202/482-2000

DOT	U.S. Department of Transportation 1200 New Jersey Avenue, SE Washington, DC 20590 www.dot.gov	855/368-4200
EJMA	Expansion Joint Manufacturers Association, Inc. 25 North Broadway Tarrytown, NY 10591 www.ejma.org	914/332-0040
EPA	Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 www.epa.gov	202/272-0167
FCICA	Floor Covering Installation Contractors Association 7439 Millwood Drive West Bloomfield, MI 48322 www.fcica.com	248/661-5015 877/TO-FCICA
FM Global	Factory Mutual Insurance Company Mary Breighner Global Practice Leader Education, Public Entities, Health Care FM Global 9 Woodcrest Court Cincinnati, OH 45246 www.fmglobal.com	513/742-9516
FS	General Services Administration (GSA) Index of Federal Specifications, Standards and Commercial Item Descriptions 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407 www.gsa.gov	202/619-8925
GA	The Gypsum Association 6525 Belcrest Road, Suite 480 Hyattsville, MD 20782 www.gypsum.org	301/277-8686

GANA	Glass Association of North America 800 SW Jackson St., Suite 1500 Topeka, KS 66612-1200 www.glasswebsite.com	785/271-0208
HMA	Hardwood Manufacturers Association 665 Rodi Road, Suite 305 Pittsburgh, PA 15235 http://hmamembers.org	412/244-0440
HPVA	Hardwood Plywood & Veneer Association 1825 Michael Faraday Drive Reston, Virginia 20190 www.hpva.org	703/435-2900
IAPMO	International Association of Plumbing and Mechanical Officials (formerly the Western Plumbing Officials Association) 4755 E. Philadelphia St. Ontario, CA 91761 www.iapmo.org	909/472-4100
ICC	International Code Council 500 New Jersey Avenue, NW, 6th Floor Washington, DC 20001 www.iccsafe.org	888/422-7233
IEEE	Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016-5997 www.ieee.org	212/419-7900
IES	Illuminating Engineering Society 120 Wall Street, Floor 17 New York, NY 10005-4001 www.ies.org	212/248-5000
ITRK	Intertek Testing Services 3933 US Route 11 Cortland, NY 13045 www.intertek.com	607/753-6711

MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850 www.mcaa.org	301/869-5800
MIA	Marble Institute of America 28901 Clemens Rd, Ste 100 Cleveland, OH 44145 www.marble-institute.com	440/250-9222
MMPA (formerly WMMPA)	Moulding & Millwork Producers Association (formerly Wood Moulding & Millwork Producers Association) 507 First Street Woodland, CA 95695 www.wmmpa.com	530/661-9591 800/550-7889
MSS	Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180-4602 http://mss-hq.org	703/281-6613
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Rd. Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.naamm.org	630/942-6591
NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	703/684-0084
NAPA	National Asphalt Pavement Association 5100 Forbes Blvd. Lanham, MD USA 20706-4407 www.asphaltpavement.org	888/468-6499 301/731-4748
NCSPA	National Corrugated Steel Pipe Association 14070 Proton Road, Suite 100 LB9 Dallas, TX 75244 www.ncspa.org	972/850-1907

NCMA	National Concrete Masonry Association 13750 Sunrise Valley Drive Herndon, VA 20171-4662 www.ncma.org	703/713-1900
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org	301/977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814 www.necanet.org	301/657-3110
	National Electrical Manufacturers Association 1300 North 17th Street, Suite 1752 Rosslyn, Virginia 22209 www.nema.org	703/841-3200
NEII	National Elevator Industry, Inc. 1677 County Route 64 P.O. Box 838 Salem, New York 12865-0838 www.neii.org	518/854-3100
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts USA 02169-7471 www.nfpa.org	617/770-3000
NHLA	National Hardwood Lumber Association PO Box 34518 Memphis, TN 38184 www.nhla.com	901/377-1818

NIA	National Insulation Association 12100 Sunset Hills Road, Suite 330 Reston, VA 20190 www.insulation.org	703/464-6422
NRCA	National Roofing Contractors Association 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.nrca.net	847/299-9070
NSF	NSF International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, MI 48113-0140, USA www.nsf.org	800/673-6275 734/769-8010
NTMA	National Terrazzo and Mosaic Association PO Box 2605 Fredericksburg, TX 78624 www.ntma.com	800/323-9736
OSHA	Occupational Safety and Health Act U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Ave., NW Washington, D.C. 20210 www.osha.gov	800/321-OSHA (6742)
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 or 500 New Jersey Ave., N.W. 7th Floor Washington, D.C. 20001 www.cement.org	847/966-6200 202/408-9494
PCI	Precast/Prestressed Concrete Institute 200 W. Adams St. #2100 Chicago, IL 60606 www.pci.org	312/786-0300
PDCA	Painting and Decorating Contractors of America 2316 Millpark Drive, Ste 220 Maryland Heights, MO 63043 www.pdca.com	800/332-PDCA (7322) 314/514-7322

PDI	Plumbing & Drainage Institute 800 Turnpike Street, Suite 300 North Andover, MA 01845 http://pdionline.org	978/557-0720 800/589-8956
PEI	Porcelain Enamel Institute, Inc. P.O. Box 920220 Norcross, GA 30010 www.porcelainenamel.com	770/676-9366
PG&E	Pacific Gas & Electric Company www.pge.com	800/743-5000
PLANET	Professional Landcare Network 950 Herndon Parkway, Suite 450 Herndon, Virginia 20170 www.landcarenetwork.org	703/736-9666 800/395-2522 703/736-9668
RFCI	Resilient Floor Covering Institute 115 Broad Street, Suite 201 La Grange GA 30240 www.rfci.com	706/882-3833
RIS	Redwood Inspection Service 818 Grayson Road, Suite 201 Pleasant Hill, CA 94523 www.redwoodinspection.com	925/935-1499
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021 www.sdi.org	847/458-4647
SDI	Steel Door Institute 30200 Detroit Road Westlake, Ohio 44145 www.steeldoor.org	440/899-0010
SJI	Steel Joist Institute 234 W. Cheves Street Florence, SC 29501 http://steeljoist.org	843/407-4091

SMA	Stucco Manufacturers Association 500 East Yale Loop Irvine, CA 92614 www.stuccomfgassoc.com	949/387.7611
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219 www.smacna.org	703/803-2980
SPI	SPI: The Plastics Industry Trade Association, Inc. 1667 K St., NW, Suite 1000 Washington, DC 20006 www.plasticsindustry.org	202/974-5200
SSPC	Society for Protective Coatings (formerly the Steel Structures Painting Council) 40 24th St 6th Fl Pittsburgh, PA 15222 www.sspc.org	412/281-2331 877/281-7772
TCA	The Tile Council of North America 100 Clemson Research Blvd. Anderson, SC 29625 www.tcnatile.com	864/646-8453
TPI	Truss Plate Institute 218 North Lee Street, Suite 312 Alexandria, VA 22314 www.tpinst.org	703/683-1010
TPI	Turfgrass Producers International 2 East Main Street East Dundee, IL 60118 www.turfgrasssod.org	800/405-8873 847/649-5555
TCIA	Tree Care Industry Association (formerly the National Arborist Association) 136 Harvey Road, Suite 101 Londonderry, NH 03053 www.tcia.org	800/733-2622

TVI	The Vermiculite Institute c/o The Schundler Company 150 Whitman Avenue Edison, NJ. 08817 www.vermiculiteinstitute.org	732/287-2244
UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 www.ul.com	847/272-8800 877/854-3577
UNI	Uni-Bell PVC Pipe Association 2711 LBJ Freeway, Suite 1000 Dallas, TX 75234 www.uni-bell.org	972/243-3902
USDA	U.S. Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 www.usda.gov	202/720-2791
WA	Wallcoverings Association 401 North Michigan Avenue Suite 2200 Chicago, IL 60611 www.wallcoverings.org	312/321-5166

WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281 or 6980 S.W. Varns Tigard, OR 97223 www.wclib.org	503/639-0651
WCMA	Window Covering Manufacturers Association 355 Lexington Avenue 15th Floor New York, New York 10017 www.wcmanet.org	212/297-2122
WDMA	Window & Door Manufacturers Association 401 N. Michigan Avenue, Suite 2200 Chicago, IL 60611 or 2025 M Street, NW, Ste. 800 Washington, D.C. 20036-3309 www.wdma.com	312/321-6802 202/367-1157
WI	Woodwork Institute P.O. Box 980247 West Sacramento, CA 95798 www.wicnet.org	916/372-9943
WRI	Wire Reinforcement Institute 942 Main Street Hartford, CT 06103 www.wirereinforcementinstitute.org	860/240-9545
WWCA	Western Wall & Ceiling Contractors Association 1910 N. Lime St. Orange, California 92865 www.wwcca.org	714/221-5520
WWPA	Western Wood Products Association 522 SW Fifth Ave., Suite 500 Portland, OR 97204-2122 www2.wwpa.org	503/224-3930

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 43 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation the General Conditions and Agreements.

1.02 MATERIAL AND EQUIPMENT

A. Only items approved by the Owner and/or Architect shall be used.

B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.03 MATERIAL AND EQUIPMENT COLORS

A. The Owner and/or Architect will provide a schedule of colors.

B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.

B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.

C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.

D. Materials are not acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.

E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, and underground services. Contractor shall protect material and equipment furnished under Contract.

F. Contractor may store materials on Site with prior written approval by the Owner, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at a bonded warehouse and with appropriate insurance coverage at no cost to Owner.

G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.

B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

2.02 FACILITIES AND EQUIPMENT

Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work connected with Contract.

2.03 MATERIAL REFERENCE STANDARDS

Where material is specified solely by reference to “standard specifications” and if requested by Owner, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).

B. Work shall be executed by tradespersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.02 COORDINATION

A. Contractor shall coordinate installation of Work so as to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to Owner.

B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

3.03 COMPLETENESS

Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and by Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," "to match similar," should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.04 APPROVED INSTALLER OR APPLICATOR

Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator who does not have other approved applicator work in progress or completed is not approved for this Project.

3.05 MANUFACTURER'S RECOMMENDATIONS

All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the Owner and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the Owner and/or the Architect.

END OF SECTION

DOCUMENT 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Inspector of Record, Tests and Inspections, Uncovering and Correction of Work; and

B. Agreement.

1.02 RELATED CODES:

A. The Work is governed by requirements of Title 24, California Code of Regulations ("CCR"), and the Contractor shall keep a copy of these available at the job Site for ready reference during construction.

B. The Division of the State Architect ("DSA") shall be notified at or before the start of construction.

1.03 APPLICABLE CODES:

A. Work of the project shall conform to the following Codes, copies of which shall be maintained at the job site by the Contractor throughout the duration of the work:

1.3.1 2013 California Building Standards Administrative Code (Part 1, Title 24, CCR)

1.3.2 2013 California Building Code (Part 2, Title 24, CCR) (2015 Edition International Building Code of the International Code Council with California Amendments)

1.3.3 2013 California Electrical Code (Part 3, Title 24, CCR) (2014 Edition National Electrical Code of the National Fire Protection Association, NFPA)

1.3.4 2013 California Mechanical Code (Part 4, Title 24 CCR) (2015 Edition Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials, IAPMO)

1.3.5 2010 California Plumbing Code (Part 5, Title 24, CCR)

(2015 Edition Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, IAPMO)

1.3.6 2013 California Energy Code (Part 6, Title 24, CCR)

1.3.7 California Elevator Safety Orders (Subchapter 6, Chapter 4, Division 1, Title 8, CCR)

1.3.8 2013 California Historical Building Code (Part 8, Title 24, CCR)

1.3.9 2013 California Fire Code (Part 9, Title 24, CCR)

1.3.10 2013 California Existing Building Code (Part 10, Title 24, CCR)

1.3.11 2013 California Referenced Standards Code (Part 12, Title 24 CCR)

1.3.12 NFPA 13, 2016 Edition, Automatic Sprinkler Systems, California Amended

1.3.13 NFPA 17 Dry Chemical Extinguishing Systems 2013 Edition

1.3.14 NFPA 24, 2016 Edition, Private Fire Service Mains

1.3.15 NFPA 72, 2016 Edition, National Fire Alarm Code California Amended (Note: See UL Standard 1971 for "Visual Devices")

1.3.16 NFPA 253 Critical Radiant Flux of Floor Covering Systems (2015 Edition)

1.3.17 NFPA 2015 Clean Agent Fire Extinguishing Systems current Edition

1.04 OBSERVATION AND SUPERVISION:

A. The Owner and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, CCR, Part 1, Title 24, Section 4-341.

B. One or more Project Inspector(s) approved by DSA and employed by or in contract with the Owner, referred to hereinafter as the "Project Inspector, "will observe the work in accordance with CCR, Part 1, Title 24, Sections 4-333(b) and 4-342:

(1) The Project Inspector shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections. The Contractor shall provide facilities and access as required and shall provide assistance for sampling or measuring materials.

(2) The Project Inspector will notify the Owner and Architect and call the attention of the Contractor to any observed failure of Work or material to conform to Contract Documents.

(3) The Project Inspector shall observe and monitor all testing and inspection activities required.

The Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to CCR, Part 1, Title 24, Section 4-343. The Contractor shall supervise and direct the Work and maintain a competent superintendent on the job who is authorized to act in all matters pertaining to the Work. The Contractor's superintendent shall also inspect all materials, as they arrive, for compliance with the Contract Documents. Contractor shall reject defective Work or materials immediately upon delivery or failure of the Work or material to comply with the Contract Documents. The Contractor shall submit verified reports as indicated in the Contract Documents, including, without limitation, the Specifications and as required by Part 1, Title 24, Section 4-336.

1.05 TESTING AGENCIES:

A. Testing agencies and tests shall be in conformance with the Contract Documents and the requirements of Part 1, Title 24, Section 4-335.

B. Testing and inspection in connection with earthwork shall be under the direction of the Owner's consulting soils engineer, if any, referred to hereinafter as the "Soils Engineer."

C. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory, referred to hereinafter as the "Testing Laboratory." The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the Owner.

1.06 TESTS AND INSPECTIONS:

A. The Contractor shall be responsible for notifying the Owner and Project Inspector of all required tests and inspections. Contractor shall notify the Owner and Project Inspector at least seventy-two hours (72) hours in advance of performing any Work requiring testing or inspection.

B. The Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.

C. The Owner will pay for first inspections and tests required by the "CCR," and other inspections or tests that the Owner and/or the Architect may direct to have made, including the following principal items:

(1) Tests and observations for earthwork and paving.

(2) Tests for concrete mix designs, including tests of trial batches.

(3) Tests and inspections for structural steel work.

(4) Field tests for framing lumber moisture content.

(5) Additional tests directed by the Owner that establish that materials and installation comply with the Contract Documents.

(6) Test and observation of welding and expansion anchors.

D. The Owner may at its discretion, pay and back charge the Contractor for:

(1) Retests or reinspections, if required, and tests or inspections required due to Contractor error or lack of required identifications of material.

(2) Uncovering of work in accordance with Contract Documents.

(3) Testing done on weekends, holidays, and overtime will be chargeable to the Contractor for the overtime portion.

(4) Testing done off Site.

E. Testing and inspection reports and certifications:

(1) If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification.

(a) The Owner;

(b) The Construction Manager, if any;

(c) The Architect;

(d) The Consulting Engineer, if any;

(e) Other engineers on the Project, as appropriate;

(f) The Project Inspector; and

(g) The Contractor.

(2) When the test or inspection is one required by the CCR, a copy of the report shall also be provided to the DSA.

PART 2 - PRODUCTS

2.01 TYPE OF TEST AND INSPECTIONS:

A. Per DSA 103 form.

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions; and

B. Agreement.

1.02 TEMPORARY UTILITIES:

A. Electric Power and Lighting

(1) Contractor will pay for power during the course of the Work. To the extent power is available in the building(s) or on the Site, Contractor may use the Owner's existing utilities by making prearranged payments to the Owner for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver that power service from its existing location in the building(s) or on the Site to point of intended use.

(2) Contractor shall verify characteristics of power available in building(s) or on the Site. Contractor shall take all actions required to make modifications where power of higher voltage or different phases of current are required. Contractor shall be fully responsible for providing that service and shall pay all costs required therefor.

(3) Contractor shall furnish, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.

(4) Contractor shall be responsible for maintaining existing lighting levels in the project vicinity should temporary outages or service interruptions occur.

B. Heat and Ventilation

(1) Contractor shall provide temporary heat to maintain environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation and curing of materials, and to protect materials and finishes from damage due to improper temperature and humidity conditions. Portable heaters shall be standard units complete with controls.

(2) Contractor shall provide forced ventilation and dehumidification, as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.

(3) Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary heat and ventilation, including costs for fuel consumed, required for the performance of the Work.

C. Water

(1) Contractor will pay for water during the course of the Work. To the extent water is then available in the building(s) or on the Site, Contractor may use the Owner's existing utilities by making prearranged payments to the Owner for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver such utility service from its existing location in the building(s) or on the Site to point of intended use.

(2) Contractor shall use backflow preventers on water lines at point of connection to Owner's water supply. Backflow preventers shall comply with requirements of Uniform Plumbing Code.

(3) Contractor shall make potable water available for human consumption.

D. Sanitary Facilities

(1) Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the Inspector for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is directed by the Inspector or Contractor completes all other work at the Site.

(2) Use of toilet facilities in the Work under construction shall not be permitted except by consent of the Inspector and the Owner.

E. Telephone Service

(1) Contractor shall arrange with local telephone service company for telephone service for the performance of the Work. Contractor shall, at a minimum, provide in its field office one line for telephone and one line for fax machine.

(2) Contractor shall pay the costs for telephone and fax lines installation, maintenance, service, and removal.

F. Fire Protection:

(1) Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire, State Fire Marshall and/or its designee.

(2) Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.

G. Trash Removal:

(1) Contractor shall provide trash removal on a timely basis. **[OWNER MAY INDICATE SPECIFIC FREQUENCY FOR PROJECT]**

H. Temporary Facilities:

1.03 CONSTRUCTION AIDS:

A. Plant and Equipment:

(1) Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workmen. Include elevators, hoists, debris chutes, and other equipment, tools, and appliances necessary for performance of the Work.

(2) Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the Owner.

B. None of the Owner’s tools and equipment shall be used by Contractor for the performance of the Work.

1.04 BARRIERS AND ENCLOSURES:

A. Contractor shall obtain the Owner's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.

B. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or Premises, the public, and workers. Contractor shall also protect the Work and existing facilities from the elements, and adjacent construction and improvements, persons, and trees and plants from damage and injury from demolition and construction operations.

C. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, the public, and for deliveries and other services and activities.

D. Tree and Plant Protection:

(1) Contractor shall preserve and protect existing trees and plants on the Premises that are not designated or required to be removed, and those adjacent to the Premises.

(2) Contractor shall provide barriers to a minimum height of 4'-0" around drip line of each tree and plant, around each group of trees and plants, as applicable, in the proximity of demolition and construction operations.

(3) Contractor shall not park trucks, store materials, perform Work or cross over landscaped areas. Contractor shall not dispose of paint thinners, water from cleaning, plastering or concrete operations, or other deleterious materials in landscaped areas, storm drain systems, or sewers. Plant materials damaged as a result of the performance of the Work shall, at the option of the Owner and at Contractor's expense, either be replaced with new plant materials equal in size to those damaged or by payment of an amount representing the value of the damaged materials as determined by the Owner.

(4) Contractor shall remove soil that has been contaminated during the performance of the Work by oil, solvents, and other materials which could be harmful to trees and plants, and replace with good soil, at Contractor's expense.

(5) Excavation around Trees:

(a) Excavation within drip lines of trees shall be done only where absolutely necessary and with written permission from the Owner.

(b) Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging and shall be approved by the Owner. Main lateral roots and taproots shall not be cut. All roots 2 inches in diameter and larger shall be tunneled under and heavily wrapped with wet burlap so as to prevent scarring or excessive drying. Smaller roots that interfere with installation of new work may be cut with prior approval by the Owner. Roots must first be cut with a Vermeer, or equivalent, root cutter prior to any trenching.

(c) Where excavation for new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If encountered immediately adjacent to location of new construction, roots shall be cut approximately 6 inches back from new construction.

(d) Approved excavations shall be carefully backfilled with the excavated materials approved for backfilling. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or

other surface irregularities. Do not use mechanical equipment to compact backfill. Tamp carefully using hand tools, refilling and tamping until Final Acceptance as necessary to offset settlement.

(e) Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be wrapped with four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill.

(f) Accidentally broken roots should be sawed cleanly 3 inches behind ragged end.

1.05 SECURITY:

The Contractor shall be responsible for project security for materials, tools, equipment, supplies, and completed and partially completed Work.

1.06 TEMPORARY CONTROLS:

A. Noise Control

(1) Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work period, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.

(2) Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the Owner a minimum of forty-eight (48) hours in advance of their performance.

B. Noise and Vibration

(1) Equipment and impact tools shall have intake and exhaust mufflers.

(2) Contractor shall cooperate with Owner to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.

C. Dust and Dirt

(1) Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.

(2) Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.

(3) Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.

(4) Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

D. Water

Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.

E. Pollution

(1) No burning of refuse, debris, or other materials shall be permitted on or in the vicinity of the Premises.

(2) Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.

F. Lighting

(1) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.07 JOB SIGN(S):

A. General:

(1) Contractor shall provide and maintain a Project identification sign with the design, text, and colors designated by the Owner and/or the Architect; locate sign as approved by the Owner.

(2) Signs other than the specified Project sign and or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the Owner.

B. Materials:

(1) Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood.

(2) Sign Surface: Minimum 3/4-inch exterior grade plywood.

(3) Rough Hardware: Galvanized.

(4) Paint: Exterior quality, of type and colors selected by the Owner and/or the Architect.

C. Fabrication:

(1) Contractor shall fabricate to provide smooth, even surface for painting.

(2) Size: 4'-0" x 8'-0", unless otherwise indicated.

(3) Contractor shall paint exposed surfaces of supports, framing, and surface material with exterior grade paint: one coat of primer and one coat of finish paint.

(4) Text and Graphics: As indicated.

1.08 PUBLICITY RELEASES:

A. Contractor shall not release any information, story, photograph, plan, or drawing relating information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s).

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF DOCUMENT

DOCUMENT 01 50 13

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Agreement; and

C. Document 01 50 00.

1.02 SECTION INCLUDES:

A. Administrative and procedural requirements for the following:

(1) Salvaging non-hazardous construction waste.

(2) Recycling non-hazardous construction waste.

(3) Disposing of non-hazardous construction waste.

1.03 DEFINITIONS:

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

G. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.

H. Sanitary Waste:

(1) Garbage: Refuse and scraps resulting from preparation, cooking, distribution, or consumption of food.

(2) Sewage: Domestic sanitary sewage.

1.04 PERFORMANCE REQUIREMENTS:

A. General: Develop waste management plan that results in end-of Project rates for salvage/recycling of fifty percent (50%) by weight (or by volume, but not a combination) of total waste generated by the Work.

1.05 SUBMITTALS:

A. Waste Management Plan: Submit waste management plan within 5 days of date established for commencement of the Work.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit copies of report. Include the following information:

(1) Material category.

(2) Generation point of waste.

(3) Total quantity of waste in tons or cubic yards.

(4) Quantity of waste salvaged, both estimated and actual in tons or cubic yards.

(5) Quantity of waste recycled, both estimated and actual in tons or cubic yards.

(6) Total quantity of waste recovered (salvaged plus recycled) in tons or cubic yards.

(7) Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Submit permit or license and location of recycling or waste disposal sites. Waste Reduction Calculations: Before final payment, submit copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. CHPS Submittal: CHPS letter template for Credit ME2.0 and ME2.1, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

I. Qualification Data: For Waste Management Coordinator.

J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

K. Submittal procedures and quantities are specified in Document 01 33 00.

1.06 QUALITY ASSURANCE:

A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements. Review methods and procedures related to waste management including, but not limited to, the following:

(1) Review and discuss waste management plan including responsibilities of Waste Management Coordinator.

(2) Review requirements for documenting quantities of each type of waste and its disposition.

(3) Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

(4) Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

(5) Review waste management requirements for each trade.

1.07 WASTE MANAGEMENT PLAN:

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

(1) Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.

(2) Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

(3) Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.

(4) Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

(5) Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

(6) Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION:

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Comply with Document 01 50 00 for operation, termination, and removal requirements. Equipment Salvage: Any existing equipment that can be salvage for resale, reuse, or salvaged for parts shall be removed in a manner preserving the equipment integrity. Removed equipment shall be palletized all the operational parts included, wrap in plastic shrink-wrap, and return as directed by the Owner. The Owner may also require any equipment be sent to a designated reseller. The following equipment maybe salvaged including but not limited to the following:

(1) Light fixtures (without fluorescent Light bulbs)

(2) Electrical equipment (deemed PCB free)

(3) Electronic Equipment / IDF cabinets or racks

(4) Ventilation hoods

(5) Refrigerators or Freezers (including Walk-ins)

(6) Mechanical Units

(7) Mechanical Compressors

(8) Plumbing fixtures

(9) Toilet room accessories

(10) Windows, Doors and Frames

(11) Casework

(12) White Boards and framed Pin Boards

(13) Pencil sharpeners / Projections Screens

(14) Masonry or bricks

(15) Others as appropriate.

C. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

D. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

(1) Distribute waste management plan to everyone concerned within 3 days of submittal return.

(2) Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.

E. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

(1) Designate and label specific areas of Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

(2) Comply with Document 01 50 00 for controlling dust and dirt, environmental protection, and noise control.

3.02 RECYCLING CONSTRUCTION WASTE:

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

(1) Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.

(a) Inspect containers and bins for contamination and remove contaminated materials if found.

(2) Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

(3) Stockpile materials away from construction area. Do not store within drip line of remaining trees.

(4) Store components off the ground and protect from the weather.

(5) Remove recyclable waste off Owner property and transport to recycling receiver or processor.

D. Packaging:

(1) Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

(2) Polystyrene Packaging: Separate and bag material.

(3) Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain on Site, break down pallets into component wood pieces and comply with requirements for recycling wood.

(4) Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

E. Site-Clearing Wastes: Chip brush, branches, and trees on site.

F. Wood Materials:

(1) Clean Cut-Offs of Lumber: Grind or chip into small pieces.

(2) Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

(1) Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.03 DISPOSAL OF WASTE:

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

(1) Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on site.

(2) Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner property and legally dispose of them.

END OF SECTION

DOCUMENT 01 52 13

FIELD OFFICES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions; and

B. Agreement.

1.02 SECTION INCLUDES:

A. Requirements for Field Offices and Field Office Trailers.

1.03 SUMMARY:

A. General: Contractor shall provide Owner's Field Office Trailer and contents, for Owner's use exclusively, during the term of the Contract. Contractor shall provide a space to work and desk for the Project Inspector.

B. Property: Trailer, furniture, furnishings, equipment, and the like, supplied by the Contractor with the Office Trailer shall remain the property of the Contractor; Owner property items installed, delivered, and the like by Owner within the Office Trailer will remain Owner's property.

C. Modifications: Owner reserves the right to modify the trailer or contents, or both, as may be deemed proper by Owner.

D. Condition: Trailer and contents shall be clean, neat, substantially finished, in good, proper, and safe condition for use, operation, and the like; the trailer and contents shall not be required to be new.

E. Installation Timing: Provide safe, fully furnished, functional, proper, complete, and finished trailer properly ready for entire use, within ten (10) calendar days of Owner's notification of the issuance of Notice to Proceed.

1.04 SUBMITTALS:

A. General: Submit submittals to Owner in quantity, format, type, and the like, as specified herein.

B. Office Trailer Data: One (1) copy of manufacturer's descriptive data, technical descriptions, regulatory compliance, industry standards, installation, removal, and maintenance instructions.

C. Equipment Data: Two (2) copies of manufacturer data for each type of equipment, if directed by Owner.

D. Furniture and Furnishings Data: Two (2) copies of manufacturer data for each type of equipment, if directed by Owner.

E. Plans: One (1) electronic file, One (1) reproducible copy of appropriately scaled plans of trailer layout. Plans shall include, but not be limited to: lighting; furniture; equipment; telephone and electrical outlets; and the like. At the Owners discretion, the file may be required to be uploaded to e-Builder.

F. Product Samples: One (1) complete and entire unit of each type, if directed by Owner.

1.05 QUALITY ASSURANCE

A. Standards: In the event that provisions of codes, regulations, safety orders, Contract Documents, referenced manufacturer's specifications, manufacturer's instructions, industry standards, and the like, are in conflict, the more restrictive and higher quality shall govern.

B. Installer: Installer or Installers engaged by Contractor must have a minimum of five (5) years of documented and properly authenticated successful experience of specialization in the installation of the items or systems, or both, specified herein.

C. Manufacturer: Contractor shall obtain products from nationally and industry recognized Manufacturer with five (5) years minimum, of immediately recent, continuous, documented and properly authenticated successful experience of specialization in the manufacture of the product specified herein.

D. State Personnel Training: Provide proper training for maintenance and operations, including emergency procedures, and the like, as directed by Owner.

E. Units: Shall be sound and free of defects, and shall not include any damage or defect that will impair the safety, installation, performance, or the durability of the entire Office Trailer and appurtenant systems.

1.06 REGULATORY REQUIREMENTS

A. General: Work shall be executed in accordance with applicable Codes, Regulations, Statutes, Enactment's, Rulings, Laws, each authority having jurisdiction, and including, but not limited to, Regulatory Requirements specified herein.

B. California Building Standards Code ("CBSC").

C. California Code of Regulations, Title 25, Chapter 3, Sub Chapter 2, Article 3 ("CCR").

D. Coach Insignia: Trailer shall display California Commercial Coach Insignia; such insignia shall be deemed to show that the trailer is in accordance with the Construction and Fire Safety requirements of CCR.

PART 2 – PRODUCTS

2.01 FIELD OFFICE TRAILER

A. General: Provide entire Field Office Trailer of type, function, operation, capacity, size, complete with controls, safety devices, accessories, and the like, for proper and durable installation. Partitions, walls, ceiling, and other interior and exterior surfaces shall be appropriately finished, including, but not limited to, trim, painting, wall base, floor covering, suspended or similar ceiling, and the like; provide systems, components, units, nuts, bolts, screws, anchoring devices, fastening devices, washers, accessories, adhesives, sealants, and other items of type, grade, and class required for the particular use, not identified but required for a complete, weather-tight, appropriately operating, and finished installation.

B. Manufacturers: General Electric Capital Modular Space; The Space Place, Inc.; or equal.

C. Program: Provide a wheel-mounted trailer with stairs, landings, platforms, ramps, stairs, platforms, and the like, in good, proper, safe, clean, and properly finished condition; with proper heavy duty locks, and other proper and effective security at all doors, windows, and the like. Trailer shall be maintained in good, proper, safe, clean, and properly finished condition during the Contract.

(1) Nominal Trailer Size: Four hundred eighty (480) square feet, minimum.

(2) Stairs, Platform: Properly finished stairs, platforms, and ramps.

(3) Doors: Two (2), three (3) foot wide exterior doors with locksets; finished ramp, steps, and entry platform at each exterior door.

(4) Keys: Submit five (5) keys for each door, window, furniture unit, and the like, there shall be no other key copies or originals available; each key shall be identified for Owner; and shall be labeled, or tagged or both, as directed by Owner.

(5) HVAC: **[PROVIDE DESCRIPTION OR DELETE]**

(6) Lighting: Sixty-five (65) foot-candles illumination minimum at any point, at thirty (30) inches above finished floor throughout from fluorescent light source, exclusively, or as directed by Owner.

(7) Electrical Outlets: One (1) duplex outlet evenly spaced every twelve (12) linear horizontal feet of wall face, and electrical service ready for use.

(8) Telephones and Telephone Outlets: Two (2) telephone lines wired, connected to telephone utility service, and ready for use, and two (2) telephone instruments, each with two (2)-line capability, speed dial and hands-free feature. Locate each outlet as directed by Owner.

(9) Answering Machine: One (1) unit, two (2)-line; digital.

2.02 FIELD OFFICE TRAILER ITEMS

A. General: Provide the Field Office Trailer with the following arranged into two (2) workstations:

(1) Desks: Two (2) desks: thirty-six (36) inches by sixty (60) inches; steel, laminated plastic top; locking, one (1) or two (2) file drawers single pedestal; steel; provide five (5) keys to Owner.

(2) Tables: Two (2) tables; thirty-six (36) inches by sixty (60) inches; twenty-nine (29) inches high; steel, laminated plastic top tables; one (1) at each desk.

(3) Chairs: Two (2) chairs: swivel; steel; with seat cushion and arms; one (1) at each desk.

(4) Waste Baskets: Two (2) waste baskets, one at each desk.

B. Furniture and Equipment: Provide in the space located to effect efficient and logical use.

(1) File cabinet: One (1); four (4) drawer; lateral; steel locking.

(2) Plan Table: One (1) plan table: thirty-six (36) inches deep by seventy-two (72) inches wide by forty-two (42) inches high; adjustable; wood or steel; with lockable plan and pencil drawers.

(3) Drafting Stool: One (1) drafting stool; swiveling; steel; padded; adjustable; with footrest and casters.

(4) Bookshelf: One (1) bookshelf: thirty-six (36) inches deep by seventy-two (72) inches wide by forty-two (42) inches high; adjustable; wood or steel; with lockable plan and pencil drawer.

(5) Plan Rack: One (1) wheel mounted plan rack.

(6) Waste Baskets: One (1) large waste basket.

(7) Coat/Hat Hanger: Wall mounted with minimum capacity for four (4) garments and ten (10) hats.

(8) Document Management System: Shall include an integrated high-volume printer, copier, and facsimile machine, including stand, base, and storage cabinet; and shall include the following features:

(a) Type: Laser, dry electrostatic transfer, plain paper, digital, multi-function imaging system.

(b) Network: Ethernet or Token Ring network ready, Plug-and-Play.

(c) Print, send/receive facsimile from any connected workstation.

(d) Resolution: Six hundred (600) dots per inch by six hundred (600) dots per inch, minimum.

(e) Print Speed: Twenty (20) pages per minute, minimum.

(f) Copies: Twenty (20) copies per minute, minimum.

(g) Document Handler: Forty (40) sheet, minimum

(h) Collator: Forty (40) bin, minimum, with stapling.

(i) Duplexing: Capable.

(j) Paper Size: Capable of handling paper sizes to eleven (11) inches by seventeen (17) inches.

(k) Paper Cassettes: One (1) each for eight and one half (8.5) inches by eleven (11) inches, eight and one half (8.5) inches by fourteen (14) inches, and eleven (11) inches by seventeen (17) inches paper sizes; minimum two hundred fifty (250) sheets per cassette.

(l) Reduction/Enlargement: Capable of reduction to twenty-five percent (25%) and enlargement to two hundred percent (200%).

(m) Facsimile Electronic Storage: Capable of storing minimum of fifty (50) speed dial numbers, group faxing and broadcast faxing.

(n) Facsimile Scanning: Capable of scanning into memory a minimum of one hundred (100) pages with maximum scan time of three (3) seconds per page.

(o) Halftone: Sixty-four (64) levels.

(p) Redial: Automatic and Manual.

(9) Maintenance: Contractor shall purchase service agreements for each unit of equipment for the duration of the project plus two (2) months, and shall maintain all equipment in proper working condition. Service agreements shall include

provision for replacement of toner cartridges and other items required to effect proper unit use. Service agreements shall also provide for:

(a) Unlimited Service Calls.

(b) Same Day Response.

(c) All parts, labor, preventative maintenance and mileage.

(d) All chemicals, such as toner, fixing agent, and the like.

(e) System training and setup.

(10) Portable Toilets: Two (2); each shall include a urinal; each unit shall be a properly enclosed chemical unit conforming to ANSI Z4.3.

(a) Location: As directed by Owner.

(b) Maintenance: Maintain each unit and surrounding areas in a clean, hygienic and orderly manner, at all time. Empty, clean, and sanitize each unit each day at a location and time as directed by Owner.

(c) Removal: Relocate, or remove from the site, each Portable Toilet. Upon such directive by Owner, the Contractor shall forthwith relocate or remove each Portable Toilet and submit the affected areas to a condition which existed prior to the installation of each Portable Toilet, within three (3) calendar days, or as directed by Owner in writing, at no cost to Owner.

2.03 UTILITY AND SERVICES

A. Telephone Service: Contractor shall provide and interface the entire telephone service, and shall properly and timely pay for telephone service for Owner's non-long-distance use.

B. Electrical Service: Provide all proper connections and continuously pay for service for the duration of the Work.

2.04 FINISHES

A. General: Manufacturer standard finish system over surfaces properly cleaned, pretreated, and prepared to obtain proper bond; all visible surfaces shall be coated.

B. Finish: Color as selected by Owner from manufacturer standard palette.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Properly prepare area and affected items to receive the Work. Set Work accurately in location, alignment, and elevation; rigidly, securely, and firmly anchor to appropriate structure; install plumb, straight, square, level, true, without racking, rigidly anchored to proper solid blocking, substrate, and the like; provide appropriate type and quantity of reinforcements, fasteners, adhesives, self-adhesive and other tapes; lubricants, coatings, accessories, and the like, as required for a complete, structurally rigid, stable, sound, and appropriately finished installation, in accordance with manufacturer's published instructions, and as indicated. The more restrictive and higher quality requirement shall govern. Moving parts shall be properly secured, without binding, looseness, noise, and the like.

B. Installation: Install in accordance with 25 CCR 3.2.3 and as directed by Owner; jack up trailer and level both ways; mount on proper concrete piers with all load off wheels; provide required tie down and accessories per Section 4368 of referenced CCR, and as directed by Owner.

C. Rejected Work: Work, materials, unit, items, systems, and the like, not accepted by Owner shall be deemed rejected, and shall forthwith be removed and replaced with proper and new Work, materials, unit, items, systems, and the like at no cost to Owner.

D. Standard: Comply with manufacturer's published instructions, or with instructions as shown or indicated; the more restrictive and higher quality requirement shall govern.

E. Location: As directed by Owner.

F. Fire Resistance: Construct and install in accordance with UL requirements.

G. Maintenance: Contractor shall maintain trailer and adjacent areas in a safe, clean and hygienic condition throughout the duration of the Work, and as directed by Owner. Properly repair or replace furniture or other items, as directed by Owner. Properly remove unsafe, damaged, or broken furniture, or similar items, and replace with safe and proper items. Contractor shall pay cost of all services, repair, and maintenance, or replacement of each item.

H. Janitorial Service: Provide professional janitorial services, including, but not limited to, trash, waste paper baskets, fill paper dispensers; clean and dust all furniture, files, and the like; sweep and mop resilient and similar flooring; and vacuum carpeting and similar flooring.

(1) Frequency: Two (2) times per week, minimum.

I. Removal: Properly remove the Office Trailer and contents from the Site upon completion of the Contract, or as directed by Owner in writing. Forthwith properly patch and repair affected areas; replace damaged items with new items. Carefully and properly inventory, clean, pack, store, and protect Owner property; submit Owner property to Owner at a date, time and location as directed by Owner.

END OF SECTION

DOCUMENT 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:

(1) Section 01 25 13 "Product Options and Substitutions" for requests for substitutions.

(2) Section 01 42 19 "References" for applicable industry standards for products specified.

1.03 DEFINITIONS:

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

(1) Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

(2) New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

(3) Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in- service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.04 ACTION SUBMITTALS:

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

(1) Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

(2) Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

(a) Form of Approval: As specified in Section 01 33 00 "Submittals."

(b) Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 3300 "Submittals." Show compliance with requirements.

1.05 QUALITY ASSURANCE:

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

(1) Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

(2) Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

(3) Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

(4) Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

(1) Store products to allow for inspection and measurement of quantity or counting of units.

(2) Store materials in a manner that will not endanger Project structure.

(3) Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

(4) Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

(5) Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

(6) Protect stored products from damage and liquids from freezing.

(7) Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.07 PROJECT WARRANTIES:

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.

3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Contract Closeout and Final Cleaning."

PART 2 – PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

(1) Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

(2) Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

(3) Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

(4) Where products are accompanied by the term "as selected," Architect will make selection.

(5) Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

(6) Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

(1) Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

(2) Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

(3) Products:

(a) Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.

(b) Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

(4) Manufacturers:

(a) Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

(b) Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

(5) Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

(1) If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 13 "Product Options and Substitutions" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

(1) Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

(2) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

(3) Evidence that proposed product provides specified warranty.

(4) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

(5) Samples, if requested.

PART 3 – EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 64 00

OWNER-FURNISHED PRODUCTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions; and

B. Agreement.

1.02 SECTION INCLUDES:

A. Requirements for the following:

(1) Installing Owner-furnished materials and equipment.

(2) Providing necessary utilities, connections and rough-ins.

1.03 DEFINITIONS

A. Owner: Owner, who is providing/furnishing materials and equipment.

B. Installer Contactor: Contractor, who is installing the materials and equipment furnished by the Owner.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Receive, store and handle products in accordance with the manufacturer's instructions.

B. Protect equipment items as required to prevent damage during storage and construction.

PART 2 – PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS:

A. Installer Contractor's Responsibilities:

(1) Verify mounting and utility requirements for Owner-furnished materials and equipment items.

(2) Provide mounting and utility rough in for all items where required.

(a) Rough in locations, sizes, capacities, and similar type items shall be as indicated and required by product manufacturer.

B. Owner and Installer Contractor(s) Responsibilities:

(1) Owner-Furnished/Contractor Installed ("OFCI"): Furnished by the Owner; installed by the Installer Contractor.

(a) General: Owner and Installer Contractor(s) will coordinate deliveries of materials and equipment to coincide with the construction schedule.

(b) Owner will furnish specified materials and equipment delivered to the site. Owner/vendor's representative shall be present on Site at the time of delivery to comply with the contract requirements and Specifications Section 01 43 00, Materials and Equipment, Article 1.04.

(c) The Owner furnishing specified materials and equipment is responsible to provide manufacturer guarantees as required by the Contract to the Installer Contractor.

(d) The Installer Contractor shall:

1) Review, verify and accept the approved manufacturer's submittal/Shop Drawings for all materials and equipment required to be installed by the Installer Contractor and furnished by the Owner. Any discrepancies, including but not limited to possible space conflicts, should be brought to the attention of the Project Manager and/or Program Manager, if applicable.

2) Coordinate timely delivery. Installer Contractor shall receive materials and equipment at Site when delivered and give written receipt at time of delivery, noting visible defects or omissions; if such declaration is not given, the Installer Contractor shall assume responsibility for such defects and omissions.

3) Store materials and equipment until ready for installation and protect from loss and damage. Installer Contractor is responsible for providing adequate storage space.

4) Coordinate with other bid package contractors and field measurement to ensure complete installation.

5) Uncrate, assemble, and set in place.

6) Provide adequate supports.

7) Install materials and equipment in accordance with manufacturer's recommendations, instructions, and Shop Drawings, supply labor and material required, and make mechanical, plumbing, and electrical connections required to operate equipment.

8) Be certified by equipment manufacturer for installation of the specific equipment supplied by the Owner.

9) Provide anchorage and/or bracing as required for seismic restraint per Title 24, UBC Standard 27-11 and all other applicable codes.

10) Provide the contract-required warranty and guarantee for all work, materials, equipment, and installation upon its completion and acceptance by the Owner. Guarantee includes all costs associated with the removal, shipping to and from the Site, and re-installation of any equipment found to be defective.

C. Compatibility with Space and Service Requirements:

(1) Equipment items shall be compatible with space limitations indicated and as shown on the Contract Documents and specified in other sections of the Specifications.

(2) Modifications to equipment items required to conform to space limitations specified for rough in shall not cause additional cost to the Owner.

D. Manufacturer's printed descriptions, specifications, and instructions shall govern the Work unless specifically indicated or specified otherwise.

2.02 FURNISHED MATERIALS AND EQUIPMENT

A. All furnished materials and equipment are indicated or scheduled on the Contract Documents.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install equipment items in accordance with the manufacturer's instructions.

B. Set equipment items securely in place, rigidly or flexibly mounted in accordance with manufacturers' directions.

C. Make electrical and mechanical connections as indicated and required.

D. Touch-up and restore damaged or defaced finishes to the Owner's satisfaction.

3.02 CLEANING AND PROTECTION

A. Repair or replace items not acceptable to the Architect.

B. Upon completion of installation, clean equipment items in accordance with manufacturer's recommendations, and protect from damage until final acceptance of the Work by the Owner.

END OF SECTION

SECTION 01 66 00

PRODUCT DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Access;

B. Special Conditions.

1.02 PRODUCTS

A. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.

B. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

A. Contractor shall transport and handle products in accordance with manufacturer's instructions.

B. Contractor shall promptly inspect shipments to confirm that products comply with requirements, quantities are correct, and products are undamaged.

C. Contractor shall provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

A. Contractor shall store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, Contractor shall place on sloped supports, above ground.

C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.

(1) Storage shall be a secure and bonded warehouse. Payment will not be made by the Owner for materials stored off-site, until such time as the materials are incorporated into the Work.

D. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.

F. Contractor shall provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Contractor shall arrange storage of products to permit access for inspection and periodically inspect to assure products are undamaged and are maintained under specified conditions.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 71 23

FIELD ENGINEERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions; and

B. Agreement.

1.02 REQUIREMENTS INCLUDED:

A. Contractor shall provide and pay for field engineering services by a California-registered engineer, required for the project, including, without limitations:

(1) Survey work required in execution of the Project.

(2) Civil or other professional engineering services specified, or required to execute Contractor's construction methods.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEERS:

Contractor shall only use a qualified licensed engineer or registered land surveyor, to whom Owner makes no objection.

1.04 SURVEY REFERENCE POINTS:

A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.

B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:

(1) Make no changes or relocation without prior written notice to Owner and Architect.

(2) Report to Owner and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

(3) Require surveyor to replace Project control points based on original survey control that may be lost or destroyed.

1.05 RECORDS:

Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

1.06 SUBMITTALS:

A. Contractor shall submit name and address of Surveyor and Professional Engineer to Owner and Architect prior to its/their work on the Project.

B. On request of Owner and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the Owner.

C. Contractor shall submit a certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or nonconformance with Contract Documents.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 COMPLIANCE WITH LAWS:

Contractor is responsible for meeting all applicable codes, OSHA, safety and shoring requirements.

3.02 NONCONFORMING WORK:

Contractor is responsible for any re-surveying required by correction of nonconforming work.

END OF SECTION

DOCUMENT 01 73 00

Execution

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

(1) Construction layout.

(2) Field engineering and surveying.

(3) Installation of the Work.

(4) Cutting and patching.closeout

(5)

(6) Coordination of Owner-installed products.

(7) Progress cleaning.

(8) Starting and adjusting.

(9) Protection of installed construction.

B. Related Sections:

3. Section 01 11 00 "Summary of Work" for limits on use of Project site.

4. Section 01 33 00 "Submittals" for submitting surveys.

(10) Section 01 77 00 "Contract Closeout and Final Cleaning " for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.03 DEFINITIONS:

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.04 INFORMATIONAL SUBMITTALS:

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit one copies signed by land surveyor.

D. Final Property Survey: Submit one copies showing the Work performed and record survey data.

1.05 QUALITY ASSURANCE:

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land- surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

5. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

6. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

(a) Primary operational systems and equipment.

(b) Fire separation assemblies.

(c) Air or smoke barriers.

(d) Fire-suppression systems.

(e) Mechanical systems piping and ducts.

(f) Control systems.

(g) Communication systems.

(h) Fire-detection and -alarm systems.

(i) Conveying systems.

(j) Electrical wiring systems.

(k) Operating systems of special construction.

(11) Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

(a) Water, moisture, or vapor barriers.

(b) Membranes and flashings.

(c) Exterior curtain-wall construction.

(d) Sprayed fire-resistive material.

(e) Equipment supports.

(f) Piping, ductwork, vessels, and equipment.

(g) Noise and vibration-control elements and systems.

(12) Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections.

b. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

(1) If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.

2. List of detrimental conditions, including substrates.

3. List of unacceptable installation tolerances.

4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.03 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

5. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

6. Establish limits on use of Project site.

(13) Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

(14) Inform installers of lines and levels to which they must comply.

(15) Check the location, level and plumb, of every major element as the Work progresses.

(16) Notify Architect when deviations from required lines and levels exceed allowable tolerances.

(17) Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.04 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

(1) Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

(2) Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

(1) Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

(2) Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

(3) Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

(1) Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

(2) Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.05 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

(1) Make vertical work plumb and make horizontal work level.

(2) Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

(3) Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

(4) Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

(1) Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

(2) Allow for building movement, including thermal expansion and contraction.

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

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

(1) Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 11 00 "Summary of Work."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

(1) In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

(2) Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

(3) Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

(4) Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

(5) Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

(6) Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

(1) Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

(2) Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

(a) Clean piping, conduit, and similar features before applying paint or other finishing materials.

(b) Restore damaged pipe covering to its original condition.

(3) Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

(a) Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

(4) Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even- plane surface of uniform appearance.

(5) Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.07 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

(1) Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

(2) Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.08 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

(1) Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

(a) Use containers intended for holding waste materials of type to be stored.

(3) Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

(1) Remove liquid spills promptly.

(2) Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 13 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.09 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

DOCUMENT 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions 3.12; and

B. Agreement.

1.02 CUTTING AND PATCHING:

A. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:

(1) Make several parts fit together properly.

(2) Uncover portions of Work to provide for installation of ill-timed Work.

(3) Remove and replace defective Work.

(4) Remove and replace Work not conforming to requirements of Contract Documents.

(5) Remove Samples of installed Work as specified for testing.

(6) Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

(7) Attach new materials to existing remodeling areas – including painting (or other finishes) to match existing conditions.

B. In addition to Contract requirements, upon written instructions from the Owner, Contractor shall uncover Work to provide for observations of covered Work in accordance with the Contract Documents; remove samples of installed materials for testing as directed by Owner; and remove Work to provide for alteration of existing Work.

C. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or work of others.

1.03 SUBMITTALS:

A. Prior to any cutting or alterations that may affect the structural safety of Project, or work of others, and well in advance of executing such cutting or alterations, Contractor shall submit written notice to Owner pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration, including the following:

(1) The work of the Owner or other trades.

(2) Structural value or integrity of any element of Project.

(3) Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.

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

(5) Visual qualities of sight-exposed elements.

B. Contractor's Request shall also include:

(1) Identification of Project.

(2) Description of affected Work.

(3) Necessity for cutting, alteration, or excavations.

(4) Affects of Work on Owner, other trades, or structural or weatherproof integrity of Project.

(5) Description of proposed Work:

(a) Scope of cutting, patching, alteration, or excavation.

(b) Trades that will execute Work.

(c) Products proposed to be used.

(d) Extent of refinishing to be done.

(6) Alternates to cutting and patching.

(7) Cost proposal, when applicable.

(8) The scheduled date the Contractor intends to perform the Work and the duration of time to complete the Work.

(9) Written permission of other trades whose Work will be affected.

1.04 QUALITY ASSURANCE:

A. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.

B. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the Owner's decision shall be final.

1.05 PAYMENT FOR COSTS:

A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the Owner, its consultants, including but not limited to the Construction Manager, the Architect, the Project Inspector(s), Engineers, and Agents, will be paid by Contractor and/or deducted from the Contract by the Owner.

B. Owner shall only pay for cost of Work if it is part of the original Contract Price or if a change has been made to the contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the Owner, other than defective or nonconforming Work, will be paid by Owner on approval of written Change Order. Contractor shall provide written cost proposals prior to proceeding with cutting and patching.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the Industry Standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall first recommend a product of a manufacturer or appropriate trade association for approval by the Owner.

B. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 – EXECUTION

3.01 INSPECTION:

A. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating

and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.

B. Contractor shall report unsatisfactory or questionable conditions in writing to Owner as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by Owner.

3.02 PREPARATION:

A. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.

B. Contractor shall provide devices and methods to protect other portions of Project from damage.

C. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation, any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION:

A. With respect to performance, Contractor shall:

(1) Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.

(2) Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.

(3) Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.

B. Contractor shall employ original installer or fabricator to perform cutting and patching for:

(1) Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.

(2) Sight-exposed finished surfaces.

C. Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.

D. Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.

E. Contractor shall restore Work which has been cut or removed. Contractor shall install new products to provide completed Work in accordance with requirements of the Contract Documents and as required to match surrounding areas and surfaces.

F. Contractor shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF SECTION

DOCUMENT 01 76 00

ALTERATION PROJECT PROCEDURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions; and

B. Agreement.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK:

A. New Materials: As specified in the Contract Documents including, without limitation, in the Specifications, Contractor shall match existing products, conditions, and work for patching and extending work.

B. Type and Quality of Existing Products: Contractor shall determine by inspection, by testing products where necessary, by referring to existing conditions and to the Work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Contractor shall verify that demolition is complete and that areas are ready for installation of new Work.

B. By beginning restoration Work, Contractor acknowledges and accepts the existing conditions.

3.02 PREPARATION:

A. Contractor shall cut, move, or remove items as necessary for access to alterations and renovation Work. Contractor shall replace and restore these at completion.

B. Contractor shall remove unsuitable material not as salvage unless otherwise indicated in the Contract Documents. Unsuitable material may include, without limitation, rotted wood, corroded metals, and deteriorated masonry and concrete. Contractor shall replace materials as specified for finished Work.

C. Contractor shall remove debris and abandoned items from all areas of the Site and from concealed spaces.

D. Contractor shall prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.

E. Contractor shall close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Contractor shall insulate ductwork and piping to prevent condensation in exposed areas. Contractor shall insulate building cavities for thermal and/or acoustical protection, as detailed.

3.03 INSTALLATION:

A. Contractor shall coordinate Work of all alternations and renovations to expedite completion and to accommodate Owner occupancy.

B. Designated Areas and Finishes: Contractor shall complete all installations in all respects, including operational, mechanical work and electrical work.

C. Contractor shall remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original or specified condition.

D. Contractor shall 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. Contractor shall install products as specified in the Contract Documents, including without limitation, the Specifications.

3.04 TRANSITIONS:

A. Where new Work abuts or aligns with existing, Contractor shall perform a smooth and even transition. Patched Work must 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, Contractor shall terminate existing surface along a straight line at a natural line of division and make a recommendation for resolution to the Owner and the Architect for review and approval.

3.05 ADJUSTMENTS:

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

B. Where a change of plane of 1/4 inch or more occurs, Contractor shall submit a recommendation for providing a smooth transition to the Owner and the Architect for review and approval.

C. Contractor shall trim existing doors as necessary to clear new floor finish and refinish trim as required.

D. Contractor shall fit Work at penetrations of surfaces.

3.06 REPAIR OF DAMAGED SURFACES:

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

B. Contractor shall repair substrate prior to patching finish.

3.07 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS:

A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored by Contractor to their original condition or better, where indicated.

B. Contractor shall protect and replace, if damaged, all existing guard posts, barricades, and fences.

C. Contractor shall give special attention to avoid damaging or killing trees, bushes and/or shrubs on the Premises and/or identified in the Contract Documents, including without limitation, the Drawings.

3.08 FINISHES:

A. Contractor shall finish surfaces as specified in the Contract Documents, including without limitations, the provisions of all Divisions of the Specifications.

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

3.09 CLEANING:

A. Contractor shall continually clean the Site and the Premises as indicated in the Contract Documents, including without limitation, the provisions in the General Conditions and the Specifications regarding cleaning.

END OF SECTION

DOCUMENT 01 78 23

OPERATIONS AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions; and

B. Agreement.

1.02 QUALITY ASSURANCE:

Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT:

A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").

B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.

C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.

D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.

E. Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME:

A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.

C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.

E. Text: The Contractor shall include any and all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Contractor shall bind in one copy of each.

1.05 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.

E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.

C. Contractor shall include color coded wiring diagrams as installed.

D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.

G. Contractor shall include manufacturer's printed operation and maintenance instructions.

H. Contractor shall include sequence of operation by controls manufacturer.

I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Contractor shall provide control diagrams by controls manufacturer as installed.

K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).

O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.07 SUBMITTAL:

A. Contractor shall submit to the Owner for review three (3) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor's start of Work.

B. For equipment, or component parts of equipment put into service during construction and to be operated by Owner, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

C. Contractor shall submit three (3) copies of a complete Manual in final form prior to final Application for Payment. Copy will be returned with Architect/Engineer comments. Contractor must revise the content of the Manual as required by Owner prior to Owner's approval of Contractor's final Application for Payment.

D. Contractor must submit three (3) copies of revised Manual in final form within ten (10) days after final inspection.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 78 36

WARRANTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions §§ 3.5, 9.7.1, and 12.2.5; and

B. Agreement.

1.02 FORMAT

A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.

B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.

C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.

D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.03 PREPARATION:

A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with Owner's permission, Contractor shall leave date of beginning of time of warranty until the date of completion is determined.

B. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required.

C. Contractor shall co-execute submittals when required.

D. Contractor shall retain warranties until time specified for submittal.

1.04 TIME OF SUBMITTALS:

A. For equipment or component parts of equipment put into service during construction with Owner's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.

B. Contractor shall submit for Owner approval all warranties and related documents within ten (10) days after date of completion. Contractor must revise the warranties as required by the Owner prior to Owner's approval of Contractor's final Application for Payment.

C. For items of work delayed beyond date of completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as start of warranty period.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 78 39

RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions § 9.9.2; and

B. Agreement.

PART 2 PART 2 - RECORD DRAWINGS

2.01 GENERAL:

A. As indicated in the Contract Documents, the Owner will provide Contractor with one set of reproducible (mylars) plans of the original Contract Drawings.

B. Contractor shall maintain at each Project Site one set of marked-up plans and shall transfer all changes and information to those marked-up plans, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Drawings ("As-Builts") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Builts shall be available at the Project Site. The Contractor shall submit reproducible vellums at the conclusion of the Project following review of the blueline prints.

C. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.

D. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Claim Directives, RFI's, and Addenda, shall be accurately and legibly recorded by Contractor.

E. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.02 RECORD DRAWING INFORMATION:

A. Contractor shall record the following information:

(1) Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.

(2) Actual numbering of each electrical circuit.

(3) Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.

(4) Locations of all items, not necessarily concealed, which vary from the Contract Documents.

(5) Installed location of all cathodic protection anodes.

(6) Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.

(7) Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.

(8) Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.

In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

B. Contractor shall provide additional drawings as necessary for clarification.

C. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."

PART 3 - RECORD SPECIFICATIONS

3.01 GENERAL:

Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.

PART 4 - MAINTENANCE OF RECORD DOCUMENTS

4.01 GENERAL

A. Contractor shall store Record Documents apart from documents used for construction as follows:

(1) Provide files and racks for storage of Record Documents.

(2) Maintain Record Documents in a clean, dry, legible condition and in good order.

B. Do not use Record Documents for construction purposes.

PART 5 – PRODUCTS (Not Used)

END OF SECTION

DOCUMENT 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

(1) Demonstration of operation of systems, subsystems, and equipment.

(2) Training in operation and maintenance of systems, subsystems, and equipment.

(3) Demonstration and training video recordings.

B. Allowances: Furnish demonstration and training instruction time under the Demonstration and Training Allowance as specified in Section 01 21 00 "Allowances."

C. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up. See requirements in Section 01 22 00 "Alternatives and Unit Pricing."

1.03 INFORMATIONAL SUBMITTALS:

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

(1) Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.04 CLOSEOUT SUBMITTALS:

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

(1) Identification: On each copy, provide an applied label with the following information:

(a) Name of Project.

(b) Name and address of videographer.

(c) Name of Architect.

(d) Name of Construction Manager.

(e) Name of Contractor.

(f) Date of video recording.

(2) Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.

(3) Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

(4) At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.05 QUALITY ASSURANCE:

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

(1) Inspect and discuss locations and other facilities required for instruction.

2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.

(5) Review required content of instruction.

(6) For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.06 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 – PRODUCTS

2.01 INSTRUCTIONAL PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

7. Basis of System Design, Operational Requirements, and Criteria: Include the following:

(a) System, subsystem, and equipment descriptions.

(b) Performance and design criteria if Contractor is delegated design responsibility.

(c) Operating standards.

(d) Regulatory requirements.

(e) Equipment function.

(f) Operating characteristics.

(g) Limiting conditions.

(h) Performance curves.

(7) Documentation: Review the following items in detail:

(a) Emergency manuals.

(b) Operations manuals.

(c) Maintenance manuals.

(d) Project record documents.

(e) Identification systems.

(f) Warranties and bonds.

(g) Maintenance service agreements and similar continuing commitments.

(8) Emergencies: Include the following, as applicable:

(a) Instructions on meaning of warnings, trouble indications, and error messages.

(b) Instructions on stopping.

(c) Shutdown instructions for each type of emergency.

(d) Operating instructions for conditions outside of normal operating limits.

(e) Sequences for electric or electronic systems.

(f) Special operating instructions and procedures.

(9) Operations: Include the following, as applicable:

(a) Startup procedures.

(b) Equipment or system break-in procedures.

(c) Routine and normal operating instructions.

(d) Regulation and control procedures.

(e) Control sequences.

(f) Safety procedures.

(g) Instructions on stopping.

(h) Normal shutdown instructions.

(i) Operating procedures for emergencies.

(j) Operating procedures for system, subsystem, or equipment failure.

(k) Seasonal and weekend operating instructions.

(l) Required sequences for electric or electronic systems.

(m) Special operating instructions and procedures.

(10) Adjustments: Include the following:

(a) Alignments.

(b) Checking adjustments.

(c) Noise and vibration adjustments.

(d) Economy and efficiency adjustments.

(11) Troubleshooting: Include the following:

(a) Diagnostic instructions.

(b) Test and inspection procedures.

(12) Maintenance: Include the following:

(a) Inspection procedures.

(b) Types of cleaning agents to be used and methods of cleaning.

(c) List of cleaning agents and methods of cleaning detrimental to product.

(d) Procedures for routine cleaning.

(e) Procedures for preventive maintenance.

(f) Procedures for routine maintenance.

(g) Instruction on use of special tools.

(13) Repairs: Include the following:

(a) Diagnosis instructions.

(b) Repair instructions.

(c) Disassembly; component removal, repair, and replacement; and reassembly instructions.

(d) Instructions for identifying parts and components.

(e) Review of spare parts needed for operation and maintenance.

PART 3 – EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

8. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.

9. Owner will furnish an instructor to describe Owner's operational philosophy.

(14) Owner will furnish Contractor with names and positions of participants.

E. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

(1) Schedule training with Owner with at least seven days' advance notice.

F. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

G. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral or a written performance-based test.

H. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.02 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

(1) At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

(1) Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.

(2) File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.

(3) File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.

(4) Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

(a) Name of Contractor/Installer.

(b) Business address.

(c) Business phone number.

(d) Point of contact.

(e) E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

(1) Film training session(s) in segments not to exceed 15 minutes.

(a) Produce segments to present a single significant piece of equipment per segment.

(b) Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.

(c) Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

(1) Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION

SECTION 01 77 00
Closeout Procedures

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Demonstration and Instructions.

E. Project Record Documents.

F. Operation and maintenance data.

G. Warranties.

H. Spare parts and maintenance materials.

1.2 CLOSEOUT PROCEDURES

A. Request Architect's observation of rough-ins when walls and ceilings are still open for observation. Give Architect at least 48 hours notice. Architect will prepare punch list of unsatisfactory Work.

B. When Work is substantially complete, submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is substantially complete in accordance with Contract Documents and ready for Architect's inspection. Certificate shall include evidence that equipment and systems have been tested in the presence of the Architect and manufacturer's representatives, where applicable. Substantial Completion shall be defined as 95% completion of all Work, including 100% completion of the following: air balance report and submittal, final testing of fire alarm by Local Fire Inspector/Consultant/[Owner][District]'s Representative, mechanical utility commissioning with [Owner][District]'s Representative, final electrical testing by IOR/testing laboratory, all finishes, painting (except touch-up), cleaning of Project area (including window washing).

C. Provide submittals to Architect that are required by governing or other authorities.

D. Punch List:

1. Contractor shall correct all punch list items within twenty days of delivery of

the punch list, but no later than the final completion date.

2. Prior to submission of its request for final payment, Contractor shall certify that a completed set of Project Record Documents has been submitted to the Architect for final review.

E. Final Inspection:

1. Within seven days after notice by the Contractor of completion of punch list work, the Architect will conduct the final inspection with the [Owner][District] and the Contractor.

2. Items found not resolved may be cause for back charge of additional time for Architect to re-visit the site for final verification.

F. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

G. Submit affidavit of payment of debts and claims, AIA Document G706.

H. Submit affidavit of release of liens, AIA Document G706A.

I. Submit consent of Contractor's surety to final payment, AIA Document G707.

1.3 REINSPECTION FEES

A. Architect (and his consultants, if required) will perform 1 observation of rough-ins, and 1 observation of Work that is substantially complete. When punch list items have been completed, Architect will observe to verify.

B. Should the Architect and his Consultants have to perform re-inspections and punch list due to failure of the Work to comply with the status of completion claimed by the Contractor; [Owner][District] will deduct the amount of compensation for such re-inspections and punch lists from the final payment to the Contractor.

1.4 FINAL ADJUSMENT OF ACCOUNTS

A. Submit a final statement of accounting to the Architect.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.

2. Additions and Deductions Resulting From:

a. Previous Change Orders.

b. Deductions for uncorrected Work.

c. Penalties and bonuses.

d. Deductions for liquidated damages.

e. Deductions for re-inspection payment.

f. Other adjustments.

3. Total Contract Sum, as adjusted.

4. Previous payments.

5. Sum Remaining Due: Architect will prepare a final Change Order, reflecting approved adjustments to the Contract Sum, which were not previously made by Change Order.

1.5 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions.

1.6 RELATED REQUIREMENTS

A. As a condition precedent to final acceptance of the Project, the Contractor shall provide spare/loose parts, maintenance materials and operation manuals as required by various Sections of the Specifications.

1. Parts and materials shall be packaged so as to preclude damage in normal handling and storage.

2. Packages shall be labeled with full description of contents and Project name.

3. Place packaged parts and materials at location directed by [Owner][District]'s representative.

4. Maintenance and Operation Manuals: Provide permanent quality manual of maintenance and operation for all materials requiring operation or for which manufacturer, supplier, or installer recommend maintenance (i.e., floor coverings, roofing, operating mechanisms, electrical devices, paint, etc.). Manuals shall contain manufacturer's instructions and recommendations for proper operation and maintenance. Where applicable, include parts list, sources of parts, service and program for frequency of maintenance. Five sets required, bound in 3-ring binders, shall be provided by Contractor.

5. Prior to turning over any operations manuals or spare/loose parts, accompanied by a CD-ROM, Contractor shall submit for approval and,

upon approval, shall maintain a master log of required manuals and parts, including description, Specification reference, responsibility designation, anticipated and actual delivery dates, delivery acknowledgement, etc.

B. The General Conditions cover the Contractor's responsibility to remedy defects due to faulty workmanship and materials which appear within one year from the date of recording of the Notice of Acceptance.

C. Special warranties are required by various Sections of the Specifications. Assemble written warranties, label and submit to the Architect for review and transmittal to the [Owner][District].

1. Equipment warranties shall be written in the manufacturer's standard form and shall be countersigned by the subcontractor or supplier and the Contractor.

2. All other warranties shall be written on the subcontractor's or supplier's letterhead and shall be countersigned by the Contractor.

3. Bind warranties and bonds in heavy-duty five sets of commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project title or name and the name of the Contractor. The CD-ROM shall be included in the binder side pocket.

4. When operating and maintenance manuals are required for warranted construction, provide additional copies of each warranty, as necessary, for inclusion in each required manual.

1.7 FINAL CLEANING

A. Execute final cleaning prior to final inspection. Work includes sweeping, brushing, and other general cleaning of completed Work and removal of debris, surplus material, and tools not in active use, scaffolding and other equipment no longer needed.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

H. Refer to Section 01 74 00 for additional requirements.

1.8 FIRE PROTECTION

A. Store volatile/hazardous waste in covered metal containers and remove from premises daily in a manner which complies with all ordinances, regulations, and laws regarding hazardous materials.

1.9 POLLUTION CONTROL

A. Conduct clean-up and disposal operations to comply with codes, ordinances regulations, and anti-pollution laws.

1.10 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.11 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to [Owner][District]'s personnel two weeks prior to date of final inspection.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with [Owner][District]'s personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.12 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following Record Documents; record actual revisions to the Work in contrasting color.

1. Contract Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other Modifications to the Contract.

5. Reviewed Shop Drawings, Product Data, and Samples.

B. Store Record Documents separate from documents used for construction, in a clean, dry environment and maintain sets in good order.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each Section in contrasting color ink, description of actual products installed, including the following:

1. Manufacturer's name and product model and number.

2. Changes made by Addenda and Modifications.

E. Contract Drawings and Shop Drawings: Legibly mark each item in contrasting color ink to record actual construction including:

1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

3. Field changes of dimension and detail, identified by RFI or Change Order.

4. Details not on original Contract Drawings.

F. After final inspection is requested, Contractor shall submit Record Documents to the Architect for review. Contractor shall make such revisions or corrections as may be necessary for the Drawings and Specifications to be a true, complete, and accurate record of the Work.

1. Accompany submittal with transmittal in duplicate, containing:

a. Date.

b. Project title and number.

c. Contractor's name and address.

d. Title and number of each Record Document.

e. Signature of Contractor or his authorized representative.

G. Submit documents to Architect for final Application for Payment. Inadequate or incomplete Record Documents may be used as cause for withholding payment.

1.13 RECORD DRAWINGS

A. Architect will provide Contractor with one set of reproducible sepia plans of the original Contract Drawings.

B. Contractor shall maintain one set of marked-up prints kept at each job-site and updated each month, or as otherwise agreed, shall transfer changes and information indicated on the marked-up blue line prints to the reproducible drawings. Contractor shall submit to the Architect one set of blue line prints showing all changes incorporated into the Work since the preceding monthly submittal. The Record Drawings shall be available at the Project Site.

C. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.

D. Deviations in construction, especially pipe and conduit locations and deviations caused by Change Orders, Field Clarifications, Requests for Clarification and Addenda shall be accurately and legibly recorded.

E. Locations and changes shall be done in a neat, legible manner and, where applicable, indicated by drawing a "cloud" around the changed or addition information.

1.14 RECORD DRAWING INFORMATION

A. Record the following information:

1. Locations of Work buried under or outside each building, such as plumbing and electrical lines and conduits.

2. Actual numbering of each electrical circuit.

3. Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract.

4. Locations of all items, not necessarily concealed, which vary from the Contract Documents.

5. Installed location of all cathodic protection anodes.

6. Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.

7. Locations of underground Work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub-outs,

invert elevations, etc.

8. Sufficient information to locate Work concealed in each building with reasonable ease and accuracy. In some instances, this may be by dimension, in others; it may be in relation to the spaces in the building near which it was installed.

1.15 OPERATION AND MAINTENANCE DATA

A. Provide Data For:

1. Fire alarm system.

2. Mechanical equipment and controls.

3. Energy management system.

4. Electrical system.

5. Security and communication systems.

B. Submit prior to final inspection, bound in 8-1/2" x 11" text pages, three-ring, D-size binders with durable vinyl covers plus one CD-ROM for all equipment in the above categories.

C. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of Project, and subject matter of binder when multiple binders are required.

D. Internally subdivide the binder contents using permanent page dividers with laminated plastic tabs, logically organized in Parts as described below.

E. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, engineers, Contractor, subcontractors, and major equipment suppliers.

F. Part 2: Operation and maintenance instructions, arranged by Specification Section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:

1. Significant design criteria.

2. List of equipment.

3. Parts list for each component.

4. Operating instructions.

5. Maintenance instructions for equipment and systems.

6. Maintenance instructions for finishes, including recommended cleaning methods and materials.

G. Part 3: Project documents and certificates, including the following:

1. Shop Drawings and Product Data.

2. Air and water balance reports.

3. Certificates.

4. Photocopies of warranties.

1.16 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble documents from subcontractors, suppliers, and manufacturers, including items furnished by [Owner][District].

C. Provide Table of Contents and assemble in binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

F. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of warranty on the Work that incorporates the products.

G. Manufacturer's letter of intent to furnish products and services beyond the warranty period where indicated.

H. Manufacturer's disclaimer and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.

I. When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

J. When Work covered by warranty has failed and has been corrected, reinstate warranty by written endorsement. Reinstated warranty shall be equal to original warranty with equitable adjustment for depreciation.

K. Upon determination that Work covered by warranty has failed, replace or repair Work to an acceptable condition complying with requirements of the Contract

Documents.

1.17 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections.

B. Deliver to Project Site and place in location as directed.

C. Obtain signed receipt for delivery of materials and submit prior to application for final payment.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Use only those cleaning materials which will not create disruptive fumes or hazards to health or property and which will not damage surfaces.

B. Use only cleaning materials and methods recommended by manufacturer of surface to be cleaned and by cleaning agent material manufacturer. Repair or replace surfaces damaged due to use of improper cleaners and techniques.

PART 3 - EXECUTION

3.1 CLEAN-UP DURING CONSTRUCTION

A. Execute daily cleaning to keep Work, site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris and rubbish from the site daily or dispose of in approved container on-site.

3.2 DUST CONTROL

A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces

C. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for acceptance and occupancy.

D. Lower waste materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

E. Conform to City, County, and State dust control regulations.

3.3 GENERAL CLEANING REQUIRMENTS

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

B. Wash and shine glazing mirrors.

C. Polish glossy surfaces to a clear shine.

D. Clean glass; remove labels, fingerprints, grease, dirt stains, spots, marks, and other foreign materials from exposed exterior and interior surfaces.

E. Clean hardware, plumbing fixtures, and chrome and storefront systems; remove paint spots, asphalt and smears from surfaces; clean fixtures and wash concrete and tile floors.

F. Comply with all special cleaning, waxing and finishing instructions contained in Contract Documents.

G. Restore existing improvements, inside or outside property, which were disturbed, damaged or destroyed as a result of Work under this Contract.

H. Restore and replace damaged material conforming to original colors, textures, lines, grades, shapes and kind, except as otherwise required. Labor, material and methods used in restoring improvements shall conform to directions obtained from Architect before commencing Work.

3.4 FINAL CLEANING

A. Use experienced workmen and professional cleaners for final cleaning.

B. Legally dispose of waste materials, debris and rubbish off the site.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from exposed and semi-exposed surfaces.

D. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.

E. Vacuum clean all interior spaces including inside cabinets. Broom clean paved surfaces. Rake clean other surfaces of grounds.

F. Broom and water clean paved surfaces and walks. Rake clean other surfaces and grounds.

G. Maintain cleaning until building or portion thereof, is accepted and occupied by [Owner][District].

H. At completion of construction and just prior to final acceptance or occupancy, conduct final inspection exposed interior and exterior surfaces.

3.5 VENTILATING SYSTEM CLEANING

A. Clean permanent filters and replace disposable filters if units were operated during construction.

B. Clean ducts, blowers and coils if units were operated during construction.

END OF SECTION

SECTION 02 05 00
Common Work Results For Existing Conditions

PART 1 - GENERAL

A. SUMMARY

1. Provide selective demolition of exterior finishes as needed to complete maintenance repairs and/or replacements.

2. Provide selective demolition of interior finishes as needed to complete maintenance repairs and/or replacements.

3. Protect portions of building, site, and adjacent structures affected by demolition operations.

   a. Protect from damage existing construction to remain

   b. Contractor shall patch and repair any existing construction to remain that is damaged by selective demolition work at no cost to the District.

4. The District will occupy portions of the building directly adjacent to areas of selective demolition. Contractor shall conduct selective demolition work in a manner that will minimize disruption of the District's normal operations

B. Provide a minimum of 72 hours advance notice to the District of selective demolition work or utility shutdowns that will affect the District's normal operations.

C. Coordinate work with capping or closure of existing utilities.

D. Remove abandoned mechanical and electrical systems; cap or terminate at accessible locations.

E. Provide temporary protection for the public from demolition operations.

F. Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.

G. Provide pollution control during demolition operations.

H. Provide removal and legal disposal of materials.

1.2 SUBMITTALS:

A. Submit selective demolition schedule. Include methods for protecting adjacent work and location of temporary partitions.

B. Submit proposed location for disposal of materials and building permit, if applicable.

C. Submit proposed duration of: Noise producing work; utility shut-downs; and hazardous material abatement work, if applicable.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SELECTIVE DEMOLITION

A. Survey existing conditions and correlate with Drawings and specifications to verify extent of demolition required.

B. Do not damage building elements and improvements indicated to remain.

C. Secure all required permits or certificates for demolition or discontinuance of utilities, prior to beginning work.

D. Examine conditions at site to verify that demolition methods proposed for use will not endanger existing structures by overloading, failure, or unplanned collapse.

E. If known or suspected hazardous materials are encountered during operations, stop operations immediately and notify the District.

F. All items not listed for "salvage and return to Owner" remain property of District, and shall be collected for reuse or recycling as directed by the District's Representative. Contractor shall not remove any items of salvage or recycle value from the project site without the express permission of the District's Representative.

G. Do not close or obstruct streets, walkways, driveways or other occupied or used spaces or facilities without the written permission of the District and authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the District and authorities having jurisdiction. If necessary, provide temporary utilities.

H. Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.

I. Perform demolition operations so as to prevent dust and pollutant hazards. Provide chutes as required to control dust and debris.

J. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

K. Burning of demolished materials is not permitted.

L. Transport and dispose of demolished materials off District's property in a legal manner.

3.2 SCHEDULE

A. Items to remain in place and protected for reuse: As indicated in drawings.

B. Items to be salvaged for reinstallation in this project: As indicated in drawings.

C. Items to be salvaged and delivered to District: As indicated in drawings.

D. Utilities requiring interruption, capping, or removal.

END OF SECTION

SECTION 02 30 00
Subsurface Investigation

PART 1 - GENERAL

1.1 DESCRIPTION

A. Geotechnical Investigation Report:

1. A "Geotechnical Engineering and Geohazards Study" dated September 20, 2023 has been prepared for the project by Atlas Technical Consultants LLC of San Ramon, CA and is hereby included by reference into the Contract Documents.

2. The Geotechnical Engineering and Geohazards Study may be examined at the office of the Architect, and copies may be obtained for the cost of reproduction and handling upon request addressed to the Architect and accompanied by full payment.

B. Use of data:

1. The report is available for bidders' information, but is not a warranty of subsurface conditions.

2. Bidders should visit the site and acquaint themselves with existing conditions.

3. Prior to bidding, bidders may make their own investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under the time schedules and arrangements approved in advance by the Architect.

1.2 QUALITY ASSURANCE

A. A Soils Engineer shall be retained by the [Owner][District] to verify the adequacy of work in connections with excavating, trenching, filling, backfilling, and grading, and to perform compaction testing.

B. Readjust work performed that does not meet approval of the Soils Engineer.

C. Initial testing and inspection by the Soils Engineer should be paid for by the [Owner][District]. Additional testing of readjusted work required due to failure of the Work to meet the approval of the Soils Engineer at the initial inspection, shall be paid for by the Contractor.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

SECTION 02 41 16
Structure Demolition

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition of designated structures and removal of materials from site.

B. Demolition and removal of foundations and slabs-on-grade where indicated.

C. Disconnecting and capping removal of identified utilities where indicated.

D. Removal of underground piping where indicated.

E. Salvage, storage, and turnover of items to be retained by District.

F. Temporary fire protection.

G. Coordination with hazardous waste removal.

1.2 REGULATORY REQUIREMENTS

A. Conform to applicable codes for demolition of structures, safety of adjacent structures, dust control and disposal of materials.

B. Comply with 2016 California Fire Code (CFC), California Code of Regulations, (CCR) Title 24, Part 9, Chapter 33 - Fire Safety During Construction and Demolition.

C. Obtain required permits from authorities having jurisdiction.

D. Notify affected utility companies before starting Work and comply with their requirements.

E. Do not close or obstruct roadways, sidewalks, and hydrants without permits.

F. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

1.3 SUBMITTALS

A. Predemolition Photographs: Show conditions of existing adjacent construction and site improvements that might be misconstrued as damaged by demolition operations. Submit before Work begins.

B. Record Documents: Submit under provisions of Section 01 78 30. Accurately

record locations of utilities and subsurface obstructions on Record Drawings.

C. Landfill Records: Receipt and acceptance of hazardous waste by a landfill licensed to accept hazardous waste.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for removing refrigerant, stating that refrigerant recovery was performed according to EPA regulations. Include name and address of technician and date of recovery.

1.4 QUALITY ASSURANCE

A. Demolition Firm: Experienced firm that specializes in demolition similar to extent indicated for this Project.

B. Refrigerant Recovery Technician: Certified by EPA - approved certification program.

1.5 PROJECT CONDITIONS

A. Buildings to be demolished will be evacuated and their use discontinued before start of Work.

B. District will occupy building(s) adjacent to demolition area. Conduct demolition so District's operation will not be disrupted.

C. Provide at least 72 hours notice to District of activities that will affect District's operation.

D. Maintain access to existing walkways, exits, and other adjacent occupied facilities.

E. District assumes no responsibility for buildings and structures to be demolished.

F. Hazardous Materials: Hazardous materials are present in buildings to be demolished. A report on the presence of hazardous materials is on file for review and use.

1. Hazardous materials remediation is specified in Section 02 80 00 Hazardous Material Remediation.

2. Do not disturb hazardous materials except as specified.

1.7 SCHEDULING

A. Schedule Work under the provisions of Division 01.

B. Schedule Work to coincide with new construction.

C. Perform Work during normal hours of operation.

PART 2 - PRODUCTS

2.1 Unused

PART 3 - EXECUTION

3.1 EXAMINATION

A. Correlate existing conditions with requirements indicated.

B. Inventory and record condition of items to be removed and salvaged.

C. Verify that hazardous waste remediation is complete.

3.2 PREPARATION

A. Provide, erect, and maintain temporary barriers and security devices under provisions of Section 01 50 00.

B. Protect existing landscaping materials, appurtenances, and structures which are not to be demolished.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

D. Mark location of utilities.

3.3 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures and occupancies.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify Architect. Do not resume operations until directed.

C. Conduct operations with minimum interference to public accesses. Maintain egress and access at all times.

D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon, or limit access to their property.

E. Sprinkle Work with water to minimize dust. Provide hoses and water connections for this purpose.

F. Maintain fire safety during demolition in accordance with CFC, Article 87, Section 8706.

3.4 DEMOLITION

A. Disconnect, cap, and identify designated utilities within demolition areas.

B. Remove foundation walls and footings.

C. Remove concrete slabs and asphalt paving.

D. Backfill open pits and holes caused as a result of demolition, in accordance with Section 02 41 19 Selective Demolition and Section 02 41 19.16 Selective Interior Demolition.

E. Rough grade and compact areas affected by demolition to maintain site grades and contours.

F. Remove demolished materials from site and dispose of legally.

G. Do not burn or bury materials on site. Leave site in clean condition.

H. Remove temporary Work.

3.5 RECYCLING OF DEMOLITION MATERIALS

A. Separate recycled demolition materials from other demolished materials.

B. Stockpile processed materials on-site without intermixing with other materials.

C. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

D. Do not store materials within drip line of trees.

E. Transport recyclable materials that are not indicated to be reused off District's property to recycling receiver or processor.

F. Recycled incentives received for building demolition materials shall be equally shared between Contractor and District.

G. Concrete: Break up and transport to concrete-recycling facility.

H. Concrete Reinforcement: Remove reinforcement from concrete and sort with other metals.

I. Masonry: Crush masonry and screen to comply with requirements in Division 2 for use as satisfactory soil for fill or subbase.

J. Masonry Reinforcement: Remove reinforcement from masonry and sort with other metals.

K. Wood Materials: Sort and stack members according to size, type, and length. Separate dimensional and engineered lumber, panel products, and treated wood materials.

L. Metals: Separate by metal type, Remove nuts, bolts, and rough hardware. Sort structural steel by type and size.

M. Roofing: Separate organic and fiberglass shingles and felts. Remove nails, staples, and accessories.

N. Doors and Hardware: Brace open end of door frames. Leave hardware attached to doors.

O. Carpet and Pad: Store clean dry carpet and pad in closed container or trailer.

P. Gypsum Board: Stack large clean pieces on pallets. Remove edge trim and sort with metals. Remove and dispose of fasteners.

Q. Acoustical Ceiling Materials: Stack panels and tiles on pallets. Separate suspension system and sort with metals.

R. Equipment: Drain tanks, piping and fixtures. Seal openings with caps or plugs.

S. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, and other components.

T. Lighting Fixtures: Remove lamps and separate by type.

U. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type and size.

V. Conduit: Reduce conduit to straight lengths and store by type and size.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items to be [recycled], [reused], [salvaged], [reinstalled], or otherwise indicated to remain, remove demolished materials from Project Site and legally dispose of them in an EPA-approved landfill.

B. Do not burn or bury materials on site.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition.

B. Return adjacent areas to condition existing before demolition operations began.

C. Leave site in a clean condition.

D. Items to be protected in place:

1. As specified in drawings.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

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.

B. Comply with rules and regulations of State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Subchapter 4, "Construction Safety Order."

C. Comply with applicable local and state agencies having jurisdiction.

D. Comply with governing EPA notification regulations.

1.02 SUMMARY

A. Section Includes:

1. Demolition and removal of selected site elements.

2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.

2. Section 015000 "Temporary Facilities and Controls" for temporary protection of existing trees and plants that are affected by selective demolition.

3. Section 017300 "Execution" for cutting and patching procedures.

4. Section 017600 "Alteration Project Procedures" for general protection and work procedures for alteration projects.

5. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.04 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to District Representative.

1.05 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site if demolition of site is complicated or selective demolition of structures.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Use of elevator and stairs.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.07 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.08 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.09 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.

2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Coordinate with District environmental consultant for abatement of hazardous material. District preference is for abatement of asbestos versus encapsulating.

3. Hazardous material remediation is specified elsewhere in the Contract Documents.

4. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

D. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

B. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

C. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings, or preconstruction photographs or video.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."

2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.02 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.03 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with utility companies.

2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.04 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.05 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain fire watch during and for at least four hours after flame-cutting operations.

6. Maintain adequate ventilation when using cutting torches.

7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

10. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area on-site as designated by Owner.

5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.06 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.08 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

B. Finish of repaired surfaces shall be uniform and free from blemishes and variations in color and surface texture.

Attachments

- None

END OF SECTION

SECTION 02 41 19.16
Selective Interior Demolition

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of designated building equipment and fixtures.

B. Removal of designated construction.

C. Disposal of materials.

D. Cap and identify utilities.

E. Temporary partitions to allow building occupancy.

F. Schedule of materials and equipment.

G. Temporary fire protection.

H. Coordination with hazardous waste removal.

1.2 PROJECT RECORD DOCUMENTS

A. Submit record drawings under provisions of Section 01 77 00.

B. Accurately record locations of capped utilities, and subsurface obstructions.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition Work, safety of structure, electrical disconnection and reconnection and dust control.

B. Comply with 2016 California Fire Code (CFC), California Code of Regulations, (CCR) Title 24, Part 9, Chapter 33 - Fire Safety During Construction and Demolition.

C. Obtain required permits from authorities.

D. Notify affected utility companies before starting Work and comply with their requirements.

E. Do not close or obstruct egress width to exits.

F. Do not disable or disrupt building fire or life safety systems without [10] days prior written notice to the District.

G. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.4 SCHEDULING

A. Schedule Work under provisions of Section 01 32 13.

B. Schedule Work to coincide with new construction.

C. Describe demolition removal procedures and schedule.

D. Perform noisy, malodorous, or dusty Work:

1. As determined by the District's representative to limit disruptions to normal facility operations.

1.5 PROJECT CONDITIONS

A. Areas of buildings to be demolished will be evacuated and their use discontinued before start of Work.

B. District will occupy building(s) adjacent to demolition area. Conduct demolition so District's operation will not be disrupted.

C. Provide at least 72 hours notice to District of activities that will affect District's operation.

D. Maintain access to existing walkways, exits and other adjacent occupied facilities.

E. District assumes no responsibility for areas of buildings to be demolished.

F. Hazardous Materials: Hazardous materials are present in buildings to be demolished. A report on the presence of hazardous materials is on file for review and use.

1. Hazardous materials remediation is specified in Section 02 80 00 Hazardous Material Remediation.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Correlate existing conditions with requirements indicated.

B. Inventory and record conditions of items to be removed and salvaged.

C. Execute pre-demolition photographs.

D. Verify that hazardous waste remediation is complete.

3.2 PREPARATION

A. Erect and maintain weatherproof closures for exterior openings.

B. Erect and maintain temporary partitions to prevent spread of dust, fumes, noise, and smoke to provide for District occupancy as specified in Section 01 11 00.

C. Protect existing items which are not indicated to be altered.

3.3 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent [and occupied] building areas.

B. Cease operations immediately if structure appears to be in danger. Notify Architect. Do not resume operations until directed.

C. Maintain protected egress and access to the Work.

D. Maintain fire safety during demolition in accordance with CFC, Chapter 33 FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION.

3.4 EROSION AND SEDIMENTATION CONTROL

A. Provide erosion and sedimentation control measures in accordance with the requirements of the Storm Water Pollution Prevention Plan.

B. Inspect, repair, and maintain erosion and sedimentation control measures during clearing operations.

3.5 DEMOLITION

A. Disconnect [remove] and cap [and identify] designated utilities within demolition areas.

B. Demolish in an orderly and careful manner. Protect existing supporting structural members.

C. Except where noted otherwise, remove demolished materials from site. Do not

burn or bury materials on site.

D. Remove demolished materials from site as Work progresses. Upon completion of Work, leave areas in clean condition.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items to remain, remove all demolished materials from site and dispose in an EPA approved landfill.

B. Do not burn or bury materials on site.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement to Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A706, Grade 60 deformed.

B. Low-Alloy Steel Reinforcing Bars (Weldable): ASTM A706/A706M, deformed.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

B. Mechanical Splice Couplers: ACI 318 Type 1 or 2, same material of reinforcing bar

being spliced; mechanical-lap type.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement mechanical splice couplers.
3. Steel-reinforcement welding.

END OF SECTION 032000

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete standards.
2. Concrete materials.
3. Admixtures.
4. Fiber reinforcement.
5. Vapor retarders.
6. Floor and slab treatments.
7. Liquid floor treatments.
8. Curing materials.
9. Accessories.
10. Repair materials.
11. Concrete mixture materials.
12. Concrete mixture class types.
13. Concrete mixing.

1.2 ACTION SUBMITTALS

A. Product data.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Compressive strength at 28 days or other age as specified.
3. Compressive strength required at stages of construction.
4. Durability exposure classes for Exposure Categories F, S, W, and C.
5. Maximum w/cm ratio.
6. Calculated equilibrium and fresh density for lightweight concrete.
7. Slump or slump flow limit.
8. Air content.
9. Nominal maximum aggregate size.
10. Intended placement method.
11. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1.3 INFORMATIONAL SUBMITTALS

A. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.

B. Material certificates.

C. Material test reports.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing that performs duties on behalf of the Architect/Engineer.

C. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I or Type II
2. Pozzolans: ASTM C618, Class C, F, or N.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

B. Normal-Weight Aggregates:

1. Coarse Aggregate: ASTM C33/C33M, Class 1N
2. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
3. Fine Aggregate: ASTM C33/C33M.
4. Recycled Aggregate: Provide documentation of characteristics of recycled aggregate and mechanical properties and durability of proposed concrete, which incorporates recycled aggregate to conform to appliable requirements for the class of concrete.

2.3 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Admixtures with special properties, with documentation of claimed performance enhancement, ASTM C494/C494M, Type S.

2.4 CONCRETE MIXTURE MATERIALS

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland or hydraulic cement in concrete assigned to Exposure Class F3 as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

2.5 CONCRETE MIXTURE CLASS TYPES

A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.

1. Exposure Class: ACI 318 Class F0.
2. Minimum Compressive Strength: 3000 psi at 28 days.
3. Maximum w/cm Ratio: 0.50.
4. Air Content:

    a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

CONCRETE MIXING

B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.

C. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 TOLERANCES

A. Comply with ACI 117.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

3.4 INSTALLATION OF VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 INSTALLATION OF CAST-IN-PLACE CONCRETE

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

3.6 APPLICATION OF FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117, Class B.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.8 INSTALLATION OF CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch.
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    b. Compact mortar in place and match surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a

sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.

c. Place patching mortar before bonding agent has dried.
d. Compact patching mortar and finish to match adjacent concrete.
e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.9 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31/C31M.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

C. Delivery Tickets: Comply with ASTM C94/C94M.

D. Inspections:
1. Verification of use of required design mixture.
2. Concrete placement, including conveying and depositing.
3. Verification of concrete strength before removal of shores and forms from beams and slabs.
4. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd, but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing is to be conducted from at least

five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

   a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests as needed.

3. Slump Flow: ASTM C1611/C1611M:

   a. One test at point of delivery for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests as needed.

4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.

   a. One test for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064/C1064M:

   a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample when strength test specimens are cast.

6. Compression Test Specimens: ASTM C31/C31M:

   a. Cast and standard cure two sets of two 6 inches by 12-inches or 4-inch by 8-inch cylindrical specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C39/C39M.

   a. Test one set of two standard cured specimens at seven days and one set of two specimens at 28 days.
   b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
   c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide

corrective procedures for protecting and curing in-place concrete.

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests:

    a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

        1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.7.6.3.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.10 PROTECTION

A. Protect concrete surfaces.

B. Protect from petroleum stains.

C. Prohibit vehicles from interior concrete slabs.

D. Prohibit placement of steel items on concrete surfaces.

END OF SECTION 033000

SECTION 03 30 53

MISCELLANEOUS CAST-IN-PLACE-CONCRETE

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.

B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site Development Requirements for ADA Accessibility.

C. California Department of Transportation (Caltrans):

1. Standard Specifications:

a. Section 26: Aggregate Bases.

b. Section 40: Concrete Pavement.

c. Section 41: Concrete Pavement Repair.

d. Section 51: Concrete Structures.

e. Section 52: Reinforcement.

f. Section 73: Concrete Curbs and Sidewalks.

g. Section 90: Concrete.

D. Traffic Manual.

E. Highway Design.

1.02 SUMMARY

A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

2. Section 321313 "Concrete Paving" for concrete pavement and walks.

3. Section 328000 “Irrigation”

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.

1.04 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:

1. "General Requirements."

2. "Formwork and Formwork Accessories."

3. "Reinforcement and Reinforcement Supports."

4. "Concrete Mixtures."

5. "Handling, Placing, and Constructing."

B. Comply with ACI 117.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 1064, as drawn.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064, flat sheet.

2.03 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: Per Section 03 30 00 – CAST IN PLACE CONCRETE

2. Fly Ash: Per Section 03 30 00 – CAST IN PLACE CONCRETE

3. Slag Cement: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregate: ASTM C 33, 1-1/2-inch nominal maximum aggregate size.

D. Lightweight Aggregate: ASTM C 330, 1-inch nominal maximum aggregate size.

E. Air-Entraining Admixture: ASTM C 260.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494, Type A.

2. Retarding Admixture: ASTM C 494, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.

6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

G. Water: ASTM C 94.

2.04 RELATED MATERIALS

A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A or B.

B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.05 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.06 CONCRETE MIXTURES

A. Comply with ACI 301.

B. Normal-Weight Concrete:

1. Minimum Compressive Strength: 3000 psi or as indicated at 28 days.

2. Maximum W/C Ratio: 0.45.

3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

4. Slump Limit: 4 inches, plus or minus 1 inch.

5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

2.07 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.

1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd, increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 FORMWORK INSTALLATION

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.02 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 VAPOR-RETARDER INSTALLATION

A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.

1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

3.04 STEEL REINFORCEMENT INSTALLATION

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.05 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Owner.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

3.06 CONCRETE PLACEMENT

A. Comply with ACI 301 for placing concrete.

B. Do not add water to concrete during delivery, at Project site, or during placement.

C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.

D. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases 6 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.

3. Minimum Compressive Strength: 3000 psi at 28 days.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor them into structural concrete substrate.

6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.07 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding 1/2 inch.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.

1. Apply to concrete surfaces where indicated.

C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-rubbed finish.

2. Grout-cleaned finish.

3. Cork-floated finish.

D. Sand Blasted Finish:

1. Blasting Operations and Requirements:

a. Apply sandblasted finish to exposed concrete surfaces where indicated.

b. Perform sand blasting at least 72 hours after placement of concrete. Coordinate with formwork construction, concrete placement schedule, and formwork removal to ensure that surfaces to be blast finished are blasted at the same age for uniform results.

c. Determine type of nozzle, nozzle pressure, and blasting techniques required to match the Engineer's control samples.

d. Abrasive blast corners and edge of patterns carefully, using back-up boards, to maintain uniform corner or edge line.

e. Depths of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surface to match the Engineer's control samples as follows:

f. Brush Sand Blast Finish: Remove cement matrix to expose face of fine aggregate; no reveal.

g. Light Sand Blast Finish: Expose fine aggregate with occasional exposure of coarse aggregate; maximum 1/16-inch reveal.

2. Surface Continuity: Perform sand blast finishing in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish on each surface or area of work. Maintain patterns of variances in depths of cuts as indicated.

3. Construction Joints: Use technique acceptable to the Engineer to achieve uniform treatment of construction joints.

4. Protection and Repair:

a. Protect adjacent materials and finishes from dust, dirt, and other surface or physical damage during abrasive blast finishing operations. Provide protection as required and remove from site at completion of the work.

b. Repair or replace other work damaged by finishing operations.

5. Clean-up: Maintain control of concrete chips, dust, and debris in each area of the work. Clean up and remove such material at the completion of each day of operation. Prevent migration of airborne materials by use of tarpaulins, wind breaks, and similar containing devices.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed

surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.08 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

1. Do not further disturb surfaces before starting finishing operations.

C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes unless otherwise indicated.

D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.

E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

G. Slip-Resistive Broom Finish: Apply a slip-resistive finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.09 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials, as environmental conditions dictate:

a. Water.

b. Continuous water-fog spray.

c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Zypex Waterproofing Coating or approved equivalent. Apply uniformly to concrete surfaces indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: Perform according to ACI 301.

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

Attachments

- None

END OF SECTION

SECTION 05 51 00
Prefabricated Stairs and Ramps

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Shop-fabricated, self-adjustable stairs, landings, ramps and railing assemblies componentized for field installation.

B. Footing devices and connectors as needed.

C. Non-slip surfacing, if not part of the construction.

1.2 REFERENCES

A. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. ASTM A36 – Standard Specification for Carbon Structural Steel.

C. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

D. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

E. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

F. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

G. AWS A2.4 - Standard Symbol for Welding, Brazing, and Nondestructive Examination

H. AWS D1.1 - Structural Welding Code - Steel.

I. SSPC - Steel Structures Painting Council.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Engineering drawings bearing the professional seal of an engineer registered in the State of California, along with the DSA approval stamp.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

D. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.4 QUALIFICATIONS

A. Welders' Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Drawings.

PART 2 - **PRODUCTS**

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Sharon Companies products used as a standard of quality. Substitutions as approved by Architect prior to Bid Date.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 62 00.

2.2 MATERIALS - STEEL

A. Steel Sections and Plates: ASTM A36.

B. Steel Shapes: ASTM Grade 50.

C. Steel Tubing:

1. Structural Use: ASTM A500, Grade B or C.

2. Non-Structural Use: ASTM A513, hot-rolled or cold-rolled (mill option).

D. Pipe: ASTM A53, Grade B, Schedule 40.

E. Steel Sheet:

1. Structural Use: ASTM A570 (hot-rolled) or A366 (cold-rolled).

2. Non-Structural Use: ASTM A569 (hot-rolled) or A366 (cold-rolled).

F. Fasteners and Accessories: Provide all necessary anchor bolts, clip angles, hanger

rods and other hardware, accessories and incidental materials required for complete installation of stairs and rails.

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

H. Welding Materials: Conform to AWS code and AWS filler metal specifications for material being welded.

I. Shop and Touch Up Primer: SSPC 15, Type 1, red oxide.

J. Touch-Up Primer for Galvanized Surfaces: SSPC 20.

K. Primer: Acrylic Latex rust-inhibitive primer containing less than 1.0 pounds per gallon volatile organic compounds (VOC), certified to be compatible with finish coats specified in Section 09 91 00.

L. Concrete Materials and Reinforcement: Comply with the applicable requirements of Section 03 30 00.

2.3 MATERIALS - ALUMINUM

A. Stair treads and walk surfaces shall be formed from aluminum plate or extrusion, ASTM B221 alloy 6061-T6, and shall be deeply serrated on all sides to provide maximum foot grip and traction. Handrails and toe boards shall be able to withstand a 250 pound loading without failure. Space posts not to exceed 6' on center, or as indicated.

B. Rails shall be 1-1/2" outside diameter aluminum extrusions, ASTM B221 alloy 6061-T6.

2.4 MATERIALS - CONCRETE

A. Precast concrete.

B. Railings: Universal fit, coordinated with the concrete for anchorage.

2.5 STANDARD STAIR AND RAIL SYSTEM

A. Manufacturer's standard prefabricated, pre-engineered straight run stair and landing system, consisting of hot-rolled steel sheet treads, risers and landings. Stringers shall be steel plate or channel with side mounted prefabricated railings:

1. Stringers: Minimum thickness or gauge as determined by structural design calculations, structural grade steel plate and or channel.

2. Risers: Closed riser, minimum 14 gauge hot-rolled mild steel sheet, sloped maximum 1-1/2" and conforming to ADAAG nosing requirements.

3. Treads: Manufacturer's standard concrete pan system (field-poured). Tread pans shall be minimum of 14 gauge, or as determined by design calculations. Pan depth 1-1/2". Exposed welds from the bottom side of flight assemblies will not be allowed. All welds shall be from topside of tread pans as recommended by manufacturer. Refer to Section 03 30 00 for concrete design requirements and field finish of treads.

4. Landings: Minimum of 11 gauge hot-rolled mild steel sheets, formed for a minimum 3" concrete fill, with 12 gauge channel supports and bracing welded to perimeter frame at 12" on center.

5. Fasteners and Supports: Sized by the manufacturer to meet the structural design criteria. If hanger rod connections are applicable to any of the landing connections, they shall be a minimum of 5/8" diameter steel rod, actual size based on stair load.

B. Manufacturer's standard welded steel tube railing system complying with the following requirements:

1. Rails: 1-1/2" diameter by minimum 13 gauge round steel tube, continuous multi strand type, equally spaced not more than 3-15/16" clear between strands, and with a minimum extension per code at top and bottom risers. Wrap rail continuously past space between fights to form guardrail as required by building code. Terminate rail ends with radiused returns, newel posts, or safety terminations approved by local code. Provide not less than 1-1/2" clear between rail and wall.

2. Rail Posts: 1-1/2" square by 11 gauge tubing. Rail-posts shall fasten to side of plate stringers per manufacturer's shop drawings. Manufacturer shall pre-weld erection aid to rail post for proper height to aid stair erector. Erection aid (setting block) to be removed and weld ground smooth after installation.

3. Fabrication:

a. Use preformed or prefabricated bends.

b. Butt weld tee and cross intersections in tubing: cope and weld intersections in pipe. Miter elbows.

c. Mechanically fasten internal sleeves and fittings.

d. Provide minimum 3/16" welded steel plate closures or hemispherical closure fittings on all exposed rail ends.

2.6 FABRICATION, GENERAL

A. Fit and shop assemble in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds unless indicated otherwise.

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

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise. Screws or bolts in contact with concrete shall be hot-dip galvanized or stainless steel.

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

2.7 FINISHES

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. To the greatest extent possible, galvanizing shall be performed after all welding and cutting is complete.

C. Galvanize assembled items to minimum 1.25 ounces per square foot zinc coating in accordance with ASTM A123.

D. Repair damaged galvanized surfaces in accordance with ASTM A780 Method A2.

E. Do not prime surfaces in direct contact with concrete or where field welding is required.

F. Prime paint items with one coat of primer, after galvanizing.

G. Apply non-slip surfacing to all treads and walk surfaces.

H. Finish: Field paint exposed-to-view [prime painted] [and] [galvanized] items under provisions of Section 09 91 00.

PART 3 - **EXECUTION**

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive Work.

B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate trades.

3.3 INSTALLATION

A. Align accurately with adjacent structures.

B. Install items plumb and level, accurately fitted, free from distortion or defects.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components indicated on Drawings.

E. Perform field welding in accordance with AWS D1.1.

F. Obtain Architect's approval prior to site cutting or making adjustments not scheduled.

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

END OF SECTION

SECTION 06 05 60
Countertops

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Epoxy resin countertops and sinks.

B. Splash panels.

C. Preparation for utilities.

1.2 REFERENCES

A. WI - Woodwork Institute: Manual of Millwork.

B. ASTM A653 – Standard Specification for Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

D. NEMA HPDL LD - High-Pressure Decorative Laminates.

1.3 QUALITY ASSURANCE

A. Manufacture countertops in accordance with quality standards of the Manual of Millwork of the Woodwork Institute.

B. Issue WI Certified Compliance Certificate to Architect prior to delivery of countertops and provide WI Certified Compliance Labels on all countertops.

C. Provide WI Reinspection Service at the job site prior to installation. Provide to Architect a written report showing the results of the reinspection.

D. Upon completion of the installation, provide a WI Certified Compliance Certificate.

1.4 MOCK-UP

A. Prepare mock-up under provisions of Section 01 45 00.

B. Provide full size countertops of each type indicated.

C. Units will be examined to ascertain quality and conformity to WI standards.

D. Units will establish a minimum standard of quality for this Work.

E. Approved units may be used as part of the Work.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes. Provide WI Certified Compliance label on first page of each set.

C. Submit Samples of each type of countertop material.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Active member of the Woodwork Institute licensed by WI to provide WI Certified Compliance Certificates and Labels for the products and materials specified in this Section.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 EPOXY RESIN COUNTERTOPS

A. Epoxy resin tops and splashes as manufactured by Laboratory Tops, Inc., (512) 352-5591, or Trespa (800) 487-3772, or approved equal, shall be fabricated in accordance with the following:

1. Core Thickness: 1" (Trespa: 3/4").

2. Edge: Radius 1/4" with drip groove.

3. Sink Edge: 1/4" deep x 5/16" wide continuous rabbet.

4. Backsplash: Square butt.

5. Color: Black.

B. Epoxy resin sinks (drop in type) as manufactured by Laboratory Tops, Inc., (512) 352-5591, or approved equal, shall be fabricated in accordance with the following:

1. Wall Thickness: 1/2".

2. Edge: 1/4" thick lipped rim.

3. Color: Black.

4. Type: (As indicated on Plumbing Drawings)

   a. [SK-10:] [____:] Rim dimensions 29-5/8" long x 16-5/8" wide x 12" inside bowl depth, end drain location.

   b. [SK-11:] [____:] Rim dimensions 29-5/8" long x 16-5/8" wide x 6" over all depth. This sink must be disabled accessible.

   c. [SK-12:] [____:] Rim dimensions 15-5/8" square x 6" over all depth. This sink must be disabled accessible.

2.3 HARDWARE

A. Grommets: Doug Mockett and Company, Inc. SG Series; plastic 3-1/2", diameter. Colors and locations as selected by Architect.

B. Countertop Standard or Concealed Brackets: 1/8" thick x 18" x 24" steel legs, 1-1/2" forms with six 1/4" mounting holes per side, 1,000 lbs. minimum load support, 45° cut out as manufactured by A & M Hardware, Inc., or approved equal.

C. Piano Hinge for Countertop, or approved equal.

D. Remainder of hardware required shall be as listed in Supplement No. 1 to Sections 14 and 15 of the Manual of Millwork.

2.4 FABRICATION

A. Shop assemble countertops for delivery to site in units easily handled and sized to permit passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

D. Install plastic grommets in the field in countertops as directed by the District's Representative and/or Architect.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify adequacy of backing and support framing.

B. Examine countertops for defects. Correct all defects prior to installation.

3.2 INSTALLATION

A. Install countertops in accordance with Installation of Architectural Millwork, Section 26 of the Manual of Millwork.

B. Make joints neatly, with uniform appearance.

C. Install Work plumb, level, true, and straight, with no distortions. Install with no variation in flushness of adjoining surfaces.

D. Shim as required, using concealed shims.

E. Scribe and cut to fit adjoining Work.

F. Repair damaged and defective Work to eliminate visual and functional defects; where repair is not possible, replace Work.

G. Sealant: Install sealant as specified in Section 07 92 00, as required to close any small unavoidable gaps between counter and abutting surfaces.

3.3 ADJUSTING AND CLEANING

A. Protect countertops from damage until acceptance.

B. Clean countertops with materials and equipment that will not cause damage to surfaces.

3.4 SCHEDULE

A. Each base cabinets shall receive a countertop.

B. All countertops shall be plastic laminate covered unless specifically noted otherwise.

C. Stainless steel countertops shall be as detailed on Drawings.

D. Galvanized steel countertops shall be installed where indicated.

END OF SECTION

SECTION 06 10 00
Rough Carpentry

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All lumber framing, rough hardware and blocking as indicated.

1.2 REFERENCES

A. Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work in this Section where cited by abbreviations noted below (latest editions apply).

1. California Code of Regulations. Title 24, also known as California Building Code (CBC), with amendments.

2. APA - American Plywood Association, "Product Guide: Performance Rated Panels".

3. PS - United States Product Standard, PS-1 Series of "Construction and Industrial Plywood".

4. UL - Underwriters' Laboratories, Inc.

5. WCLIB - West Coast Lumber Inspection Bureau, "Standard Grading Rules No. 17".

6. Pacific Lumber Inspection Bureau, "Western Lumber Grading Rules", Standard No. 17, 2018

7. AWPA - American Wood Preservers Association Standards.

8. ASTM - American Society of Testing and Materials.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings of all specially fabricated rough hardware.

C. Certificates of compliance with standards specified.

1.4 DELIVERY, STORAGE AND HANDLING

A. Provide proper facilities for handling and storage of materials to prevent

damage to edges, ends, and surfaces.

B. Keep materials dry. Where necessary, stack materials off ground on level flat forms, fully protected from weather.

1.5 JOB CONDITIONS

A. Environmental Requirements: Maintain uniform moisture content of lumber at not more than 19% before, during, and after installation.

B. Sequencing, Scheduling: Coordinate details with other Work supporting, adjoining or fastening to rough carpentry Work.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Rough Carpentry:

1. Sills on Concrete: Foundation grade Redwood or pressure-treated Douglas Fir.

2. Lumber (Wood Framing): Meet requirements of following minimum grades.

Item	Grade
Studs	D.F. No. 2
Plates	D.F. No. 2
Beams	D.F. No. 1
Joists	D.F. No. 2
Posts	D.F. No. 1
Blocking	D.F. No. 2

B. Plywood: Provide thickness, grade, and panel identification index shown on Drawings.

C. Rough Hardware: All exterior hardware shall be hot-dipped galvanized steel:

1. Nails: Common wire, typical.

2. Powder Driven Fasteners: Hilti Fastening Systems: Impex Tool Corporation; or approved equal. Tempered steel pins with special corrosion-resistant finish. Provide guide washers to accurately control penetration, maximum 3/4". Accomplish fastening by low-velocity piston-driven powder-actuated tool.

3. Expansion Bolts: Red Head, Trubolt: “Wedge Type”; Hilti; "Kwik-Bolt III" or

approved equal. Reverse cone, self-wedging, expansion type, Tightening of nut or increased tension on bolt shank shall act to force wedges outward to create positive increased resistance to withdrawal.

4. Metal Timber Framing Connectors: Simpson Company or approved equal. Fabricate from hot-dipped galvanized steel. Connectors shall be at least 16 gauge material, 1/8" plate materials where welded, unless otherwise shown or specified, punched for nailing. Nails and nailing shall conform to the manufacturer's instructions, with a nail provided for each punched hole.

5. Miscellaneous Hardware: Provide all common screws, bolts, fastenings, washers and nuts required to complete rough carpentry Work.

2.2 TREATMENTS

A. Fire-Retardant Treatment: Koppers Co., Inc.'s "FirePro, FlamePro", or approved equal.

B. Preservative Treatment: Furnish in accordance with AWPA.

2.3 FABRICATION

A. Preparation:

1. Verify measurements at job site.

2. Verify details and dimensions of equipment and fixtures integral with finish carpentry for proper fit and accurate alignment.

3. Coordinate details with other Work supporting, adjoining, or fastening to casework.

B. Lumber:

1. Kiln-dry to maximum 19% moisture content prior to shipment (S-dry). Stack and air-dry to maximum 15% in field prior to installation.

2. Furnish surfaced four sides, S4S, unless otherwise noted.

3. Size shall conform with rules of governing standard. Sizes shown are nominal unless otherwise noted.

C. Wood Treatments:

1. Preservative Treatment:

a. Treat lumber and plywood sheathing exposed to weather.

b. Lumber: Treat in accordance with AWPA Book of Standards.

c. Plywood: Treat in accordance with AWPA Book of Standards.

d. After treatment and prior to shipping, air- or kiln-dry lumber to maximum 19% moisture content (S-dry). Air-dry in field to maximum 15% prior to installation.

2.4 QUALITY CONTROL

A. Lumber shall bear grade-trademark or be accompanied by certificate of compliance of appropriate grading agency.

B. Plywood shall bear APA grade-trademark.

C. Air-dry all framing lumber to a maximum of 15% moisture content prior to installing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive rough carpentry Work and verify following:

1. Completion of installation of building components to receive rough carpentry Work.

2. That surfaces are satisfactory to receive Work.

3. That spacing, direction, and details of supports are correct to accommodate installation of blocking, backing, stripping, furring and nailers.

4. That all anchor bolts and holdown bolts are properly installed.

3.2 INSTALLATION

A. Cutting: Perform all cutting, boring, and similar Work required.

B. Studs, Joists, Beams, and Posts: Install all members true to line. No wood shingle shims are permitted. Place joists with crown up; maximum 1/4" crown permitted.

C. Nail joints in accordance with applicable requirements of the CBC Table 2304.10.1 unless otherwise shown or specified. Predrill where nails tend to split wood.

D. Bolt holes to be 1/16" oversize. Threads shall not bear on wood. Use standard malleable iron washers against wood. Carriage bolts require washers under the nut only.

E. Provide blocking, grounds, nailers, stripping, and backing as shown and as required to secure other Work.

F. Maintain 1/8" gap between all plywood panel edges.

G. Do not utilize plywood sheets having a width smaller than 2'-0".

H. Plywood flooring shall be field glued with adhesives meeting APA specification AFG-01 applied in accordance with the manufacturers' recommendations. Apply continuous line of glue on joists and in groove of tongue and groove panels.

I. Where wood is cut, sawed, planed, bored or marred after preservative or fire-retardant treatment, apply two heavy brush coats of same material used in treatment.

J. Nail heads shall be driven flush with plywood surface. Overdriven nails (nails which fracture the outer ply layer) shall be replaced one for one.

K. Wood Screws or Lag Screws: Screws shall be screwed and not driven into place. Screw holes shall be predrilled to the same diameter and depth of shank. Holes for threaded portion shall be predrilled less than or equal to the diameter of the root of the thread. Provide standard cut washers under head of lag screws.

L. Sills under bearing, exterior and shear walls shall be bedded on 1/2" minimum drypack or grout to obtain continuous bearing.

3.3 CLEANING AND ADJUSTING

A. Remove damaged or otherwise disfigured portions and replace with new prior to the [Owner][District]'s acceptance.

B. Wash finished Work in strict accordance with product manufacturer's directions and ensure that washed surfaces do not differ from clean unwashed surfaces. Any difference will be considered unsatisfactory Work.

3.4 FIELD QUALITY CONTROL

A. The [Owner][District]'s Testing Agency shall:

1. Inspect erected timber framing as required to establish conformity of Work with Drawings.

2. Inspect all bolted connections.

3. Inspect all timber connectors for compliance with CBC Chapter 23.

4. Inspect roof diaphragm nailing for nail size, spacing and penetration at plywood panel edges, and special nailing at collector and drag members.

5. Inspect shear wall nailing for nail size, spacing and penetration at plywood panel edges, and nailing at holdown posts.

END OF SECTION

SECTION 06 20 00
Finish Carpentry

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items, other than shop prefabricated casework.

B. Hardware and attachment accessories.

1.2 REFERENCES

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. AWPA - American Wood Preservers Association.

C. NFPA 80 – Standard for Fire Door and Other Opening Protectives.

D. CBC - California Building Code.

E. UL - Underwriters' Laboratories, Inc.

F. WI - Woodwork Institute: Manual of Millwork.

1.3 QUALITY ASSURANCE

A. Manufacture millwork and finish carpentry items in accordance with quality standards of the Manual of Millwork of the Woodwork Institute.

B. Issue WI Certified Compliance Certificate to Architect prior to delivery of millwork and provide WI Certified Compliance Labels on all items of millwork.

C. All millwork and the installation of millwork shall be monitored for compliance under the scope of the WI Certified Compliance Program (CCP).

D. Provide WI Reinspection Service at the job site prior to installation. Provide to Architect a written report showing results of the reinspection.

E. Upon completion of the installation, provide a WI Certified Compliance Certificate.

1.4 REGULATORY REQUIREMENTS

A. Conform to UBC and UL requirements for fire ratings.

B. Conform to Flame Spread Classifications of Interior Millwork contained within the Appendix of the WI Manual of Millwork for flame spread ratings.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, finishes, and accessories to a minimum scale of 1-1/2" to 1'. Provide WI Certified Compliance label on first page of each set.

C. Submit two samples 6" x 6" in size illustrating wood grain and specified finish.

D. Submit two samples 6" long of wood trim.

E. CHPS 2014 Submittals:

1. Credit EQ 7.0 – Low Emitting Materials

EQ 7.0 Flooring Systems

Applicable to all resilient flooring and carpet systems installed in the project's interior. 75%, or more, of the installed area of such products shall be shall be tested for emissions of VOCs of concern with respect to chronic inhalation exposures following the specifications of the CDPH Standard Method V1.1, 2010 and shall be compliant with the Standard Method when modeled to the school classroom scenario described therein.

2. Credit EQ 7.1 – Additional Low Emitting Materials

EQ 7.1.2 Flooring Systems

Flooring systems include but are not limited to: carpet with or without an integral cushion, carpet with an integral adhesive system, and separate cushion; resilient flooring; wood flooring; ceramic tile flooring; other mineral-based flooring (either natural or manmade) without any organic component, and concrete flooring. For the purposes of this option, it is assumed that ceramic tile, organic-free mineral-based flooring, and concrete flooring are negligible sources of VOCs and are available for credit without any testing requirements. Site applied flooring adhesives are treated under Option 1 for Adhesives & Sealants, and site applied flooring stains, sealers and coatings are treated under Option 2 for Paints & Coatings. All flooring systems installed in the project's interior totaling 90% or more of the total floor area shall be

tested for emissions of VOCs of concern with respect to chronic inhalation exposures following the specifications of the CDPH Standard Method V1.1, 2010 (CDPH Standard Method). The test results shall be compliant with the Standard Method when modeled to the school classroom scenario using the classroom flooring area. For systems consisting of more than one distinct layer (e.g., carpet with separate cushion), all layers shall individually meet the requirements of the CDPH Standard Method.

EQ 7.1.3 Composite Wood and Agrifiber Products

Composite wood is defined in the California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products (California Code of Regulations, Title 17, Sections 93120-93120.12). The affected materials are composite core and veneer core hardwood plywood (HWPW, particleboard (PB), medium density fiberboard (MDF), and thin MDF. Agrifiber products are composite boards produced from agricultural/biobased materials and a chemical binder system. At least 90%, by area, of the composite wood and the composite wood cores of finished building products (e.g., engineered wood floors, doors, trim/molding, cabinetry, and counter tops) installed onsite in the project's interior shall either 1) be manufactured with no-added formaldehyde (NAF) based resins, or 2) be manufactured with ultra-low emitting formaldehyde (ULEF) resins and shall meet the appropriate emission requirements established by the ATCM for NAF and ULEF products.

Additionally, at least 90%, by area, of all agrifiber products installed onsite in the project's interior shall be manufactured with NAF based resins.

Compliance of NAF and ULEF materials shall be demonstrated by product labels and data sheets, chain-of-custody documentation, or equivalent.

Structural plywood, structural panels, oriented strand board, structural lumber, glue laminated timber, prefabricated wood joists, and finger jointed lumber, are excluded from this option and these requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products under provisions of Section 01 87 00.

B. Conform to Section 1 of Millwork Manual.

C. Store materials in ventilated, interior locations under constant minimum

temperatures of 70°F and maximum relative humidity of 50% to 55%.

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Active member of the Woodwork Institute, licensed by WI to provide WI Certified Compliance Certificates and Labels for the products and materials specified in this section (916) 372-9943.

B. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Materials specified under Millwork Manual Section Numbers refer to lumber grades in Millwork Manual as follows: Section 3, Lumber - Hardwood/Softwoods; Section 4, Plywood - Hardwood/Softwood; Section 6, Exterior Trim; Section 9, Interior Trim.

2.3 MISCELLANEOUS EXTERIOR MILLWORK

A. Fabricate in accordance with Section 6 of Millwork Manual:

Item	Species	Grade	Intended Finish
Wood Trellis	Redwood	Custom	Transparent
Seats & Benches	Redwood	Custom	Transparent
1 x 6 T&G Vee Joint Wood Ceiling & Soffit	Redwood	Custom	Transparent
Plywood Casing & Sheathing	Douglas Fir	Custom	Transparent Texture 1-11

2.4 INTERIOR TRIM - PAINT GRADE

A. Finger jointed kiln-dried pine is acceptable for all areas except high moisture areas.

B. Trim profiles shall be mill standard shape numbers as indicated.

C. All paint-grade trim shall be pre-painted at mill.

2.5 INTERIOR TRIM - STAIN GRADE

A. Fabricate in accordance with Section 9 of Millwork Manual:

Item	Species	Grade	Intended Finish
Base, Casing, & Trim	Red Oak	Custom	Transparent
Tackboard Frames, Chalk Rail & Frame	Red Oak	Custom	Transparent

2.6 MISCELLANEOUS INTERIOR MILLWORK

A. Fabricate in accordance with Section 9 of Millwork Manual:

Item	Species	Grade	Intended Finish
1 x 6 T&G Vee Joint Wainscot	Red Oak	Custom	Transparent
Handrails	Red Oak	Custom	Transparent
1 x 6 T&G Vee Joint Ceiling	Red Oak	Custom	Transparent
Prefinished Wainscot	Medium Density Fiberboard	Custom	Transparent

2.7 INTERIOR JAMBS - NON FIRE-RATED

A. Fabricate in accordance with Section 9 of Millwork Manual:

Item	Species	Grade	Intended Finish
Interior door & borrowed light frames, stops, and trim	Red Oak	Custom	Transparent

2.8 ADHESIVE

A. Adhesives: Type 1 adhesive recommended by WI to accommodate application in accordance with the Appendix to the Millwork Manual.

B. Formulation: Exterior type, consisting of organic-resin solution, insoluble in water, thermally set in wood by kiln drying.

C. Wall Adhesive: Solvent release, cartridge type, compatible with wall substrate, capable of achieving durable bond.

2.9 WOOD TREATMENT PROCESS

A. Fire Retardant Type: Listed by Underwriters' Laboratories, Inc. (UL); capable of providing a maximum flame spread/smoke development rating of 20/25 in

accordance with ASTM E84.

B. The following items are to be treated:

1. 1 x 6 T&G Vee Joint Wainscot.

2. 1 x 6 T&G Vee Joint Ceiling.

3. Medium Density Fiberboard.

4. 3/4" Ply Wainscot.

2.10 ACCESSORIES

A. Nails: Size and type to suit application, galvanized finish for interior use, stainless steel for exterior use.

B. Bolts, Nuts, Washers, Blind Fasteners, Lags, and Screws: Size and type to suit application; galvanized finish for interior use, stainless steel for exterior use.

C. Lumber for Shimming and Blocking: Softwood lumber of Douglas Fir species.

D. Primer: Alkyd primer sealer.

E. Wood Filler: Solvent base, tinted to match surface finish color.

2.11 FABRICATION

A. Fabricate work in accordance with WI [Custom] [or] [Premium] grade standards. [as listed].

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

E. Cap exposed plastic laminate finish edges with [material of same finish and pattern] [aluminum trim] [hardwood trim].

F. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive work and field measurements are as instructed by the fabricator.

B. Verify mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

C. Verify adequacy of backing and support framing.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials or that will be permanently concealed from view.

3.3 INSTALLATION

A. Install work in accordance with WI Manual of Millwork, Custom quality standard.

B. Install fire rated door frames in accordance with NFPA 80.

3.4 TOLERANCES

A. Maximum Variation from True Position: 1/16".

B. Maximum Offset from True Alignment with Abutting Materials: 1/32".

3.5 PREPARATION FOR FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand Work smooth.

3.6 FINISHING

A. Site finish under provisions of Section 09 91 00.

3.7 PROTECTION

A. Protect finished installation under provisions of Section 01 87 00.

END OF SECTION

SECTION 06 41 16
Laminate-Clad Wood Casework

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Special fabricated cabinet units.

B. Preparation for utilities.

C. Cabinet hardware.

D. Glass for cabinet doors.

1.2 RELATED SECTIONS

A. Section 01 74 00 Cleaning and Waste Management.

B. Section 06 05 60 Countertops.

C. Section 06 10 00 Rough Carpentry.

1.3 REFERENCES

A. WI - Woodwork Institute: Manual of Millwork.

B. NEMA HPDL: High-Pressure Decorative Laminates.

1.4 QUALITY ASSURANCE

A. Manufacture casework items in accordance with quality standards of the Manual of Millwork of the Woodwork Institute.

B. Issue WI Certified Compliance Certificate to Architect prior to delivery of millwork and provide WI Certified Compliance Labels on all items of casework.

C. Provide WI Reinspection Service at the job site prior to installation. Provide to Architect a written report showing the results of the reinspection.

D. Upon completion of the installation, provide a WI Certified Compliance Certificate.

1.5 MOCK-UP

A. Prepare mock-up under provisions of Section 01 45 00.

B. Provide full size base cabinet and upper cabinet of each type indicated, in specified finish with hardware installed.

C. Units will be examined to ascertain quality and conformity to WI standards.

D. Units will establish a minimum standard of quality for this Work.

E. Approved units may be used as part of the Work.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes. Provide WI Certified Compliance label on first page of each set.

C. Submit Samples of each color/pattern of plastic laminate cabinet facing.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Active member of the Woodwork Institute licensed by WI to provide WI Certified Compliance Certificates and Labels for the products and materials specified in this Section.

B. Substitutions: Under provisions of Section 01 62 00.

2.2 CABINET DESIGN

A. Individual cabinets are indicated on the Drawings by the WI Design Numbering System, Section 15, Supplement No. 3.

B. A WI number followed by an "L" indicated on the Drawings requires that each door or pair of doors and drawers within that WI cabinet be individually lockable.

2.3 CASEWORK - LAMINATED PLASTIC COVERED

A. Fabricate in accordance with Section 15 of the Manual of Millwork:

1. WI Grade: Custom.

2. Type: Type I.

3. Construction: Style A-Frameless.

4.	Joinery:	Dado and screw.
5.	Cabinet Backs:	AWS, Dadoed (Detail 2C and 7C Millwork Manual).
6.	Cabinet Door Type:	Type A. Stile and rail (for glass).
7.	Shelves:	3/4 inch plywood core
8.	Drawer bottoms:	Fully let-in glued and blocked with Applewood 5-ply
9.	Shelf Edge Bands:	0.020" PVC in color to match shelf. All 4 edges of adjustable shelves to receive banding.
10.	Door, Drawer, and Cabinet Drawer Box Edge Bands:	Door and Drawer: 3 mm PVC edge banding. Boxes: 0.020" PVC white.
11.	Exposed Surfaces (Including Shelves and Interior of Open Front Cabinets):	0.028" high pressure plastic laminate color and pattern as selected by Architect. A maximum of 5 colors and patterns to be selected by Architect from Nevamar's standard ARP textured, satin and wood grain pattern finish.
12.	Semi-Exposed Surfaces (Behind Doors and Inside Drawers):	Low pressure decorative polyester or melamine laminate ALA-85.
13.	Exposed Laboratory Surfaces (Including Shelves and Interior of Open Front Cabinets):	Acid-resistant laminated plastic "Chemsurf" by WilsonArt, color as selected by Architect from standard patterns, satin finish.
14.	Security and Dust Panels:	Particleboard, 3/4" thick at all lockable drawers.
15.	Track for Sliding Glass Doors:	Knape & Vogt No. [965KA][1092 Series]

2.4 GLAZING

A. 1/4" thick clear laminated safety glazing with all exposed edges ground smooth.

B. Glass shelves (if indicated) 5/8" thick clear laminated safety glazing with all exposed edges ground smooth.

2.5 HARDWARE

A. Hinge option: Unless noted otherwise, BLUM concealed self-closing hinge with Inserta Plate, silver shall be used.

B. Pulls for doors and drawers: Hafele Stainless Steel U-shaped wire pull.

C. Sliding door hardware:

1. For 3/4" sliding glass door: Engineered Product Co. EPCO, Part No.11

2. For 1/4" glass sliding doors: Knape and Vogt No. 992 Series

D. Drawer Slides:

1. Accuride Heavy Duty, full extension with +1.5" extension, with ball bearings.

E. Wall standards and brackets: Knape and Vogt No. 83 Standard with No. 183 brackets for heavier duty.

F. Door and drawer locks:

1. For cabinet doors: COMPX NATIONAL, "Pin Tumber Door & Drawer Locks" No. C-8173 Lock.

a. Ensure lock face sits flush with face of casework door, size lock depth to match door panel thickness.

2. For cabinet drawers: COMPX NATIONAL, "Pin Tumber Door & Drawer Locks" No. C-8178 Lock.

3. For sliding wood doors, COMPX NATIONAL, "Pin Tumber Sliding Door, File Cabinet Locks" No. C-8142 lock.

4. For sliding glass doors: Olympus, "Showcase/Ratchet Lock" No. 329R-26D

G. Metal Shelf Supports at exposed opening shelving shall be Knape and Vogt No. 346 Series with cushion #129 RUB. Provide (2) #8 wood screws per shelf support at opposite corners for seismic restraint.

H. Shelf Supports at adjustable shelves at cabinet doors shall be 'Accuride' or 'Blum' earthquake rated shelf clips.

I. Magnetic catches shall be Engineered Product Co. EPCO, Part No. 593.

J. Grommets: Doug Mockett and Company, Inc. SG Series; TG Flip0Top Series Plastic 2" diameter. Colors and locations as selected by Architect.

K. Hanger Rods: 1-1/16" diameter tubing, stainless steel.

L. Remainder of hardware required shall be as listed in Supplement No. 1 to Sections 14 and 15 of the Manual of Millwork.

2.6 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and sized to permit passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

D. In freestanding base casework with utilities, provide enclosed chase from penetration into casework (includes through floor penetrations) to termination at fixture. Utilities to be entirely concealed by chase. Provide plastic laminate clad face and edged banded removable access panels as necessary for full accessibility to utilities. Access panels to be located at unexposed portion of casework. Chase and access panels shall in no way reduce or infringe on ADA and Title 24 accessibility requirements.

E. Install plastic grommets in the field in plastic laminate casework and [Owner][District]-furnished furniture as directed by the [Owner][District]'s Representative and/or Architect.

F. Install seismic shelf lips on all exposed edges of open laboratory shelving with flathead countersunk wood screws spaced 6" on center. Finish exposed screw heads to match color of shelf lip.

G. Install one adjustable shelf for each 12" of height for all wall mounted cabinets.

H. Provide stretcher at top face of all door and drawer fronts.

I. Fabricate base and full height cabinets 24" deep unless shown otherwise.

J. Fabricate wall mounted upper cabinets 12" deep unless shown otherwise.

K. Provide locks as indicated at location shown on Drawings for both doors and drawers.

L. Provide acid-resistant laminated plastic at all exposed surfaces (including shelves and interior of open front cabinets.)

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

A. Set and secure casework in place rigid, plumb, and level.

B. Install casework in accordance with Installation of Architectural Millwork, Section 26 of the Manual of Millwork.

3.3 ADJUSTING AND CLEANING

A. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly and correctly.

B. Clean casework, shelves, hardware, fittings and fixtures.

3.4 SCHEDULE

A. All casework shall be plastic laminate covered unless specifically noted otherwise.

END OF SECTION

SECTION 071324
Pre-Applied Sheet Membrane Waterproofing

PART 1 — GENERAL

1.01 SUMMARY

A. The Work of this Section includes, but is not limited to, pre-applied sheet membrane waterproofing that forms an integral bond to poured concrete for the following applications:
   1. Vertical Applications: Membrane applied against soil retention system prior placement of concrete or shotcrete foundation walls or placement of cast-in-place concrete walls;
   2. Horizontal Applications: Membrane applied on prepared subbase prior to placement of concrete slabs.

B. Related sections include, but are not limited to, the following:
   1. Section 312000 – Earth Moving
   2. Section 031500 – Concrete Accessories
   3. Section 032000 – Concrete Reinforcing
   4. Section 033000 – Cast-In-Place Concrete

1.02 SUBMITTALS

A. Submit manufacturer's product data, installation instructions, and membrane samples for approval.

1.03 REFERENCE STANDARDS

The following standards and publications are applicable to the extent referenced in the text.

A. ACI International (ACI):

ACI 506.2 Specification for Shotcrete

1. American Society for Testing and Materials (ASTM):

C 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
D 412 Standard Test Methods for Rubber Properties in Tension
D 570 Standard Test Method for Water Absorption of Plastics
D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
D 3767 Standard Practice for Rubber - Measurements of Dimensions
D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
E 96 Standard Test Methods for Water Vapor Transmission of Materials
E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.04 QUALITY ASSURANCE

A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five (5) years.

B. Installer: A firm which has at least three (3) years experience in work of the type required by this section.

C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

    a. Include waterproofing Installer, reinforcing steel Installer, concreting/shotcreting Installer, Installers of items penetrating waterproofing, waterproofing consultant, Owner's testing agency, Architect, sheet waterproofing manufacturer's representative, Contractor, Construction Manager, and Owner's representative.

    b. Review working conditions and substrate conditions required by sheet waterproofing manufacturer.

    c. Review project details and discuss detrimental conditions that may interfere with satisfactory installation.

E. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than recommended by the manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer’s instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.

1.06 PROJECT CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.07 WARRANTY

A. Sheet Membrane Waterproofing: Provide written five year material warranty issued by the membrane manufacturer upon completion of work.

PART 2 — PRODUCTS

2.01 MATERIALS

A. Pre-Applied Integrally Bonded HDPE Sheet Waterproofing Membrane: PREPRUFE® 275 Membrane by GCP Applied Technologies, a 0.95 mm (0.038 in) nominal thickness composite sheet membrane consisting of 0.50 mm (0.020 in.) of high density polyethylene film, a pressure-sensitive adhesive and a trafficable weather resistant coating. The membrane shall be supplied in a kick-out roll orientation and shall have no release liner to reduce waste onsite. The membrane shall form an integral, adhesive, and permanent bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete and shall include dual adhesive ZipLap technology to complete side laps and secure adjacent sheets. Provide membrane with the following physical properties:

PHYSICAL PROPERTIES FOR PREPRUFE® 275 MEMBRANE:

Property	Test Method	Typical Value
Color		White
Thickness	ASTM D 3767 Method A	0.95 mm (0.038 in.) nominal
Lateral Water Migration Resistance	ASTM D 5385 Modified[1]	Pass at 71 m (231 ft) of hydrostatic head pressure
Low Temperature Flexibility	ASTM D 1970	Unaffected at -20°F (-29°C)
Elongation	ASTM D 412 Modified[2]	300%
Crack Cycling at -23°C (-9.4°F), 100 Cycles	ASTM C 836	Unaffected, Pass
Tensile Strength, film	ASTM D 412	27.6 MPa (4,000 lbs/in.^{2})
Peel Adhesion to Concrete	ASTM D 903 Modified[3]	700 N/m (4.0 lbs/in.)
Lap Adhesion	ASTM D 1876 Modified[4]	1225 N/m (7.0 lbs/in.)
Resistance to Hydrostatic Head	ASTM D 5385 Modified[5]	55 m (180 ft)
Puncture Resistance	ASTM E 154	600 N (135 lbs)
Permeance	ASTM E 96 Method B	0.6 ng/Pa x s x m^2 (0.01 perms)
Water Absorption	ASTM D 570	0.5%

Footnotes:

1. *Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the blind side waterproofing membrane.*
2. *Elongation of membrane is run at a rate of 50 mm (2 in.) per minute at room temperature.*
3. *Concrete is cast against the protective coating surface of the membrane and allowed to cure (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 50 mm (2 in.) per minute at room temperature.*

4. *The test is conducted 15 minutes after the lap is formed as per manufacturer's instructions and run at a rate of 50 mm (2 in.) per minute at room temperature.*
5. *Hydrostatic head tests are performed by casting concrete against the membrane with a lap. Before the concrete sets, a 3 mm (0.125 in.) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface.*

2.02 Ancillary Products

A. Waterstop: ADCOR® hydrophilic waterstop or DE NEEF® Injecto® Tube groutable waterstop by GCP Applied Technologies for non-moving concrete construction joints.

B. Preformed Soil Retention Wall Tieback Cover: PREPRUFE® Tieback Cover by GCP Applied Technologies as a prefabricated detail for soil retention wall tiebacks.

C. Tape for covering cut edges, roll ends, penetrations and detailing: PREPRUFE® Tape LT (for temperatures between 25°F (-4°C) and 86°F (30°C)) and PREPRUFE® Tape HC (for use in Hot Climates, minimum 50°F (10°C)).

D. Miscellaneous Materials: accessories specified or acceptable to manufacturer of pre-applied waterproofing membrane.

PART 3 — EXECUTION

3.01 EXECUTION

A. The Installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the Contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 SUBSTRATE PREPARATION

A. It is essential to create a sound and solid substrate to eliminate movement during the concrete pour or shotcrete placement. Substrates must be regular and smooth with no gaps or voids greater than 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability.
Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 0.5 in. (12 mm) out of alignment.

3.04 INSTALLATION, VERTICAL APPLICATIONS

A. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:

1. Place the membrane HDPE film side to the substrate with the green zip strip facing towards the concrete pour. End laps should be staggered to avoid a build-up of layers.
2. Leave the green and blue zip strips in position until the overlap procedure is completed and the lap is to be made.

3. Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge with a red guideline. The blue zip strip on the underside of the succeeding membrane shall be positioned on top of the green zip strip on the top of the previous sheet. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap.
4. Peel back and remove both the green and blue zip strips in the overlap area to achieve an adhesive to adhesive bond, lining up leading edge of the top sheet with the red guideline.
5. For lengths of membrane greater than 8 ft. (2.4 m), fastening can be made through the selvedge within 0.5 in. (13 mm) from the leading edge of the membrane using a small low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps.
6. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller.
7. Overlap all roll ends and cut edges by a minimum 3 in. (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary.
8. Allow to dry and apply PREPRUFE® Tape LT (or HC in hot climates) centered over the lap edges and roll firmly. Apply additional PREPRUFE® Tape LT (or HC in hot climates) a minimum of 2 in. (50 mm) beyond all edges of membrane that are not sealed by the selvedge.
9. Immediately remove tinted plastic release liner from the PREPRUFE® Tape.
10. Immediately remove tinted plastic release liner from the PREPRUFE® CJ Tape.
11. Protect membrane, tape and ancillaries in accordance with manufacturer's recommendations until placement of concrete. Inspect for damage just prior to placement of concrete and make repairs in accordance with manufacturer's recommendations.

3.05 PROTECTION

Protect membrane in accordance with manufacturer's recommendations until concrete or shotcrete placement. Inspect for damage just prior to concrete or shotcrete placement and make repairs in accordance with manufacturer's recommendations.

SECTION 07 61 00
Sheet Metal Roofing

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Precoated galvanized steel roofing and associated flashings.

B. Counterflashings.

C. Underlayments.

D. Clips, fasteners, closures, and accessories.

E. Gutters and downspouts where indicated as part of this system.

F. Integral fascias where indicated as part of this system.

G. Coordinate transitions to other roofing systems indicated to form a complete integrated roof assembly.

1.2 REFERENCES

A. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A755 - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

C. ASTM A792 - Standard Specification for Steel Sheet, 55% Aluminum - Zinc Alloy. Coated by the Hot-Dip Process.

D. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

E. ASTM D226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

F. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos Free.

G. ASTM E283 – Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Skylights, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.

H. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

I. SMACNA - Architectural Sheet Metal Manual.

J. UL (Underwriters Laboratories) - Wind Resistance Classification.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit Shop Drawings, showing material profile, jointing pattern, jointing details, fastening methods, and installation details.

C. Submit two 24" square Samples of metal roofing mounted on plywood backing and illustrating typical batten seam, underlayment material, and finish.

D. Submit manufacturer's installation instructions.

1.4 SYSTEM DESCRIPTION

A. Metal roof system with exposed fasteners. [with snap-on batten caps.]

B. UL 90 rated roofing system that has been tested in accordance with UL 580 test procedures.

C. Resistance to Air Infiltration: 0.014 cfm per lineal foot of joint when tested in accordance with ASTM E283 at static test pressure differential of 20 psf.

D. Resistance to Water Infiltration: No leakage through panel joints when tested in accordance with ASTM E331 at static test pressure differential of 20 psf.

1.5 QUALITY ASSURANCE

A. Installer: Company specializing in sheet metal roof installations with five years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products as recommended by manufacturer.

B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials during storage which may cause discoloration or staining.

1.7 WARRANTY

A. Provide AEP Span Dura Tech 5000/Dura Tech mx 30 year Limited Warranty against defective materials and finish.

B. Provide installer's 2-year warranty coverage for water tightness and integrity of seals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. AEP Span.

B. [MBCI Inc., "Craftsman LB" Series., www.mbci.com]

C. [McElroy Metal, Inc., "Medallion II"., www.mcelroymetal.com]

D. [The Garland Company, Inc., www.garlandco.com]

E. Substitutions: Under provisions of Section 01 62 00.

2.2 SHEET MATERIALS

A. Roof Panels: HR-36® exposed-fastener metal panel system with net coverage 36", rib depth 1-1/2" @ 7.2" o.c.

B. 24 Gauge Pre-Coated Galvanized Steel: ASTM A755 on Zinc-Coated Galvanized Substrate, ASTM A653, Grade 33, G90 zinc coating in accordance with ASTM A924 or ASTM A792, or Grade 50, AZ 55 aluminum/zinc coating; 0.0249" thick core steel, factory pre-coated with "Kynar 500 / Hylar 5000" coating in manufacturer's standard color as selected by Architect.

C. Batten Caps: Snap-on type, 1-1/2" wide x 1-1/2" high.

D. Eave, Hip and Ridge Strips: Snap-on and /or mechanical fasteners as required.

E. Gutters and Downspouts: To match roofing, except downspouts within 8' of finished grade shall be field-painted galvanized steel pipe, Schedule 40.

2.3 ACCESSORIES

A. Exposed Fasteners: Galvanized steel or stainless steel with neoprene washers. Finish exposed fasteners same as flashing metal.

B. Concealed Fasteners: Galvanized steel pancake head Phillips drive screws. Self-drilling, self-tapping as required by substrate.

C. Clip Assemblies: Manufacturers standard clip, 0.0478" thick galvanized steel, 33 ksi yield strength, 2-1/2" or 3-1/2" long double or single fastener type, to suit the system.

D. Underlayment: 40 mil Grace Ice & Water Shield or approved equal.

E. Slip Sheet: 0.05 psf rosin-sized building paper.

F. Sealant: As specified in Section 07 92 00.

G. Plastic Cement: ASTM D4586, Type I.

2.4 FABRICATION

A. Roll form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats and starter strips of same material as sheet, interlockable with sheet.

C. Form pieces in longest practical lengths continuous from ridge to eave.

D. Hem exposed edges on underside 1/2"; miter and seam corners.

E. Form material with batten seams.

F. Fabricate vertical faces with bottom edge formed outward 1/4" and hemmed to form drip.

G. Fabricate flashings to allow toe to extend 2" over roofing. Return and brake edges.

2.5 FINISHING

A. DuraTech® 5000 (Polyvinylidine Fluoride), full 70% Kynar® 500/Hylar 5000® consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 10-30% when tested in accordance with ASTM D-523- 89 at 60°.

B. [Zincalume® Plus protective coating., www.aepspan.com]

C. [DuraTech® mx metallic finish, consisting of a baked-on primer (0.15-0.2 mil.) and a baked-on Polyvinylidine Fluoride finish coat (0.7-0.8 mil.) with a specular gloss of 20-35% when tested in accordance with ASTM D-523-89 at 60°.]

D. Color to be selected by Architect from manufacturer's entire range of standard

colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains, valley or eaves.

B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.

C. Where used in conjunction with other roof systems, verify roofing membrane termination and base flashings are in place, sealed, and secure.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Field measure site conditions prior to fabricating Work.

B. Install starter and edge strips, and cleats before starting installation.

3.3 INSTALLATION

A. No special seaming equipment should be required to install this system.

B. Apply underlayment in single layer laid perpendicular to slope; weather lap edges 2" and nail in place. Minimize nail quantity.

C. Apply slip sheet material over underlayment in similar fashion to underlayment.

D. Cleat and seam all joints.

E. Stagger transverse joints of roofing and slip sheets.

3.4 BATTEN SEAM ROOFING

A. Execute metal Work in accordance with SMACNA standards and manufacturer's details and instructions.

3.5 FLASHINGS

A. Conform to SMACNA details and manufacturer's details and standards.

B. Secure flashings in place using concealed fasteners.

C. Cleat and seam all joints.

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal metal joints watertight.

3.6 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 45 29.

B. Inspection will involve surveillance of Work during installation to ascertain compliance with specified requirements.

3.7 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 87 00.

B. Do not permit traffic over unprotected roof surfaces.

END OF SECTION

SECTION 07 62 00
Sheet Metal Flashing and Trim

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pre-coated, coping, parapet, and cap flashings.

B. Fascias, gutters, valleys, and scuppers.

C. Counterflashings at piping penetrations, vent pipes, and conduits.

D. Counterflashings over bituminous base flashings.

E. Counterflashings at roof mounted equipment, curbs and supports.

F. Counterflashings for roof hatches and skylights.

G. Flexible sheet flashing and elastic flashing.

H. Manufactured reglets.

I. Sill-pans (sheet metal sub-pans) for windows and storefront units.

1.2 REFERENCES

Contractor's work shall comply with the following standards as applicable.

Manufactured items are to be fabricated to these same standards.

The following standards (and publications) are applicable to the extent referenced in the text. The most recent of these standards is implied, unless otherwise stated.

A. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A755 - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

C. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM B32 - Standard Specification for Solder Metal.

E. ASTM B101 - Standard Specifications for Lead-Coated Copper Sheet and Strip for Building Construction.

F. ASTM D226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

G. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos Free.

H. SMACNA - Architectural Sheet Metal Manual.

1.3 SYSTEM DESCRIPTION

A. Work of this Section is to physically protect [membrane roofing,] [pre-formed metal roofing] [and] [base flashings,] from damage that would permit water leakage to building interior.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing Work with five years minimum experience.

B. Perform Work in accordance with SMACNA standard details and requirements.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit Shop Drawings of sheet metal items indicating profiles, jointing, terminations, sill pans and installation details. Indicate type and spacing of fasteners.

C. Submittal of specific plates from the SMACNA Architectural Sheet Metal Manual constitutes acceptable documentation of installation details.

D. Submit Product Data for pre-coated galvanized steel and flashing accessories.

E. Submit two 4" square Samples illustrating metal finish color for pre-coated steel.

1.6 STORAGE AND HANDLING

A. Store products under provisions of Section 01 87 00.

B. Stack preformed material to prevent twisting, bending, or abrasion, and to provide ventilation.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.7 WARRANTY

A. Provide manufacturer's 20-year warranty against defective materials and finish.

B. Provide installer's 2-year warranty coverage for water tightness and integrity of seals.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

A. Pre-Coated Galvanized Steel: ASTM A755 on zinc-coated galvanized substrate, ASTM A653, Grade 33, G90 zinc coating in accordance with ASTM A924; 0.0299" thick core steel, factory pre-coated with "Kynar 500" or "Hylar 5000" coating of color to be selected by Architect.

2.2 ACCESSORIES

A. Lead-Coated Copper: ASTM B101, Temper H00 and H01, cold-rolled copper sheet, coated both sides with lead weighing not less than 12 pounds per 100 square feet or more than 15 pounds per 100 square feet total weight of copper sheet with lead applied to both sides.

B. Fastener: Galvanized steel or stainless steel with soft neoprene washers at exposed fasteners. [Finish exposed fasteners shall match pre-coated metal.]

C. Underlayment: ASTM D266; No. 30 asphalt-saturated roofing felt.

D. Metal Primer: As specified in Section 09 91 00.

E. Protective Backing Paint: Zinc chromate alkyd.

F. Slip Sheet: 0.05 psf, rosin-sized building paper.

G. Sealant: As specified in Section 07 92 00.

H. Bedding Compound: Rubber-asphalt type.

I. Plastic Cement: ASTM D4586, Type I.

J. Metal Flashing System: Two piece pre-coated galvanized steel similar to Springlok Flashing System, manufactured by Fry Reglet, type as indicated. Include fabricated end closures and mitered corners.

K. Solder for Lead-Coated Copper: ASTM B32, Grade SN 60% tin, 40% lead.

L. Solder for Zinc: ASTM B32; 50/50 tin/lead type, with rosin flux.

M. Self-Adhesive Flexible Sheet Flashing: 40-mil-thick composite of polyethylene film and self-adhesive rubberized asphalt with embossed slip-resistant surface; "Ice and Water Shield" by W.R. Grace or approved equal.

N. Manufactured Reglets: Two piece pre-coated galvanized steel, spring-action type similar to "Springlock Flashing System" or approved equal, manufactured by Fry Reglet, type as indicated. Include fabricated end closures and mitered corners. Finish: Manufacturer's gray epoxy primer; exposed portions shall be field finish painted as specified in Section 09 91 00.

O. Fabricated Galvanized Sill Pans. Shop fabricate sill pans from 24 ga, fully soldered and watertight as per the drawings. Protect underside of pans sitting atop concrete surfaces with continuous layer of self-adhered flashing.

2.3 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate concealed cleats of galvanized steel, ASTM A653, Grade 33, G90 zinc coating, 0.0478" thickness, interlockable with sheet.

C. Fabricate exposed cleats and coverplates of same material as sheet, interlockable with sheet.

D. Form pieces in longest practical lengths.

E. Hem exposed edges on underside 1/2". Miter and seam corners.

F. Form material with flat lock seam.

G. Solder and seal metal joints. After soldering, remove flux. Wipe and wash solder joints clean.

H. Fabricate corners from one piece with minimum 18" long legs; seam for rigidity, seal with sealant.

I. Fabricate vertical faces with bottom edge formed outward 1/4" and hemmed to form drip.

J. Fabricate flashings to allow toe to extend 4" over [bituminous base flashings] [roofing surface]. Return and brake edges.

K. Fabricate vent pipe and roof penetration flashings of non lead-bearing material with clamping ring and storm collar.

2.4 FINISH

A. Shop prepare and prime exposed ferrous metal surfaces.

B. Back-paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

C. Site paint exposed to view metal surfaces under provisions of Section 09 91 00.

D. "Kynar 500" or "Hylar 5000" factory pre-coated finish with 0.2 mil baked on primer and 0.8 mil baked on topcoat for a 1.0 mil dry film thickness. Finish shall be warrantied for a minimum of 20 years against all defects.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.

B. Verify membrane termination and base flashings are in place, sealed, and secure.

C. Contractor to confirm that site conditions and substrates are ready for sheet metal work to commence. If not, make suitable repairs or adjustments to the work. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Field measure site conditions prior to fabricating Work.

B. Install starter and edge strips, and cleats before starting installation.

C. Install surface-mounted reglets true to line and level. Seal top with sealant.

D. Install underlayment with protective slip sheet over parapets, caps, copings, gravel stops and curbs.

3.3 INSTALLATION

A. Conform to indicated details on the Drawings and the recommendations included in the SMACNA Architectural Sheet Metal Manual.

B. Provide for thermal expansion of exposed sheet metal Work. Space movement joints at 10' on center maximum with no joints within 2' of corners. Attach members with clips to permit movement without damage, or provide slotted or oversize holes with washers.

C. Form expansion joints of intermeshing hooked flanges filled with sealant.

D. Insert flashings into reglets to form tight fit. Secure in place with lead wedges at maximum 12" on center. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.

E. Secure flashings in place using concealed fasteners. Use exposed fasteners only where indicated.

F. Lap, lock, seam and seal all joints. Make lock seam Work flat and true to line, and sweat full of solder, except where installed to permit expansion and contraction. Lap flat lock seams, and lap seams where soldered according to pitch, but in no case less than 3". Make seams in direction of flow.

G. Apply plastic cement compound between metal flashings and felt flashings. Apply bituminous coating between dissimilar metals where occurs.

H. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

I. Roof-Penetration, Vent Pipe Flashing: Turn lead flashing down inside vent piping. Clamp flashing to other pipes penetrating roof except for vent piping. Seal with elastomeric sealant.

J. Solder metal joints watertight for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

K. Seal metal joints watertight and weathertight throughout.

3.4 FIELD QUALITY CONTROL

A. Conform to SMACNA Architectural Sheet Metal Manual.

B. Field observation will involve surveillance of Work during installation to ascertain compliance with specified requirements.

3.5 CLEANING AND ADJUSTMENT

A. Leave Work clean and free of stains, scrap and debris.

B. Repair and replace damaged Work.

END OF SECTION

SECTION 07 95 13
Expansion Joint Covers

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Floor expansion joint cover assemblies.

B. Wall expansion joint cover assemblies.

C. Ceiling/soffit expansion joint cover assemblies.

D. Roof expansion joint cover assemblies.

E. Fire barrier systems.

1.2 REFERENCES

A. ASTM A36 – Standard Specification for Carbon Structural Steel.

B. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

C. ASTM A786 - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High Strength Low-Alloy, and Alloy Steel Floor Plates.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

F. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.

G. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications.

H. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials.

I. ASTM E814 – Standard Test Method for Fire Tests of Penetration Firestop Systems.

J. CCR - California Code of Regulations, Title 24, Part 2, Section 706a.

K. NAAMM - National Association of Architectural Metal Manufacturers.

L. CBC - California Building Code.

M. UL - Underwriters Laboratories.

1.3 SUBMITTALS

A. Submit data under provisions of Section 01 33 00.

B. Shop Drawings: Indicate joint and splice locations, miters, layout of the Work, affected adjacent construction, and anchorage locations.

C. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices, and available colors and finish.

1.4 REGULATORY REQUIREMENTS

A. Fire Performance: Determined by ASTM E119 and ASTM E814 including hose stream test of full-rated period by UL 263.

B. Fire-Resistive Joint Systems: Shall have been tested in accordance with CBC Chapter 715.

C. Loading Characteristics: Floor covers capable of withstanding a minimum point load of 2,000 lbs. without damage or permanent deformation.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 60 00.

B. Deliver materials to site in as large as possible sections and assemblies.

C. Provide temporary protective cover for finished metal surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Balco Co., (714) 441-3418., wwwbalcousa.com

B. Conspec Controls, Inc., (909) 392-5500., www.conspec-controls.com

C. MM Systems Corporation, (562) 945-8951., www.mmsystemscorp.com

D. Watson Bowman Acme, (800) 677-4922., www.watsonbowmanacme.com

E. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Structural Steel Shapes: ASTM A36.

B. Steel Plates: ASTM A283, Grade C.

C. Rolled Steel Plates: ASTM A786.

D. Aluminum Extrusions: ASTM B221, 6063-T5 alloy.

E. Aluminum Sheet and Plate: ASTM B209, 6061-T6 alloy.

F. Stainless Steel: Type 304.

G. Elastomeric Sealant: ASTM C920.

H. Extruded Preformed Seals: ASTM D2000, formed to fit frames.

I. Water Barrier: PVC and thermoplastic rubber classified under ASTM D2000.

J. Fire Barrier: High temperature insulation with metallic cover tested for required dynamic structural movement without fatigue. Component of joint cover tested in accordance with ASTM E119, CCR, Title 24, and ASTM E814 including hose stream test.

K. Abrasive Grit: Two-component epoxy combined with aluminum oxide grit.

L. Threaded Fasteners: Stainless steel.

M. Backing Paint: Asphaltic type.

2.3 FABRICATION

A. Aluminum cover plate, aluminum frame construction, with resilient elastomeric filler strip, designed to permit plus or minus 50% joint movement with full recovery, and flush mounted.

B. Back paint components in contact with cementitious materials.

C. Galvanize embedded ferrous metal anchors and fastening devices.

D. Shop assemble components and package with anchors and fittings.

E. Provide joint components in single length wherever practical. Minimize site splicing.

F. Miter corners and changes in direction with hairline joints.

G. Fabricate fire barrier and provide fire-resistant sealant required for fire-resistant installation in accordance with UL listing.

2.4 FINISHES

A. Comply with NAAMM Metal Finishes Manual.

B. Painted Finish: Thermocured fluorocarbon coating of "Kynar 500" or "Hylar 5000" resin. Color as selected by Architect from manufacturer's entire range of available colors.

C. Preformed Seals: As selected from manufacturer's entire range of available colors.

D. Elastomeric Sealant: As selected from manufacturer's entire range of available colors.

E. Stainless Steel: NAAMM-M32, mechanical finish, medium satin.

F. Abrasive Grit: As selected from manufacturer's entire range of available colors.

G. Factory Primed Concealed Surfaces: Shop coat of manufacturer's standard primer, minimum 2.0 mils thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions.

B. Verify that joint preparation and affected dimensions are acceptable.

3.2 PREPARATION

A. Provide anchoring devices for installation and embedding.

B. Provide templates and rough-in measurements.

3.3 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level [, flush with adjacent surfaces].

C. Rigidly anchor to substrate to prevent misalignment. Locate not less than 3" from ends and at no more than 24" on center.

D. Allow adequate free movement for thermal expansion and contraction of metal.

E. Install preformed seals with minimum number of end joints.

F. Heat seal field splice of preformed seals to watertight condition.

G. Install secondary seals in continuous lengths without field splices.

H. Install fire barrier in accordance with manufacturer's instructions and UL listing.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 87 00.

B. Do not permit traffic over unprotected floor joint surfaces.

C. Provide removable strippable coating to protect finish surface.

3.5 JOINT COVER SCHEDULE

JOINT LOCATION	MANUFACTURER	MODEL NUMBER
Interior Floor Joint	Balco	BHS-4 Hinge
Interior Wall Joint	Balco	CML-4
Interior Wall/Ceiling Joint	Balco	CML-4
Exterior Wall Joint	Balco	9W-3.5-7
Exterior Soffit Joint	Balco	9W-3.5-7
Roof Joint	Balco	LPR-3.5-9

END OF SECTION

SECTION 08 13 13
Hollow Metal Doors and Frames

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Related Sections:

1. Section 08 71 00 Door Hardware.

2. Section 08 80 00 Glazing; for glass view panels in hollow metal doors.

3. Section 09 91 00 Painting; for field painting hollow metal doors and frames.

B. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.3 – Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames

2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Anchors.

3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

4. ANSI/SDI A250.8 - Standard Steel Doors and Frames.

5. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

6. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

9. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

10. ASTM E90 – Standard Test Method for Laboratory Measurement of AirBorne Sound Transmission Loss of Building Partitions and Elements

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

12. ANSI/BHMA A156.15 - Closer Holder, Electromagnetic and Electromechanical.

13. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.

14. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.

15. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.

16. SDI-117 - Manufacturing Tolerances Standard Steel Doors and Frames.

17. UL 10C - Positive Pressure Fire Tests of Door Assemblies.

18. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

19. California Building Code and amendments.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4" high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4" space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.5 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. CECO Door Products., www.cecodoor.com
2. Curries Company., www.curries.com
3. Security Metal Products.
4. Steelcraft., www.steelcraft.com

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/ A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A653/ A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A653/ A653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 ENERGY EFFICIENCY HOLLOW METAL DOORS

A. General: Provide 1-3/4" doors of design specified, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

2. Core Construction: Steel stiffened laminated core with fiberglass filler with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".

   a. Provide 22 gauge steel-stiffeners at 6" on-center internally welded at 5" on center to integral core assembly, No stiffener face welding is permitted.

   b. Acoustical sound transmission rating shall be no less than STC 38 complying with ASTM E90 and must be visible on factory applied labels.

3. Level/Model: Level 2 and Physical Performance Level A (Heavy Duty), Minimum 18 gauge (0.042" - 1.1-mm) thick steel, Model 2.

4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8" in 2" (3 mm in 50 mm).

5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.

6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".

7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Manufacturers Basis of Design:

1. CECO Door Products Trio-E/Trio Series., www.cecodoor.com

2. Curries Company, “777E Series Trio-E”, www.curries.com

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A1008/ A1008M.

1. Fabricate frames with mitered or coped corners.

2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.

3. Frames for Level 2 Steel Doors: Minimum 16 gauge (0.053" - 1.3-mm) thick steel sheet.

4. Frames for Level 3 Steel Doors (up to 48" in width): Minimum 16 gauge (0.053" - 1.3-mm) thick steel sheet.]

5. Frames for Level 3 Steel Doors (48" and up in width): Minimum 14 gauge (0.067" - 1.7-mm) thick steel sheet.]

6. Frames for Wood Doors: Minimum 16 gauge (0.053" - 1.3-mm) thick steel sheet.

7. Frames for Borrowed Lights: Minimum 16 gauge (0.053" - 1.3-mm) thick steel sheet.

8. Manufacturers Basis of Design:

a. CECO Door Products BQ/~~BU~~/DQ/DU Series (Drywall Profile).

b. CECO Door Products SQ/SU/SR/ Series (Masonry Profile).

c. Curries Company C/CM/CG Series (Drywall Profile).

d. Curries Company M/G Series (Masonry Profile).

C. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042" thick, with corrugated or perforated straps not less than 2" wide by 10" long;

or wire anchors not less than 0.177" thick.

2. Stud Wall Type: Designed to engauge stud and not less than 0.042" thick.

3. Windstorm Opening Anchors: Types as tested and required for indicated wall types to meet specified wind load design criteria.

4. FEMA 361 Storm Shelter Anchors: Masonry T-shaped, wire masonry type, or existing opening type anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042" thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016" thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8" (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048" thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

E. Glazing: Comply with requirements in Section 08 80 00 Glazing and with the hollow metal door manufacturer's written instructions.

F. Factory Glazing: Factory install glazing in doors as indicated. Doors with factory installed glass to include all of the required glazing material.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016" thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.

2. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4" beyond edge of door on which astragal is mounted.

3. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Section 08 71 00 Door Hardware.

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

   a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48" and wider with mortise butt type hinges

at top hinge locations.

5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.

7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.

8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18" from top and bottom of frame. Space anchors not more than 32" o.c. and as follows:

        1. Two anchors per jamb up to 60" high.

        2. Three anchors per jamb from 60" to 90" high.

        3. Four anchors per jamb from 90" to 120" high.

        4. Four anchors per jamb plus 1 additional anchor per jamb for each 24" or fraction thereof above 120" high.

    b. Stud Wall Type: Locate anchors not more than 18" from top and bottom of frame. Space anchors not more than 32" o.c. and as follows:

        1. Three anchors per jamb up to 60" high.

        2. Four anchors per jamb from 60" to 90" high.

        3. Five anchors per jamb from 90" to 96" high.

        4. Five anchors per jamb plus 1 additional anchor per jamb for each 24" or fraction thereof above 96" high.

        5. Two anchors per head for frames above 42" wide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 71 00 "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.

3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

B. Factory Pre-Finished: Factory apply electrostatic paint finish to doors and frames in accordance with ANSI/SDI A250.3 test procedure acceptance criteria for steel doors and frames with factory applied finished coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

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

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

3. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8" ± 1/16".

b. Between Edges of Pairs of Doors: 1/8" ± 1/16".

c. Between Bottom of Door and Top of Threshold: Maximum 3/8".

d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4".

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Section 08 80 00 Glazing and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION

SECTION 08 51 14
Aluminum Classroom Windows

1.1 GENERAL

1.2 SECTION INCLUDES

A. Extruded aluminum windows with fixed and operating sash.

B. Glass and glazing.

C. Operating hardware.

D. Perimeter sealant.

E. Extra components for repair.

1.3 REFERENCES

A. FGIA/AAMA 101(2021) - Voluntary Specifications for Aluminum Vinyl (PVC) and Wood Windows and Glass Door.

B. ASTM B137 - Standard Test Method for Measurement of Coating Mass Per Unit Area on Anodically Coated Aluminum.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bar, Rod, Wire, Profiles, and Tube.

D. ASTM B680 - Standard Test Method for Seal Quality of Anodic Coatings on Aluminum by Acid Dissolution.

E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

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

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

H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

I. ASTM E344 - Terminology Relating to Thermometry and Hydrometry.

J. ASTM E413 - Classification for Rating Sound Insulation.

K. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls Cyclic Static Air Pressure Difference.

L. ASTM E987 - Standard Test Methods for Deglazing Force of Fenestration Products.

M. CCR - California Code of Regulations, Title 24, Part 6, 116.

N. CEC - California Energy Commission.

O. NFRC - National Fenestration Rating Council.

P. NAAMM - National Association of Architectural Metal Manufacturers.

Q. SIGMA - Sealed Insulating Glass Manufacturers Association.

1.4 PERFORMANCE REQUIREMENTS

A. Window design shall be of multiple equal light configuration unless noted otherwise, consisting of a double hung window and a fixed unit continuously interlocked on to the inner and outer edges of the adjoining frames and shall incorporate a port for weather sealing at the exterior. Windows shall be double hung configuration with bottom sash operable. All glazed units shall be easily removable for cleaning and glass repair. Where indicated or where encountered, vents, pipes, fans, or air conditioners are located in existing sash, that sash shall be glazed with a solid (base) panel made of hardboard core with both sides covered with aluminum with clear anodized finish allowing the existing structures to be mounted though or to the panel. If the object falls in the middle sash or lower sash, the overall unit shall be fixed. [In upstairs classrooms and unsupervised areas the bottom sash shall have aluminum restrictor clips mounted at the top of the sash to allow the window to be open to a maximum of 6".] As a level of standard, the window design, performance standards, and construction are based on the DeVAC 400 Series as manufactured by Mon Ray, Inc. or pre-approved equal.

B. Qualification: Fabrication shall be by a manufacturer who can furnish evidence to the District that they are, and have been for not less than (10) consecutive years, regularly engaged in the manufacture of aluminum replacement windows units for the type and quality specified for California public schools, together with a current list of completed school projects done in the local area.

C. Identification: The sill of each window shall have a permanently affixed metal label identifying the manufacturer.

D. Comply with air infiltration, water penetration and structural performance requirements indicated in FGIA/AAMA 101 for the type, grade and performance

class of window units required.

E. Provide current certified AAMA test report that reflects the window configuration and type specified.

F. Test each type and size of required window unit through a recognized testing laboratory or agency, in accordance with ASTM E330 for structural performance, with ASTM E283 for air infiltration and with both ASTM E331 and ASTM E547 for water penetration. Provide certified test results.

G. Thermal Performance: Overall U-value of 0.72 as rated in accordance with the National Fenestration Rating councils' (NFRC) Interim U-value Rating Procedure or in accordance with default table method approved by the California Energy Commission (CEC). Provide certified test results.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Show actual conditions at existing openings. Include wall opening and component dimensions; wall opening tolerances required; anchorage and fasteners; affected related Work; installation requirements. Incomplete Shop Drawings will be rejected for resubmittal.

C. Submit Product Data for each window, including manufacturer's installation instructions.

D. Submit one full-size mock-up illustrating window frame sections, corner section, mullion section, and panning, including head closure.

E. Submit two Samples of operating hardware.

F. Submit manufacturer's certification that window units meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Label to be permanently affixed to frame listing certified U-value, certifying organization and rating procedure.

B. Label to be temporarily affixed to frame certifying that air infiltration requirements of CCR, Title 24, Part 6 have been met.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect window units under provisions of Section 01 87 00.

B. Provide wrapping or strippable coating to protect prefinished aluminum surfaces.

1.8 WARRANTY

A. The window manufacturer shall furnish a written warranty against defects in workmanship and materials for a period of ten (10) years from the date of Substantial Completion. Warranty shall stipulate that service to windows shall be performed on job site and not at a point of manufacture. Warranty shall cover all portions and components of the system, including the laminated glass.

1.9 MANUFACTURER AND INSTALLER FOLLOW-UP

A. Manufacturer shall designate the factory certified installer as responsible to be on call for a period of five (5) years following the date of Project Closeout. During such time, all calls shall be responded to within eight (8) hours of notification by the District. On call shall include any repairs required for the system and caulking, as well as training and assistance to District staff as needed.

B. Following the five-year period and for the remainder of the ten- year warranty period, the manufacturer shall be on call to correct all defects in manufacture. If such corrections involve need for the designated factory-certified installer, then installer shall be included as well.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Blomberg, https://www.blombergwindows.com/

B. Efco, https://www.efcocorp.com/

C. Kawneer, https://www.kawneer.us/

D. Substitutions: Under provisions of Section 01 62 00.

2.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Performance Requirements:

1. Windows shall conform to FGIA/AAMA 101 Section 2.2.3 Vertical Operating Windows. Windows shall meet the designation DH C60 when a 4-1/2' x 7-1/2', (34 Sq. Ft.) minimum size window is tested. Operating force tests and air leakage tests are to be performed before water resistance testing.

2. Air Leakage: With the sash in the closed and locked position, window shall be tested in accordance with ASTM E283, and meet the following

performance requirements.

a. Air leakage for windows with less than 18 lineal feet of operable crack perimeter shall not exceed 0.15 CFM at 1.56 PSF or 0.35 CFM at 6.24 PSF, when a positive and negative pressure drop is applied to the window.

3. Water Resistance: The window shall be tested in accordance with ASTM E331. A water flow of five gallons per hour, per square foot of window area, is applied to exterior face of the window for 15 minutes. The positive static pressure will be measured at the exterior side of the window. No water shall pass the interior face of the window frame, nor penetrate into the area that would represent wall construction surrounding an installed window. The minimum pressure is 6.24 PSF (50 mph).

4. Uniform Structural Load: The window shall be tested with the sash closed and locked in accordance with ASTM E330. A positive and negative load of 90 PSF (187 mph) will be applied and maintained for a period of 10 seconds, with no permanent deformation of frame and sash in excess of 0.4% of its span. At the conclusion of these tests, there will be no glass breakage, permanent damage of fasteners, hardware parts nor other damage causing the window to be inoperable.

5. Sound Transmission Loss: The window when tested in accordance with ASTM E90 and ASTM E413 will have a calculated STC not less than 32 when the sash is glazed with 1/4" laminated glass.

6. Operating Force: Operating sash once started in motion will not require more than 35 pounds operating force to keep the sash in motion, in either direction.

7. Deglazing Test: Sash when tested in accordance with ASTM E987 will have no disengagement of the sash rails from the glass when a load of 70 pounds is applied to the horizontal rails and 50 pounds to the vertical rails.

8. Aluminum Anodic Finish and Hardness Test: Submit three 12" long pieces of anodically finished exterior sill, meeting rail and mullion cover. Each Sample will be tested for coating thickness, coating weight, stain resistance and hardness. The performance shall meet these minimums:

a. ASTM B137 (Anodized Coating Density) 38 grams per cubic inch.

a. ASTM B680 (Anodic Seal Integrity): No observable stain.

a. Rockwell Tester (Hardness): Gauge reading of 12 on Webster dial gauge.

9. Certified test reports for windows will be required.

2.3 MATERIALS

A. Extruded Aluminum:

1. ASTM B221, 6063 Alloy, T5 or T6 temper.

2.4 FABRICATED COMPONENTS

A. Frame: Frame corners to be butt and coped type, with permanent gaskets at corners, secured with aluminum of three # 8 x 5/8" nonmagnetic stainless steel screws at sill corners, and a minimum of at least two # 8 x 5/8" nonmagnetic stainless steel screws at head corners. All fasteners shall be anchored into integral extruded screw ports. Frame shall be double weather stripped with four extruded weather strip ports at jambs and head sections. Frame sections at exterior shall have a fully extruded port to receive necessary trim pieces. All frame members shall be fully extruded aluminum. The use of vinyl weather strip, frame liners, etc. will not be acceptable. Sealant only corners will not be acceptable. Mitered frame corners will not be acceptable.

B. Sash: All sash corners shall be butt and cope type. Mitered sash corners will not be acceptable. All sash corners shall be secured with # 6 x 1" thread cutting nonmagnetic stainless steel screws to insure tight corners when reassembling after consecutive glass repairs have been made. Corner joints shall be factory processed with a sealant hole that will allow filling of the corners with sealant to create a water tight seal. Meeting rails shall interlock when in closed position and be double weather stripped. All sash shall have a fully extruded lift rail a minimum of 3/16" thick running the approximate width of the sash. The lift rail shall be part of the sash rail and not a separate piece. All sash corners, lift rails and any sharp edges shall be de burred and made smooth. All horizontal sash rails shall be tubular, and furnished with required hardware. All sash shall be factory glazed with specified glazing material, held in place by a virgin vinyl wrap around marine glazing in one continuous piece.

C. Screens: (Not Used)

D. Sill: All frame sill members shall be tubular and have a continuous slope to the exterior of at least 5°. The sill weep system shall prevent the passage of air, dirt and insects to the interior and provide ample opening, relative to the window size, to prevent the accumulation of water. Weep flaps to be gravity operated to open and exhaust water, yet close to prevent air infiltration.

E. Base Panel: Where indicated, to fill space between the window sash and the bottom of the rough opening, an aluminum faced hardboard shall be used. Panel shall be factory laminated of 2.063" aluminum face sheets over a 3/16" thick hardboard. Edges of hardboard shall be primed or otherwise treated to prevent delamination from moisture.

F. Head Panel: Where indicated, to fill space between the top of the rough opening and top of the window sash, an aluminum faced insulated sandwich panel shall be used. Panel shall be factory laminated of 0.040" aluminum sheet each face over 1/8" hardboard adhered to isocyanurate foam filler.

G. Base and Head Panel Surrounds: Frame and trim shall be the same as, and interlocking and compatible with, the rest of the window and detailed so that when fully constructed the windows and panels form one unit to fill the complete opening.

H. Stackability: Where indicated, some windows may exceed four panes in height. Frame and sash assemblies shall be designed to permit interconnectability of all additional components of the system, including base and head panels and sash extension.

I. General: The entire window unit including head and base panels shall be constructed in a manner that will allow easy replacement of any hardware or weather stripping. The window unit shall be double weather stripped with a seal at all sash perimeters. All weather stripping in the sash shall be concealed to prevent accumulation of foreign matter or matting through cleaning, operating or handling, which would reduce the effectiveness or life of the weather stripping. Weather stripping shall be secured to prevent movement or loss when removing sash for cleaning or glass repair.

2.5 MATERIALS

A. All frame, sash and screen members to be extruded 6063T 6 prime billet aluminum with a nominal main wall thickness not less than 0.062". Aluminum shall pass gauge reading of 12 on Webster dial gauge when tested for hardness.

2.6 WEATHER STRIPPING

A. Windows shall be double weather stripped at sill, meeting rail and jambs with woven pile seal and rigid vinyl. All weather stripping to be silicone treated, UV stabilized polypropylene pile with an integral polypropylene fin type seal. This is to be bonded to a non-shrinking backing.

2.7 FINISH

A. Finish all areas of aluminum windows and components with electrolytically deposited color thickness equal to 215R1 Alcoa 0.7 mil thickness. Finish shall meet ~~ASTM E244~~ for 0.7 mils Architectural Class 1, ASTM B137 (Anodic Coating density) 38g/in3., ASTM B680 (Anodic Seal Integrity) no observable stain.

2.8 GLASS AND GLAZING MATERIALS

A. Glass:

1. All glass shall be 5/16" nominal thickness laminated panels as follows: Outside pane to be 1/8". Interlayer to be 0.030" clear or obscure. Inner pane to be 1/8" clear low E. Laminator shall be approved by the manufacturer.

2. Obscure interlayer is to be used for the bottom (operable) sash. All other glass, unless indicated otherwise, is to receive clear interlayers.

3. Visual Light Transmission (VLT): The VLT of the entire laminated assembly shall be equal to or better than 75%.

4. Solar Heat Gain Coefficient (SHGC): The SHGC of the entire laminated assembly shall be equal to or less than 0.65.

B. Glass Pane Assembly Heat Transmittance:

1. Winter Nighttime: 0.70 BTU.

2. Summer Daytime: 0.66 BTU.

C. Glass Pane Sizes:

1. Panes sizes to be factory cut to the following three (3) sizes only:

a. Narrow: 19-1/2" high x 17-1/4" wide for 39" nominal width sash.

b. Medium: 19-1/2" high x 19-1/4" wide for 43" nominal width sash.

c. Wide: 19-1/2" high x 21-1/4" wide for 47" nominal width sash.

d. Verify all glass sizes with manufacturer.

D. Glazing Method:

1. Frame assemblies shall be sized to accept the above sizes of glass and still meet the nominal dimensions shown. Assemblies shall be fully factory glazed, but shall be constructed to permit easy and quick in-shop reglazing by the District's forces.

2. Assemblies shall be factory glazed with 5/16" laminated glass, "G" or glazing grade. (See Architectural Drawings for specific locations.) White Poly masking protective paper clearly identifying manufacturer's name shall be left applied for shipping. Brown masking paper will not be accepted. Internally seal any glazing channels voids at glass corners. Fixed glazing panels shall rest on two resilient setting blocks located at quarter points of

the horizontal span. Use 100% solids, pre-shimmed polyisobutylene butyl pre formed glazing tape applied to the glazing stop lip. Toe bead with a class "A" caulking meeting Federal Specification ~~TT S 00230C~~. Glazing stops to be 0.062" extruded 6063T 6 tempered aluminum. Stops shall have a "poron" resilient sponge, with a self-adhering surface, applied to the outer edge of the snap in stop. Stops are to snap into an extruded channel and lock into place without any special tools needed for installation or removal.

2.9 EXTERIOR PANNING TRIM

A. All exterior panning shall be extruded 6063T 6 aluminum with a minimum wall thickness of 0.062" with configuration as detailed. When installed the panning shall cover all existing exterior window framing, mullions, and trim. Aluminum sections shall be one piece, designed to interlock into window frame for the full length of jamb, head, and sill sections, in a manner that will allow back sealing of the entire perimeter to provide a completely weather tight connection. Where the head and sill butts up to the jambs a stainless steel alignment clip shall be used and back sealed. Exposed screws and rivets will not be accepted on exterior panning and covers. Where existing windows protrude away from the building panning shall cover and wrap back to the stucco, brick or building fascia in a manner that covers all wood or metal. Angle panning shall be extruded 6063T 6 aluminum which will interlock onto the panning and have a flange to allow caulking of the seam. Mitered panning corners, or receptor type panning requiring an exposed sealant joint at the exterior, between the window frame and panning joint will not be accepted.

2.10 INTERIOR TRIM

A. All interior trim shall be extruded 6063T 6 aluminum with a minimum wall thickness of 0.50". Mounting clips and fasteners for trim shall be concealed so no exposed screws or rivets are visible.

2.11 MULLION AND TRANSOMS

A. Where two or more frames are joined together, horizontally or vertically, the connector design shall be continuously interlocked on to the inner and outer edges of the frame and shall incorporate a port for weather sealing at the exterior. There shall be no exposed screws on either the interior or the exterior. The mullions and transoms must be capable of withstanding the project design wind load on the total area without deflecting more than 1/175th of the span.

2.12 OPERATION

A. All vertical sliding sash shall operate on spring loaded nylon cushion blocks, incorporating a nonmagnetic stainless steel, nylon tipped pinlocks measuring 2 1/8" x 7/32" and 2-5/8" x 7/32". The pinlocks shall engage in predetermined

ventilating positions processed into the frame, and to lock window automatically when in the closed position. The pinlocks will be operated by nylon handles measuring 2" x 11/16" located directly below the lift rail. All springs, screws, hardware components that comprise the pinlock assembly shall be nonmagnetic stainless steel. Counterbalance shall be excluded on all sash having less than 25 lbs. lift load. Where balances are required, windows shall be processed to incorporate both of the above systems. All operating surfaces to be protected from metal to metal sliding contact by woven pile, vinyl and nylon glides. All sash shall be side load, and easily removable from the inside for cleaning or repairs. Any hardware material other than nonmagnetic stainless steel will not be acceptable.

2.13 SEALANT MATERIALS

A. Sealant and Backing Material: As specified in Section 07 92 00.

2.14 FABRICATION

A. Fabricate windows allowing for minimum installation clearances and shim spacing around perimeter of assembly, yet enabling installation.

B. Rigidly fit joints and corners. Accurately fit and secure corners tight. Make corner joints flush, hairline, and weatherproof. Seal corner joints with sealant.

C. Develop drainage holes with moisture pattern to exterior.

D. Prepare components to receive anchor devices. Fabricate anchorage items.

E. Prepare components with internal reinforcement for operating hardware.

F. Provide internal reinforcement in mullions to maintain rigidity.

G. Shop glaze window units in accordance with manufacturer's instructions.

2.15 FINISHES

A. Clear Anodized Finish: NAAMM AA-MI2-C22-A41.

B. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify wall openings are ready to receive Work of this Section.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install window frames, glass and glazing and hardware in accordance with manufacturer's instructions.

B. Use anchorage devices to securely attach frame to structure.

C. Align window frame plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent Work.

D. Pack fibrous insulation in shim spaces at perimeter to maintain continuity of thermal barrier.

E. Install sealant and backing materials as specified in Section 07 92 00.

F. Adjust operable hardware for smooth operation and tight fit of sash.

3.3 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces using a solution of mild detergent in warm water. Rinse with clean water, and wipe dry with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.4 MAINTENANCE INSTRUCTIONS

A. Provide training to District personnel on window replacement and re-glazing

3.5 EXTRA STOCK

A. Provide one (1) additional glazed fixed sash unit in each of the three sizes, for each project.

B. Provide two (2) additional loose laminated glass panes in clear for each of the three standard pane sizes and one (1) additional loose obscure gray for each size. Each pane shall be individually wrapped with the interior side identified.

C. Provide list of additional components such as sealant, packing material and weather stripping, glazing tape and setting blocks available from factory along with manufacturer's published prices.

END OF SECTION

SECTION 08 56 19
Pass Thru Window

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fully-Automatic pass, service and teller window units.
2. Semi-Automatic pass, service and teller window units.
3. Self-Closing pass, service and teller window units.
4. Manual pass, service and teller window units.
5. Bullet resistant pass, service and teller window units.
6. Drawers.
7. Glazing.
8. Air curtains.
9. Deal trays and shelves.
10. Intercom and talk through.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry

1.2 REFERENCES

A. American Architectural Manufacturers Association:
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

B. American Society Mechanical Engineers Standards:
1. ASME SA-240/SA-240M - Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM International:
1. ASTM A27/A27M - Standard Specification for Steel Castings, Carbon, for General Application.
2. ASTM A 36/A 36M. - Standard Specification for Carbon Structural Steel.
3. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
7. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

8. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
9. ASTM B221/B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
10. ASTM C1036 - Standard Specification for Flat Glass.
11. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
12. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
13. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
14. ASTM E488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
15. ASTM E699 - Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components.
16. ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.
17. ASTM E2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
18. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
19. ASTM F588 - Standard Test Methods for Resistance of Window Assemblies to Forced Entry Excluding Glazing.
20. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

D. Consumer Products Safety Commission:
1. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing.

E. DuPont Powder Coating Test Method:
1. DPC TM 10.219 - PCI Powder Smoothness.

F. H.P. White Laboratory, Inc.:
1. HPW-TP0500.01:
   a. Level V.
   b. Level C Ballistics (.44 magnum).
2. HPW-TP-0500.02 - Level B Ballistics (9mm).

G. National Association of Architectural Metal Manufacturers.
1. NAAMM No. 3 Finish: Ground unidirectional uniform finish obtained with 80 - 100 grit abrasive.

H. SAE International:
1. AMS5511 - Steel, Corrosion-Resistant, Sheet, Strip, and Plate, 19Cr - 9.5Ni (304L), Solution Heat Treated.
2. AMS5513 - Steel, Corrosion-Resistant, Sheet, Strip, and Plate 19cr 9.2Ni (SAE 30304) Solution Heat Treated.

I. Steel Structures Painting Council:
1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

J. Underwriters Laboratory:
1. UL 73 - Motor-Operated Appliances.
2. UL 325 - Door, Drapery, Gate, Louver, and Window Operators and Systems.
3. UL 752 - Ballistic Standards:
   a. Level I MPSA 9mm.
   b. Level III SPSA .44 Magnum.
4. UL 1995 - Heating and Cooling Equipment.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
1. Indicate configuration, sizes, rough-in, mounting, construction and glazing details as well as installation clearances and finishes.

C. Product Data:
1. Submit manufacturer's product data for specified Products indicating materials, operation characteristics, and finishes.

D. Samples:
1. Submit two samples, 4 x 4 inches (100 x 100 mm) in size illustrating metal finishes for each finish specified.

E. Manufacturer's Installation Instructions:
1. Submit installation instructions with requirements to accommodate specific site conditions.

1.4 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by UL or testing firm acceptable to authority having jurisdiction.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum 10 years documented experience.
1. Participates in a Quality Assurance validation Program.
   a. Facility Audit.

B. Installer: Company specializing in installation of window systems specified with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Ordering: To avoid construction delays comply with ordering instructions and lead time requirements as set by window system manufacturer.

C. Pack window units and accessories in manufacturer's standard shipping containers and protective packaging. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

D. Store window units and accessories on raised blocks to prevent moisture damage protected from exposure to weather and vandalism.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication and record on shop drawings.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate work with adjacent materials specified in other Sections and as indicated on Drawings and approved shop drawings.

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

1.9 WARRANTY

A. Furnish manufacturer's standard warranty document, executed by an authorized Quikserv Corp. officer in which manufacturer agrees to repair or replace windows, drawers and air curtains that fail in materials or workmanship within specified warranty period. This warranty is in addition to, and not a limitation of other rights Owner has under the contract.
   1. Warranty Period:
      a. One year parts and labor from date of installation.
   2. Failures include, but are not limited to, the following:
      a. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
      b. Structural failures including deflections exceeding 1/4 inch.
      c. Failure of welds.
      d. Excessive air leakage.
      e. Faulty operation of sliding window hardware.
      f. Faulty operation of transaction drawers.
      g. Faulty operation of air curtains.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B221/B221M. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength and not less than 0.125 inch (3.2 mm) thick at any location for main frame and sash members.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Metallic-Coated Steel Sheet:
1. ASTM A653/A653M, CS (Commercial Steel), Type B; with G90 (Z275)zinc (galvanized) coating designation.
2. AMS5511, steel, corrosion-resistant, sheet, strip, and plate, 19Cr - 9.5Ni (304L), solution heat treated.
3. AMS5513, steel, corrosion-resistant, sheet, strip, and plate 19cr 9.2Ni (SAE 30304) solution heat treated.

D. Stainless Steel Sheet, Strip, Plate, and Flat Bars:
1. ASTM A666, austenitic stainless steel, Type 304, stretcher-leveled standard of flatness.
2. ASME SA-240/SA-240M, chromium and chromium-nickel stainless steel plate, sheet, and strip for general applications.

E. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

F. Embedded Plate Anchors: Fabricated from steel shapes and plates, minimum 3/16 inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate..

G. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.76-mm) thickness per coat.

H. Gaskets: For gaskets required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Gaskets shall remain permanently elastic, nonshrinking, and nonmigrating.

2.2 WINDOW COMPONENTS

A. Comply with requirements of UL listing for ballistics-resistance levels as specified.

B. Glass:
1. Tempered Glass: 1/4 inch thick.
2. Insulated Glass: 5/8 inch thick overall thickness.

C. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers, and with a proven record of compatibility with surfaces contacted in installation:
1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
3. Spacers: Elastomeric blocks or continuous extrusions with a Type A Shore durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

D. Flashing.

E. Welding Materials.

F. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, of sufficient strength to withstand design pressure indicated.

2.3 MANUAL EXTERIOR AND INTERIOR PASS, SERVICE AND TELLER WINDOW UNITS

A. Manufacturers:
   1. Quikserv Corp.

   2. Substitutions: In accordance with Contract Documents.

2.4 GLAZING

A. Float Glass Materials:
   1. Annealed Glass: ASTM C1036, Type 1 transparent flat, Quality Q3, float glass.
      a. Furnish annealed glass except where tempered glass is required to meet specified performance requirements.
   2. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.
      a. Fabricate tempered glass with roller-wave distortion parallel to bottom edge of glass as installed.
      b. Furnish tempered glass conforming to CPSC 16 CFR 1201 Category II.

B. Clear Glass: Annealed and Tempered float glass as specified; Class 1 clear.
   1. Clear annealed glass (FG-CA).
   2. Clear tempered glass (FG-CT).
   3. Minimum Thickness: 1/4 inch.

2.5 INTERCOM AND TALK THROUGH

A. Manufacturers - Intercom:
   1. Model: Audio Authority Model 1580S and 1580HS Series:
   2. Substitutions: In accordance with Contract Documents.

2.6 FABRICATION

A. Fabricate window to dimensions indicated on Drawings.

B. Fabricate windows, drawers and accessories to provide a complete system for assembly of components and anchorage of window, drawers and accessories.
   1. Provide units that are reglazable from the secure side without dismantling the nonsecure side of framing.
   2. Prepare security windows for glazing unless preglazing at the factory is indicated.

C. Provide weep holes and internal water passages for exterior security windows to conduct infiltrating water to the exterior.

D. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
   1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.

E. Prepare components with reinforcement required for hardware.

F. Welding: To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

G. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

H. Factory-cut openings in glazing for speaking apertures.

I. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated.

J. Weather Stripping: Factory applied.

K. Bottom Sills: Stainless steel construction, no bottom tracks and no pop rivets.

L. Handles: Stainless steel, manufacturer's standard profile and finish.

2.7 SHOP FINISHING

A. Aluminum Finishes:
   1. Mill Finished Aluminum Surfaces: manufacturer's standard finish.
   2. Clear Anodized Aluminum Surfaces: AA-M10C22A31 non-specular as fabricated mechanical finish, medium matte chemical finish, and Architectural Class II 0.7 mils (0.018 mm) clear anodized coating.
      a. Conform to AAMA 611
   3. Color Anodized Aluminum Surfaces: AA-M10C22A34 non-specular as fabricated mechanical finish, medium matte chemical finish, and Architectural Class II 0.7 mils (018 mm) bronze or black coating.
      a. Conform to AAMA 611.
   4. Painted Finish:
      a. AA-M12C12R1x non-specular as fabricated mechanical finish, chemically cleaned, and prepared for applied coating; with organic coating.
         1) Organic Coating: Manufacturer’s standard powder coat finish.
            a) [Conform to AAMA 2603.]
      b. DPC TM 10.219 - PCI Powder Smoothness.
         1) DuPont Powder Coating Test Method.

B. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.

C. Extent of Finish:
1. Apply factory coating to all surfaces exposed at completed assemblies.
2. Apply finish to surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
3. Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factory applied finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements {01300 - Administrative Requirements}: Verification of existing conditions before starting work.

B. Verify construction is ready to receive Products specified in this section.

C. Verify rough openings are correct size and in correct location.

D. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.

E. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.

F. For glazing materials whose orientation is critical for performance, verify installation orientation.

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

3.2 PREPARATION

A. Furnish frames and anchors to other sections as required for installation in surrounding partition and casework construction.

3.3 INSTALLATION

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

B. Align Products plumb, level and square.

C. Rigidly secure Products to adjacent supporting construction.

D. Glaze windows in accordance with manufacturer's instructions and Section __ __ __.

E. Seal perimeter joints in accordance with Section __ __ __.

F. Connect electrical components to power source.

G. Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements {01700 - Execution Requirements}: Requirements for adjusting.

B. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.

C. Adjust transaction drawers to provide a tight fit at contact points for smooth operation and [weathertight and] secure enclosure.

D. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements {01700 - Execution Requirements}: Requirements for cleaning.

B. Remove protective material from factory finished surfaces.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

E. Clean metal and glass surfaces to polished condition.
1. Lubricate sliding security window hardware.
2. Lubricate transaction drawer hardware.

F. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

END OF SECTION

SECTION 08 71 00
Door Hardware

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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. Storefront and Entrance door hardware.
3. Gate Hardware.
4. Digital keypad access control devices.
5. Hold-open closers with smoke detectors.
6. Wall or floor-mounted electromagnetic hold-open devices.
7. Power supplies for electric hardware.
8. Low-energy door operators plus sensors and actuators.
9. Thresholds, gasketing and weather-stripping.
10. 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.
3. Division 8: Section - Aluminum Storefront
4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.03 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

1.04 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	6AA	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.

1.05 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.

1.06 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.

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.

1.07 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: Twenty Five (25) years.
4. Exit devices: Three (3) years.
5. All other hardware: Two (2) years.

1.08 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.

1.09 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 District Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	No Substitutions
Locks, Latches & Cylinders	Schlage	No Substitutions
Exit Devices	Von Duprin	No Substitutions
Closers	Norton	Falcon
Push, Pulls & Protection Plates	Ives	No Substitutions
Flush Bolts	Ives	No Substitutions
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	No Substitutions
Stops	Ives	No Substitutions
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	National Guard	No Substitutions
Seals & Bottoms	National Guard	No Substitutions

2.02 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. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.

C. 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. Provide wired electrified options as scheduled in the hardware sets.
    a. 12 through 24 volt DC operating capability, auto-detecting
    b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
    c. 0.230A (230mA) maximum current draw
    d. 0.010A (10mA) holding current
    e. Modular / "plug in" request to exit switch

12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

D. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of ¼" diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.

E. 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. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware maximum opening force of 15 pounds according to the California Building Code section 11B-404.2.9.

F. Closers: Norton 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.

G. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.

1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
2. Provide dust proof strikes at openings using bottom bolts.

H. 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.

I. 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.

J. 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.

K. 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.

L. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

M. 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.

2.03 KEYING

A. Furnish PrimusXP “Everest-D” Patent Protected Schlage cylinders and keys for all locks except as noted.

B. Furnish construction keying for doors requiring locking during construction.

1. For FSIC systems provide 23-030-ICX Full Size Construction Cores
2. For FSIC systems provide ten 48-101-ICX Construction Keys
3. For FSIC systems provide two 48-056-ICX Control Keys (const.)
4. For FSIC systems provide two control keys for installing the permanent cores (49-056 for “Classic” keyways, 48-052-XP for “Classic Primus”) (49-003 for “Everest Conventional”, 48-005–XP for “Everest Primus”)

C. Furnish all keys with visual key control.

1. Stamp key “Do Not Duplicate”.
2. Stamp unique owner identifier from the key bow.

D. Furnish all cylinders with visual key control.

1. Stamp unique owner supplied code on cylinder side. (CKC) (6 character maximum).

E. 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.

F. 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.

G. 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 CL77R for use with FSIC Schlage cylinders.
3. Furnish CL721G for use with SFIC Schlage cylinders.

2.04 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.

2.05 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

3.01 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.

3.02 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.

H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.

K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.

L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

3.03 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.

3.04 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 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.

3.06 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.)

ADA	=	Adams Rite Mfg.	Aluminum Door Hardware
GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
JOH	=	L.E. Johnson	Sliding Door Hardware
LCN	=	LCN	Door Closers
SCE	=	Schlage Electronics	Electronic Door Components
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
TRI	=	Trimco	Signs
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

HARDWARE GROUP NO. 01 – EXTERIOR DOOR

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	PANIC HARDWARE	PA-AX-98-NL	626	VON
1	EA	PRIMUS RIM CYLINDER	20-757	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	CLOSER	P7500	689	NOR
1	EA	DRIP CAP	16A	A	NGP
1	EA	SEAL SET	2525B	BRN	NGP
1	EA	DOOR SWEEP	600A	CL	NGP
1	EA	THRESHOLD	PER DETAIL		NGP

HARDWARE GROUP NO. 02 – SINGLE OFFICE

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL CORRIDOR LOCK	ND97LD RHO	626	SCH
1	EA	PRIMUS K-I-L CYL.	20-765	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	SEAL SET	2525B	BRN	NGP

HARDWARE GROUP NO. 03 – SINGLE RESTROOM

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	SEAL SET	2525B	BRN	NGP

HARDWARE GROUP NO. 04 – DOUBLE CORRIDOR

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	DBL CYL STORE LOCK	ND66CD RHO	626	SCH
2	EA	PRIMUS K-I-L CYL.	20-765	626	SCH
2	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	SEAL SET	2525B	BRN	NGP
1	SET	MEETING STILE	600A SET	AL	NGP

HARDWARE GROUP NO. 05 – DOUBLE STORAGE

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	VANDL STOREROOM LOCK	ND96LD RHO	626	SCH
1	EA	PRIMUS K-I-L CYL.	20-765	626	SCH
2	EA	WALL STOP	WS401/402CVX	626	IVE
1	SET	MEETING STILE	600A SET	AL	NGP

HARDWARE GROUP NO. 06 – DOUBLE UTILITY

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	VANDL STOREROOM LOCK	ND96LD RHO	626	SCH
1	EA	PRIMUS K-I-L CYL.	20-765	626	SCH
2	EA	OH STOP	100S	630	GLY
1	SET	MEETING STILE	600A SET	AL	NGP

HARDWARE GROUP NO. 07 – DOUBLE CORRIDOR

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	VANDL CORRIDOR LOCK	ND97LD RHO	626	SCH
1	EA	PRIMUS K-I-L CYL.	20-765	626	SCH
2	EA	WALL STOP	WS401/402CVX	626	IVE
1	SET	MEETING STILE	600A SET	AL	NGP

END OF SECTION

SECTION 08 80 00
Glazing

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glass and glazing for [hollow metal work] [windows] [glazed walls] [and doors].

B. [Mirror glass.][One-way reflective mirror glass.][Polycarbonate mirror.]

1.2 SECTION EXCLUDES

A. Factory glazing of aluminum windows.

1.3 REFERENCES

A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

C. ASTM C1036 - Standard Specification for Flat Glass.

D. ASTM C1048 - Standard Specification for Heat Strengthened and Fully Tempered Flat Glass.

E. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.

F. GANA - Glazing Manual (50th Edition) and Sealant Manual (2008 Edition).

G. UL - Underwriters' Laboratories, Inc., Building Materials Directory.

1.4 QUALITY ASSURANCE

A. Conform to Glass Association of North America (GANA) Glazing Manual and Sealant Manual for glazing installation methods.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements for glass. Provide data on glazing sealant. Identify colors available.

C. Submit two 12" square Samples, illustrating each glass coloration.

D. Submit 12" long bead of glazing sealant in color selected.

E. Submit sealed glass unit manufacturer's certificate indicating units meet or exceed specified requirements.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, store and protect products under provisions of Section 01 87 00.

1.7 WARRANTY

A. Provide manufacturer's warranty against defects in material, including loss of hermetic seal insulating units, for a period of 5 years after date of Substantial Completion.

B. Include coverage for reflective coating on mirrors and replacement of same.

C. Include coverage for delamination of laminated glass and replacement of same.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Tempered Glass:

1. Guardian Industries Corp., www.guardian.com
2. Ford Glass Division.
3. Pilkington Glass Ltd., www.pilington.com
4. Vitro Architectural Glass., www.vitroglazings.com
5. HGP and Affiliates Inc., hyperformanceglassproducts.com
6. AGC Industries, Inc., www.agcglass.com
7. Spectrum Glass Products, Inc.
8. Oldcastle Building Envelope., obe.com
9. Viracon, Inc., www.viracon.com

B. Mirror Glass:

1. CRL Laurence Co., Inc., www.crlaurence.com

2. Ford Glass Division.

3. Vitro Architectural Glass www.vitroglazings.com

4. Pilkington Glass Ltd., www.pilington.com

5. Avalon Mirror., avalonmirrorglass.com

C. Substitutions: Under provisions of Section 01 25 13.

2.2 GLASS MATERIALS, GENERAL

A. Primary Glass Standard: Comply with ASTM C1036 requirements, including reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Tempered Glass Standard: Comply with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Visual Light Transmission and Heat Gain: Conform to requirements indicated.

D. Sizes: Fabricate glass to sizes required for glazing openings, with edge clearances and tolerances complying with recommendations of glass manufacturer and GANA.

E. Provide thicknesses indicated or, if not indicated, as recommended by glass manufacturer for application indicated.

2.3 PRIMARY GLASS PRODUCTS

A. Clear Float Glass: ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select). Low E coating on No. 2 surface of exterior glass.

B. Mirror Glass: ASTM C1036, Type I Transparent Glass, Flat; Class 1, Clear; q1 mirror select; 1/4" thick with pressure-sensitive adhesive coated scrim-impregnated film tape safety backing.

C. Polycarbonate Mirror: High-Impact strength, FDA compliant, flame-resistant, with UV stability. [0.030"] [0.118"] [0.236"] [___"] thick sheet with reflective coating on one side, protected by 1.0 mil thick gray backcoat.

2.4 TEMPERED GLASS PRODUCTS

A. Manufacturing Process: Horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed.

B. Clear Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition

A (uncoated surfaces), Type 1 (transparent glass, flat) Class 1 (clear), Quality q3 (glazing select); conforming to ANSI Z97.1.

C. Clear Tempered Float Glass - Low E: ASTM C1048, Kind FT (fully tempered), Condition C (coated) with low E coating on No. 2 surface, Type 1 (transparent glass, flat) Class 1 (clear), Quality q3 (glazing select); conforming to ANSI Z97.1.

2.5 LAMINATED GLASS PRODUCTS

A. Laminated Glass: Two panes of float glass of equal thickness, ASTM C1172, kind LHS (heat-strengthened), laminated with 0.060" thick plastic interlayer; conforming to ANSI Z97.1. Unit shall have the following characteristics:

1. Overall Laminated Glass Thickness: Approximately 1/8".

2. Visual Light Transmission (VLT): The VLT of the entire laminated assembly shall be equal to or better than 75%.

3. Solar Heat Gain Coefficient: The SHGC of the entire laminated assembly shall equal to or less than 0.60.

B. Obscure Laminated Glass:

1. Glass: Class 1 clear for both panes. Low E coating on Number 2 surface.

2. Glass Thickness (each pane): 1/8".

3. Color of Plastic Interlayer: Obscure (white).

C. Clear Laminated Glass:

1. Glass: Class 1 clear for both panes. Low E coating number 2 surface.

2. Glass Thickness (Each Pane): 1/8".

3. Color of Plastic Interlayer: Clear.

D. Plastic Interlayer: Polyvinyl Butyral as manufactured by:

1. Bayer., www.corpscience.bayer.com

2. DuPont , www.dupont.com

2.6 GLAZING SEALANTS AND PREFORMED GLAZING TABS

A. General: Comply with ASTM C920, and sealant and glass manufacturers' recommendations for suitability and compatibility.

B. One-Part Butyl Glazing Sealant:

1. Bostik Construction Products Div., www.bostik-us.com
2. Norton Performance Products., www.nortonabrasives.com
3. "BC 158"; Pecora Corp., www.pecora.com
4. "757 Butyl Sealant"; or approved equal

C. One-Part Acid-Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25:

1. Bostik Construction Products Div., www.bostik.com
2. " Dowsil 999A Silicone Glazing Sealant"; Dow Corning Corp., www.dow.com
3. "SCS2000"; General Electric Corp., siliconeforbuilding.com
4. Pecora Corp., www.pecora.com
5. Sanofi, www.sanofi.com (healthcare)
6. Master Builders Solutions, www.master-builder-solutions.com
7. "Proglaze®"; Tremco.

D. Preformed Butyl-Polyisobutylene Glazing Tape With Spacer Rod:

1. "Chem-Tape 60";
2. "Shim-Seal";
3. Tremco® 440 Tape"; Tremco Inc., www.tremcosealants.com

2.7 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene; EPDM or silicone blocks, 80-90 Shore A durometer hardness.

B. Spacer Shims: Neoprene; EPDM or silicone blocks, Shore A durometer hardness; self-adhesive one face.

C. Glazing Gasket: Resilient polyvinylchloride extruded shape to suit glazing channel retaining slot with prefabricated molded corners. Color to be selected by Architect from manufacturer's full range of colors.

D. Glazing Clips: Manufacturer's standard type.

E. Mirror Attachment Accessories: Mirror adhesive, chemically compatible with

mirror coating and wall substrate.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for Work of this Section.

B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses.

C. Prime surfaces scheduled to receive sealant.

3.3 EXTERIOR DRY METHOD (PREFORMED GLAZING AT ALUMINUM STOREFRONT SYSTEM)

A. Cut glazing tape to length; install on glass pane. Seal corners by butting tape and dabbing with butyl sealant.

B. Place setting blocks at 1/4 points with edge block no more than 6" from corners.

C. Rest glass on setting blocks and push against fixed stop with sufficient pressure to attain full contact at perimeter of pane.

D. Install removable stops without displacement of glazing gasket. Exert pressure for full continuous contact.

E. Trim protruding tape edge.

3.4 EXTERIOR COMBINATION METHOD (TAPE AND SEALANT AT STEEL FRAMES)

A. Cut glazing tape to length and set against permanent stops, 3/16" below sightline. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bed of butyl sealant along intersection of removable stop with frame ensuring full seal between glass and frame.

C. Place setting blocks at 1/4 points with edge block no more than 6" from corners.

D. Rest glass on setting blocks and push against tape and heel bead of sealant with

sufficient pressure to attain full contact at perimeter of pane.

E. Install removable stops with spacer strips inserted between glass, and applied stops at 24" intervals, 1/4" below sightline.

F. Fill gap between pane and removable stop with silicone sealant to depth equal to bite of frame on pane, but not more than 3/8" below sightline.

G. Apply cap bead of silicone sealant along exterior void, to uniform line, flush with sightline. Tool or wipe sealant surface with solvent for smooth appearance.

3.5 INTERIOR - DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16" above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6" from corners.

C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

D. Place glazing tape on free perimeter of glazing in same manner described above.

E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

F. Knife trim protruding tape.

3.6 INSTALLATION - MIRRORS

A. Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.7 CLEANING

A. After installation, mark pane with an "X" by using plastic tape or removable paste.

B. Remove glazing materials from finish surfaces.

C. Remove labels after Work is completed.

END OF SECTION

SECTION 09 30 14
Luxury Vinyl Tile (LVT)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Luxury Vinyl Tile (LVT)

1.2 REFERENCES

A. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. CBC California Building Code and Amendments.

C. ASTM D2047 – Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine

D. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

E. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials

F. ASTM E2179 – Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors

G. ASTM F925- Standard Test Method for Resistance to Chemicals of Resilient Flooring.

H. ASTM F970 – Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading

I. ASTM F1514 – Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change

J. ASTM F1515 – Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change

K. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile

L. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

M. ASTM F2199 – Standard Test Method for Determining Dimensional Stability and Curling Properties of Resilient Flooring after Exposure to Heat

N. ANSI/TCNA A137.1 American National Standards Specification for Ceramic Tile

1.3 RELATED SECTIONS

A. Section 06 10 00 Rough Carpentry

B. Section 09 30 13 Ceramic Tile

C. Section 09 65 16 Resilient Sheet Flooring

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit Product Data for all materials specified.

C. Samples: Mount tile and apply grout on two 24" x 24" plywood panels, representative of pattern, color variations, and grout joint size variations.

D. Submit manufacturer's installation instructions, maintenance data, and recommended cleaning and stain removal methods and cleaning materials.

1.5 REGULATORY REQUIREMENTS

A. LVT flooring shall comply with the following fire performance characteristics as determined by testing products per ASTM test method indicated below:

1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E648.

2. Smoke Density: Less than 450 per ASTM E662.

B. Products supplied for tile installation shall comply with local regulations controlling use of volatile organic compounds (VOC).

LVT flooring products shall have a minimum coefficient of friction when tested according to ASTM D2047 of 0.60 for flat floors and 0.80 for ramped surfaces.

C. Conform to CBC California Building Code with Amendments, and ADAAG for access for the handicapped.

1.6 QUALITY ASSURANCE

A. Conform to ANSI/TCNA A137.1 for Ceramic Tile.

B. Conform to ANSI/TCNA Standards and TCNA Handbook for tile installation.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five years documented experience.

B. Installer: Company specializing in applying the Work of this Section with minimum five years documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Concrete subfloor shall be allowed to cure for a minimum of 90 days to achieve acceptable dryness.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

D. Subfloor Moisture Conditions: Moisture emission rate of both new and existing floors of no more than 3 lbs./1000 sq. ft./24 hours when tested by ASTM F1869 with subfloor temperature not less than 65°F in the presence of the Inspector of Record.

E. Subfloor Alkalinity Conditions: A pH range of between 5 to 9 when subfloor is wetted with potable water and pHdrion paper is applied.

F. Existing floor slabs may have been installed without vapor retarders, or existing retarders may be damaged. Contractor will observe existing floors for signs of moisture-induced floor, surface failures, and mitigation of excessive moisture emission or alkalinity shall be the Contractor's responsibility and at the Contractor's cost, using methods specified herein.

1.9 EXTRA STOCK

A. Provide 100 square feet (or 10% of total installed, whichever is greater) of flooring and 100 lineal feet (or 10% of total installed, whichever is greater) of base of each material specified under provisions of Section 01 77 00.

B. Provide quantity equal to 2% of units installed of each shape and color.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - TILE

A. Tandus Centiva - Resilient Plank, Woodlot ., commercial.tarkett.com

B. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIAL

A. Biobased, recycled materials.

1. Color(s): To be selected by Architect from manufacturer's full range of colors.

2.3 ADHESIVE

A. CENTI 6000 SP Special Purpose adhesive - solvent-free, non-flammable, freeze/thaw stable, and oderless adhesive when dry. No micro-biocides to inhibit the growth of mold and mildew.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive Work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding Work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

3.3 INSTALLATION

A. Lay tile to pattern indicated. If not indicated, request from Architect. Do not interrupt tile pattern around openings.

3.4 CLEANING

A. Clean Work under provisions of Section 01 77 00.

B. Clean tile surfaces.

END OF SECTION

SECTION 09 65 16
Resilient Sheet Flooring

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Linoleum sheet flooring.

B. Calcium chloride, relative humidity and alkalinity concrete moisture testing.

1.2 REFERENCES

A. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. CBC - California Building Code Chapter 11B.

C. ASTM D2047 – Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

D. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

E. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

F. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

G. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading .

H. ASTM F1066 – Standard Specification for Vinyl Composition Floor Tile.

I. ASTM F1303 – Standard Specification for Sheet Vinyl Floor Covering with Backing.

J. ASTM F1344 – Standard Specification for Rubber Floor Tile.

K. ASTM F1861 – Standard Specification for Resilient Wall Base

L. ASTM F1869 – Standard Test method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

M. FS RR-T-650 - Treads, Metallic and Non-metallic, Skid Resistant.

N. ASTM F1066 – Standard Specification for Vinyl Composition Floor Tile

O. .

P. NFPA 258 - Recommended Practice for Determining Smoke Generation of Solid Materials.

Q. ASTM F2034 – Standard Specification for Sheet Linoleum Floor Covering

R. ASTM F2170 - Standard test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

1.3 REGULATORY REQUIREMENTS

A. Resilient flooring shall comply with the following fire performance characteristics as determined by testing products per ASTM test method indicated below:

1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E648.

2. Smoke Density: Less than 450 per ASTM E662.

B. Products supplied for tile installation shall comply with local regulations controlling use of volatile organic compounds (VOC).

C. Resilient flooring products shall have a minimum coefficient of friction when tested according to ASTM D2047 of 0.60 for flat floors and 0.80 for ramped surfaces.

D. Conform to CBC California Building Code and ADA.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit substitutions under provisions of Section 01 25 13.

C. Submit two 3" square Samples illustrating color and pattern for each floor material specified.

D. Submit two 2" long Samples of base and stair material for each material specified.

E. Submit two copies of concrete test results and locations map with manufacturer's acceptance of concrete slab as substrate.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Section 01 77 00.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Concrete subfloor shall be allowed to cure for a minimum of 90 days to achieve acceptable dryness.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

D. Subfloor Moisture Conditions: Moisture emission rate of both new and existing floors of no more than 3 lbs./1000 sq. ft./24 hours when tested by ASTM F1869 with subfloor temperature not less than 65°F in the presence of the Inspector of Record.

E. Subfloor Alkalinity Conditions: A pH range of between 5 to 9 when subfloor is wetted with potable water and pHdrion paper is applied.

F. Existing floor slabs may have been installed without vapor retarders, or existing retarders may be damaged. Contractor will observe existing floors for signs of moisture-induced floor, surface failures, and mitigation of excessive moisture emission or alkalinity shall be the Contractor's responsibility and at the Contractor's cost, using methods specified herein.

1.7 WARRANTY FOR MOISTURE, VAPOR, AND/OR ALKALINITY MITIGATION

A. System shall carry a minimum 10-year warranty for both labor and finish materials if subsequent flooring material failure is due to slab substrate generated emission and/or alkalinity. No exclusions for moisture vapor emission changes that occur at a later date from that of control system testing are allowed.

B. System shall be compatible with all floor finished and adhesives.

C. Systems shall deeply penetrate and seal the substrate and provide a smooth surface suitable to accept new floor finish material.

D. System shall be three-component consisting of a penetrating sealer, a primer and a polymerized topcoat and shall be approved by the applicator of the finish floor surface.

1.8 EXTRA MATERIALS

A. Provide 100 square feet of flooring and 100 lineal feet of base and stair materials of each material specified under provisions of Section 01 77 00.

1.9 CALCIUM CHLORIDE TEST

A. Perform test in presence of Inspector of Record.

B. The concrete surface shall be clean and void of all oils, adhesives, patching compounds and any other substances which will inhibit the natural transmission of moisture from the surface. Have the test area scarified by shotblasting.

C. Room temperature must be ecological-valid, that is, similar to the environment in which the floor covering will be installed and occupied by people. Do not conduct the test when the slab surface temperature is less than 65°F for (3) days prior to, and during the test procedure. Never conduct the test when concrete is within 5° of dewpoint.

D. Prior to exposure, the Petrie dish containing anhydrous calcium shall be weighed on a gram weight scale. The exact weight, date, and time shall be recorded.

E. Expose crystal dish according to manufacturer's instruction. After 60 to 72 hours exposure time, again record the date and time. Weigh the dish again. A formula for pounds computation is enclosed with manufacturer's instructions.

F. Compute pounds and report the test results to the Architect, Contractor and Representative and Designer. Post-weigh within 1 hour after exposure.

G. A minimum of three test kits for the first 1,000 square feet surface area is required. Add one more test unit for each additional 1,000 square feet surface area.

H. Maximum Moisture Content: 3 lbs.

PART 2 - PRODUCTS

2.1 ACCEPTABLE FLOOR SLAB PREPARATION/MITIGATION FIRMS

A. Creteseal., www.creteseal.com

B. Floor Seal Technology., floorseal.com

C. Sinak Corporation., sinakcorp.com

2.2 LINOLEUM SHEET FLOORING

A. Manufacturers: Forbo Industries, Inc., Striato.

B. Linoleum Sheet Flooring: ASTM F2034, sheet linoleum material consisting of linseed oil, wood flour and rosin binders meeting the following characteristics:

1. Thickness: 2.5 millimeters.

2. Width: Approximately 6'-6".

3. Length: Approximately 98'.

4. Static Load Limit: ASTM F970, 450 psi.

5. Backing: Jute.

6. Pattern and Color: Extending throughout material. See finish schedule.

C. Integral Coved Base: Self-coved of same material as flooring, 6" high with continuous extruded aluminum cap trim, and fillet support strip.

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Edge Strips: Vinyl type, color as selected by Architect.

D. Sealer and Wax: Types recommended by flooring manufacturer.

E. Welding Rods for Linoleum Flooring: Color matched welding rod.

F. Concrete Testing Equipment: American Moisture Test, Inc. (866) 670-9700

1. ASTM F1869 Water vapor emission

2. ASTM F710 Digital alkalinity-pH testing

3. ASTM F2170 In-concrete relative humidity

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that concrete slabs comply with ASTM F710.

B. Verify concrete floors exhibit acceptable moisture emission rate; exhibit negative alkalinity, carbonization, or dusting.

C. Perform concrete moisture testing at a rate of three tests for areas up to 1,000 square feet and one test for each 1,000 square feet thereafter in accordance with the following test methods:

1. ASTM F1869 water vapor emission: shall not exceed 3.0 lbs.

2. ASTM F2170 in-concrete relative humidity: shall not exceed 75%.

3. ASTM F710 digital alkalinity-pH testing: shall not exceed 9.0pH.

D. Verify that surfaces are smooth and flat and are ready to receive Work.

E. Perform calcium chloride test.

F. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

C. Prohibit traffic from area until filler is cured.

D. Vacuum clean substrate.

E. Apply primer to concrete slab surfaces if recommended by flooring manufacturer.

3.3 INSTALLATION - SHEET MATERIAL

A. Install in accordance with manufacturer's instructions.

B. Spread only enough adhesive to permit installation of materials before initial set.

C. Set flooring in place; press with heavy roller to attain full adhesion.

D. Pattern grain - see finish plan for pattern direction.

E. Lay flooring with seams parallel to length of room to produce minimum number of seams. Provide minimum of 1/3 full roll width. Double cut sheet and continuously heat weld seams.

F. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.

G. Install edge strips at unprotected or exposed edges, and where flooring terminates. See finish schedule.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints, provide caulking.

I. Install flooring in pan type floor access covers. Maintain floor pattern.

J. Install flooring under movable partitions and under cabinetry without interrupting floor pattern.

K. Install feature strips, edge strips, and floor markings where indicated. Fit joints tightly.

L. Allow for 25% accent color pattern unless noted otherwise.

M. Heat weld all seams of sheet flooring.

3.4 INSTALLATION - BASE MATERIAL

A. Miter internal corners.

B. Install base on solid backing. Bond tight to wall and floor surfaces.

C. Scribe and fit to door frames and other interruptions.

D. Install integral coved base in flash-coved method. Install cap trim at top of base where edge of flooring is exposed. Install radiused backing fillet at wall and floor juncture. Heat weld all seams.

3.5 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions.

C. At the very minimum, four layers of wax shall be applied, sufficient to fully seal the floor surface to a smooth lustrous finish and to completely fill all joints and any voids or cracks between tiles.

D. The finished floor, completely waxed, shall be reviewed Representative and Designer to deem satisfactory. If, in the opinion of the Representative and Designer, additional coats are required, the Contractor shall apply these at no expense to the Representative and Designer.

END OF SECTION

SECTION 09 65 30
Resilient Flooring Accessories

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: Work of this Section shall include all materials and installation necessary to provide Resilient Wall Base and Accessories, including resilient wall base and resilient flooring accessories as shown and detailed on the Drawings and specified herein.

B. Related Sections include the following:

1. Division 9, Section 09 65 10 Resilient Flooring

1.2 SUBMITTALS

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

B. Samples for Verification: In manufacturer's standard sizes, but not less than 12" long, of each product color and pattern specified.

C. Product Certificates: Signed by manufacturers of resilient wall base and accessories certifying that each product furnished complies with requirements.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in service performance.

B. Source Limitations: Obtain each type and color of product specified from one source and one (1) dye lot per room with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics: Provide products with the following fire test response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.

2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project location, including dye lot number and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50° and 90°F.

C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.5 PROJECT CONDITIONS

A. Maintain a temperature of not less than 70°F or more than 95°F in spaces to receive resilient products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After post-installation period, maintain a temperature of not less than 55°F or more than 95°F for a minimum of 48 hours.

B. Do not install products until they are at the same temperature as the space where they are to be installed.

C. For resilient products installed on traffic surfaces, close spaces to traffic during installation and for time period after installation recommended in writing by manufacturer.

D. Coordinate resilient product installation with other construction to minimize possibility of damage and soiling during remainder of construction period. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials installed, as described below packaged with protective covering for storage, and identified with labels describing contents.

1. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof, of each different type, color, pattern, and size of resilient product installed.

2. Deliver extra materials to [Owner][District].

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Resilient Flooring Accessory Schedule at the end of Part 3.

1. Unless otherwise indicated in Construction Documents, coiled wall base is to be utilized if available by manufacturer.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Resilient Flooring Accessory Schedule at the end of Part 3.

2.2 RESILIENT WALL BASE

A. Rubber Wall Base: , Type I and with requirements specified in the Resilient Flooring Accessory Schedule.

2.3 RESILIENT PRODUCTS

A. Rubber Wall Base: Cold Weld Ruber Base., Type I and with requirements specified in the Resilient Tile Flooring Schedule.

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Trowel on adhesive, water-resistant type recommended by Nora manufacturer to suit resilient products and substrate conditions indicated.

C. Substitutions not accepted unless approved by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are free of defects and fully comply with manufacturer's specified requirements for resilient product installation. Determine adhesion and dryness by performing flooring manufacturer's recommended bond and Calcium Chloride Test for moisture. Concrete slabs moisture should not exceed 5 lbs. per 1,000 sq. ft. per 24 hours. Provide [Owner][District]'s Representative with test results prior to installation for all

concrete slabs.

3.2 PREPARATION

A. General: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Use stair-tread-nose filler, according to resilient tread manufacturer's written instructions, to fill nosing substrates that do not conform to tread contours.

D. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

E. Broom and vacuum clean substrates to be covered immediately before installing resilient products. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. General: Install resilient products according to manufacturer's written installation instructions.

B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

1. Prior to installation wall base is to be allowed adequate time and per manufacturer instruction to lay flat as to regain its normal shape, free of distortion.

2. Install in longest practical lengths without gaps at seams and with tops of adjacent pieces aligned; the usage of residual pieces is prohibited.

3. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

4. Do not stretch base during installation.

5. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

6. Form outside corners on job, from straight pieces of maximum lengths

possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.

7. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

C. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

D. Apply resilient products to stairs as indicated and according to manufacturer's written installation instructions.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing resilient products:

1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.

2. Sweep or vacuum horizontal surfaces thoroughly.

3. Do not wash resilient products until after time period recommended by resilient product manufacturer.

4. Damp-mop or sponge resilient products to remove marks and soil.

B. Protect resilient products against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by resilient product manufacturer.

1. Apply protective floor polish to vinyl resilient products installed on floors and stairs that are free from soil, visible adhesive, and surface blemishes, if recommended by manufacturer.

a. Use commercially available product acceptable to resilient product manufacturer.

b. Coordinate selection of floor polish with [Owner][District]'s maintenance service.

2. Cover resilient products installed on floors and stairs with undyed, untreated building paper until inspection for Substantial Completion.

C. Clean resilient products not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

1. Before cleaning, strip protective floor polish that was applied to vinyl products on floors and stairs after completing installation only if required to restore polish finish and if recommended by resilient product manufacturer.

2. After cleaning, reapply polish on vinyl products on floors and stairs to restore protective floor finish according to resilient product manufacturer's written recommendations. Coordinate with [Owner][District]'s maintenance program.

3.5 RESILIENT FLOORING ACCESSORY SCHEDULE

A. Sanitary Wall Base # B1:

1. Products: Sanitary Base with Cold Weld, as manufactured by Nora (S 3019 D).

2. Color and Pattern: See drawings for color and pattern

3. Style: Integral

4. Minimum Thickness: 3 mm

5. Depth: 50 mm, appx. 1.97"

6. Height: 152 mm, appx. 6".

7. Lengths: appx. 10 m, appx. 32.8'

8. Material: Nora rubber compound 999.

9. ASTM: F1861 Type TP - rubber, thermoplastic

10. Outside Corners: Formed on site.

11. Inside Corners: Formed on site.

12. Ends: Premolded.

13. Surface: Smooth.

B. Transition Strips:

1. Products: Schluther

2. Color: See schedule on drawings

3. Product Description: transition strip.

4. Profile and Dimensions: Per Manufacturer.

C. Warranty:

1. 5 year limited wear warranty.

END OF SECTION

SECTION 09 77 00
Fiberglass Reinforced Wall Panels

SECTION 09 7700 – FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished cementitous wallboard.
   1. PVC trim.

B. Products Not Furnished or Installed under This Section:
   1. Cementitious substrate board.

1.2 RELATED SECTIONS

A. Section [____] – Cementitious substrate board.

B. Section [____] - Wood Stud Framing

C. Section [____] - Painting & Transparent Finishes.

1.3 REFERENCES

A. 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.

1.4 SUBMITTALS

A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

C. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

D. 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.

E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site (available as downloads for most Marlite's products at http://www.marlite.com/tech-details.aspx or by contacting Marlite at info@marlite.com).

1.5 QUALITY ASSURANCE

A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
   1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
      a. Wall Required Rating – Class [A] [C].

B. Sanitary Standards: System components and finishes to comply with:
   1. United States Department of Agriculture (USDA) / Food Safety & Inspection Services (FSIS) requirements for food preparation facilities, incidental contact.
   2. Food and Drug Administration (FDA) 2013 Food Code 6-101.11.
   3. Canadian Food Inspection Agency (CFIA) requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (range of 60 to 75°F) for 48 hours prior to installation.

1.7 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.

1.8 WARRANTY

A. Furnish one-year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Marlite; 1 Marlite Drive, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com.
   1. Product:
      a. Standard FRP

B. Substitutions: Under provisions of Section 01 25 13.

2.2 PANELS

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
   1. Dimensions:
      a. Thickness – 0.090 " (2.29mm) nominal
      b. Width - 4'-0" (1.22m) nominal
      c. Length – 10'-0" (3.0m) nominal
      d. Weight – 0.625 psf
   2. Tolerance:
      a. Length and Width: +/-1/8 " (3.175mm)
      b. Square - Not to exceed 5/32 " (3.96mm) for 10 foot (2.4m) panels

B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
   1. Flexural Strength - 1.7 x 10^4 psi per ASTM D 790.
   2. Flexural Modulus – 6.0 x 10^5 psi per ASTM D 790.
   3. Tensile Strength – 8.0 x 10^3 psi per ASTM D 638.
   4. Tensile Modulus – 9.43 x 10^5 psi per ASTM D 638.
   5. Water Absorption - 0.17% per ASTM D 570.
   6. Barcol Hardness (scratch resistance) of 30 as per ASTM D 2583.
   7. Izod Impact Strength of 7.0 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: As Indicated on the Drawings

      a. Size:

         1) Standard FRP

            a) 48" x 120" [1.2m x 3m] x .090" (3mm) nom.

2.3 MOLDINGS

A. PVC Trim: Thin-wall semi-rigid extruded PVC.
   1. M 350 Inside Corner, 10’ length
   2. M 360 Outside Corner, 10’ length
   3. M 365 Division, 10’ length
   4. M 370 Edge, 10’ length
   5. V 177 135° Inside Corner
   6. V 179 135° Outside Corner
   7. Color:

B. Outside Corner Guard:
   1. F 560SS Stainless Corner Guard, 10’ length
   2. Finish: #4 brushed satin
   3. M 961 PVC Outside Corner Guard

2.4 ACCESSORIES

A. Fasteners: Non-staining nylon drive rivets.
   1. Match panel colors.
   2. Length to suit project conditions.

B. Adhesive:
   1. VOC compliant, non-flammable, environmentally safe adhesive.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 CLEANING

A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION 09 77 00

SECTION 09 77 23
Tackable Wallboard Systems

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Tackable wall board.

1.2 REFERENCES

A. ASTM C208 – Standard Specification for Cellulosic Fiber Insulation Board .

B. ASTM D-1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.

C. ASTM E84 – Standard Test Method of Surface Burning Characteristics of Building Materials.

D. FS CCC-W-408 - Wall Covering, Vinyl Coated.

E. UL - Underwriters Laboratories, Inc.

F. CHPS - Coalition for High Performance Schools, Best Practices Manual Volume III Criteria, 2014 Edition

1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in tackable wallboard Work with five years documented experience.

1.4 REGULATORY REQUIREMENTS

A. Conform to flame spread and smoke developed ratings of no more than 25/50 for vinyl fabric covered tack surfaces when tested in accordance with ASTM E84 by UL.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide Product Data on vinyl coated fabric and fiberboard.

C. Submit two 12" square Samples of wall covering illustrating color, finish, and texture of wall covering as specified in Section 09 72 16.

D. Submit test reports verifying flame/smoke ratings.

E. CHPS 2014 Submittals:

1. Credit EQ 7.0 – Low Emitting Materials

EQ 7.0 Flooring Systems

Applicable to all resilient flooring and carpet systems installed in the project's interior. 75%, or more, of the installed area of such products shall be shall be tested for emissions of VOCs of concern with respect to chronic inhalation exposures following the specifications of the CDPH Standard Method V1.1, 2010 and shall be compliant with the Standard Method when modeled to the school classroom scenario described therein.

2. Credit EQ 7.1 – Additional Low Emitting Materials

EQ 7.1.2 Flooring Systems

Flooring systems include but are not limited to: carpet with or without an integral cushion, carpet with an integral adhesive system, and separate cushion; resilient flooring; wood flooring; ceramic tile flooring; other mineral-based flooring (either natural or manmade) without any organic component, and concrete flooring. For the purposes of this option, it is assumed that ceramic tile, organic-free mineral-based flooring, and concrete flooring are negligible sources of VOCs and are available for credit without any testing requirements. Site applied flooring adhesives are treated under Option 1 for Adhesives & Sealants, and site applied flooring stains, sealers and coatings are treated under Option 2 for Paints & Coatings. All flooring systems installed in the project's interior totaling 90% or more of the total floor area shall be tested for emissions of VOCs of concern with respect to chronic inhalation exposures following the specifications of the CDPH Standard Method V1.1, 2010 (CDPH Standard Method). The test results shall be compliant with the Standard Method when modeled to the school classroom scenario using the classroom flooring area. For systems consisting of more than one distinct layer (e.g., carpet with separate cushion), all layers shall individually meet the requirements of the CDPH Standard Method.

1.6 EXTRA STOCK

A. Provide ten (10) additional maximum length panels under provisions of Section 01 77 00.

B. Label each sheet by manufacturer, color, and pattern; store where directed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - WALLBOARD FINISH

A. Muraspec, North America: ., www.muraspec.com

B. MDC: "Bolta" brand., www.mdcwall.com

C. Maharam Wallcoverings., www.maharam.com

D. Koroseal Wallcoverings, koroseal.com

E. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS - WALLBOARD FINISH

A. Wall Covering: Vinyl fabric roll stock, conforming to FS CCC-W-408 A and B and CFFA 3 for Type II wallcovering and the following:

1. Total Weight: 20.0 oz/lin yd.

2. Roll Width: 54".

3. Color: As selected by Architect.

4. Pattern: As selected by Architect.

5. Fire Rating, ASTM E84: Class A.

   a. Flame Spread: 15.

   b. Smoke Developed: 20.

6. Stain Resistance (If Required): ASTM D1308, Method B: 24 hour exposure followed by washing with soap and water.

a.	Ethanol	Pencil	Tea	10% Hydrochloric Acid
b.	Vinegar	Mayonnaise	Milk	10% Sodium Hydroxide
c.	Detergent	Bleach	Coca-Cola	Oleic Acid
d.	Lemon Juice	Crayon	Pot Wine	10% Ammonia
e.	Coffee	Ketchup	Hydrogen Peroxide	

2.3 SUBSTRATE AND ADHESIVE

A. Fiberboard: Industrial insulation board, ironed and prime coated, ASTM C208,

cellulosic, 1/2" thick, 4' wide x required length, beveled longitudinal edges.

B. Wallcovering Adhesive: Manufacturer's standard for use with specified wallcovering and substrate application. Mildew-resistant, nonstaining, and strippable.

C. Fasteners, ring shank, small head, prefinished nails. Size and color to suit.

PART 3 - EXECUTION

3.1 FABRICATION

A. Machine apply vinyl wallcovering continuous over length of fiberboard sheet. Wrap vinyl continuous around two edges. No seams permitted on individual panels.

3.2 INSPECTION

A. Verify that site conditions are ready to receive Work and opening dimensions are as indicated on approved Shop Drawings.

B. Beginning of installation means acceptance of substrate.

3.3 INSTALLATION

A. Erect fiberboard in vertical direction. Install in full length sections with no horizontal joints. Fit boards loosely to adjacent trim so that damaged panels can be easily replaced.

B. Install panels butted tight to adjacent materials; casework, chair rail, door frames, ceilings, floors, and soffits as indicated on the Drawings. Provide lap beneath other tack or chalk board systems to conceal unfinished edges.

C. Attachment: Secure fiberboard to substrate with nails and sufficient support to hold in place. Apply adhesive in accordance with manufacturer's instructions.

D. Insure backing materials are firmly attached, free from warps and surface defects and ready to receive vinyl wall covering.

3.4 TOLERANCES

A. Maximum Variation from True Flatness: 1/8" in 10' in any direction.

3.5 CLEANING PROCEDURES

A. Common dirt and stains may be removed by rubbing lightly with a moistened

cloth, sponge, or stiff bristle brush using a mile soap, detergent, or non-abrasive cleanser. Clean water shall be used on a constant basis and the material shall be towel-dried.

B. Strong organic solvents (such as Ketones) and harsh abrasive cleaners shall not be used. Contact wall covering manufacturer for special cleaning problems.

END OF SECTION

SECTION 09 91 00
Painting

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Products and application.

C. Surface finish schedule.

D. Patch to match existing.

1.2 REFERENCES

A. ASTM D16 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.

1.3 SYSTEM DESCRIPTION

A. Preparation of all surfaces to receive final finish.

B. Painting and finishing Work of this Section using coating systems of materials including primers, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.

D. Painting and finishing all exterior and interior surfaces of materials including structural, mechanical, and electrical Work on site, in building spaces, and above or on the roof.

E. Paint exposed surfaces except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.

1.4 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.5 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and

finish products with five years experience.

B. Applicator: Company specializing in commercial painting and finishing with five years documented experience.

C. Regulatory Requirements: Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

D. Coats: The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number of coats, apply such additional coats as are necessary to produce the required finish.

E. Employ coats and undercoats for all types of finishes in strict accordance with the recommendations of the paint manufacturer.

F. Provide primers and undercoat paint produced by the same manufacturer as the finish coat.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide manufacturer's technical information and instructions for application of each material proposed for use by catalog number.

C. List each material by catalog number and cross-reference specific coating with specified finish system.

D. Provide manufacturer's certification that products proposed meet or exceed specified materials.

E. Submit two 8-1/2" x 11" Samples of each paint color and texture applied to cardboard. Resubmit Samples until acceptable color, sheen and texture is obtained.

F. CHPS 2014 Submittals:

1. Credit EQ 7.0 - Low Emitting Materials

   EQ 7.0 Paints & Coatings

   This prerequisite addresses all paints and coatings that are applied onsite in the project’s interior. The affected products include but are not limited to sealers, stains, clear wood finishes, floor sealers and coatings,

waterproofing sealers, primers, flat paints and coatings, non-flat paints and coatings, and rust preventative coatings. 90%, or more, of the total volumes of such products shall meet the applicable VOC content requirements of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011. Compliance shall be documented by product data sheets, or equivalent. Use definitions and table values in the selected VOC content standard and clearly identify the standard selected for each product.

2. Credit EQ 7.1.5 - Paints & Coatings

   See EQ 7.0 for the description of the paints and coatings covered under this criterion. 90%, or more, by volume of all interior paints and coatings normally applied to walls, ceilings, floors or trim shall be tested for emissions of VOCs of concern with respect to chronic inhalation exposures following the specifications of the CDPH Standard Method V1.1, 2010. The test results shall be compliant with the Standard Method when modeled to the school classroom scenario as follows. Flooring sealers and paints shall be modeled using the manufacturer's specified coverage and the classroom flooring area. Wall applied paints and coatings shall be modeled using the manufacturer's specified coverage and the classroom wall paint and wall coverings area. Ceiling applied paints and coatings shall be modeled similarly using the ceiling area. Wood stains and finishes and trim applied paint shall be modeled similarly using the area of the classroom door plus the area of the wall base (i.e., 11.6 m2).

3. .

1.7 FIELD SAMPLES

A. Provide field samples under provisions of Section 01 33 00.

B. On wall surfaces and other exterior and interior components, duplicate specified finishes on at least 100 square feet of surface area.

C. Provide full-coat finishes until required coverage, sheen, color and texture are obtained.

D. Simulate finished lighting conditions for review of field samples.

E. After finishes are accepted, the accepted surface may remain as part of the Work and will be used to evaluate subsequent coating systems applications of a similar nature.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver the products to site and store and protect under provisions of Section 01

87 00.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing. Paint containers not displaying product identification will not be acceptable.

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

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45°F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50%, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 45°F for interiors; 50°F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and Urethane Finishes: 65°F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 foot-candles measured mid-height at substrate surface.

1.10 EXTRA STOCK

A. Provide a ten gallon container of each finish paint color to [Owner][District] for touchup.

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

1.11 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five years experience.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, other manufacturers offering equivalent products are:

1. Benjamin Moore Paints, (213) 722-3484., www.benjaminmoore.com
2. Dunn Edwards., www.dunnedwards.com (Basis of Design)
3. Kelly-Moore Paint Company, (650) 592-8337., kellymoore.com
4. PPG Paints, (888) 774-2001., www.ppgpaints.com
5. Sherwin Williams, (310) 404-7422., www.sherwin-williams.com
6. Tnemec Company, Inc., (310) 643-5191., www.tnemec.com
7. Vista Paint Corporation, (714) 680-3800., www.vistapaint.com

B. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

B. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. Accessory Materials: Linseed oil, shella, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

D. Required CHPS 2014 Credit:

1. Credit EQ 7.0 - Low Emitting Materials

   EQ 7.0 Paints & Coatings

   This prerequisite addresses all paints and coatings that are applied onsite in the project's interior. The affected products include but are not limited to sealers, stains, clear wood finishes, floor sealers and coatings, waterproofing sealers, primers, flat paints and coatings, non-flat paints and coatings, and rust preventative coatings. 90%, or more, of the total volumes of such products shall meet the applicable VOC content requirements of the California Air Resources Board (CARB) 2007, Suggested

Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011. Compliance shall be documented by product data sheets, or equivalent. Use definitions and table values in the selected VOC content standard and clearly identify the standard selected for each product.

2. Credit EQ 7.1.5 - Paints & Coatings

   See EQ 7.0 for the description of the paints and coatings covered under this criterion. 90%, or more, by volume of all interior paints and coatings normally applied to walls, ceilings, floors or trim shall be tested for emissions of VOCs of concern with respect to chronic inhalation exposures following the specifications of the CDPH Standard Method V1.1, 2010. The test results shall be compliant with the Standard Method when modeled to the school classroom scenario as follows. Flooring sealers and paints shall be modeled using the manufacturer's specified coverage and the classroom flooring area. Wall applied paints and coatings shall be modeled using the manufacturer's specified coverage and the classroom wall paint and wall coverings area. Ceiling applied paints and coatings shall be modeled similarly using the ceiling area. Wood stains and finishes and trim applied paint shall be modeled similarly using the area of the classroom door plus the area of the wall base (i.e., 11.6 m2).

2.3 FINISHES

A. Refer to schedule at end of Section for surface finish schedule.

PART 3 - EXECUTION

3.1 INSPECTION

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

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

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

   1. Plaster and Gypsum Wallboard: 12%.

   2. Masonry, Concrete, and Concrete Unit Masonry: 12%.

   3. Exterior Located Wood: 15%, measured in accordance with ASTM D2016.

D. Beginning of installation means acceptance of existing surfaces.

3.2 SURFACE PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.

B. Correct minor defects and clean surfaces which affect Work of this Section.

C. Shellac and seal marks which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Aluminum Surfaces: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

F. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

G. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

H. Gypsum Board: Repair all voids, nicks, cracks and dents with patching materials and finish flush with adjacent surface. Latex fill minor defects. Spot prime defects after repair.

I. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Pretreat with phosphoric acid etch or vinyl wash. Apply coat of etching primer the same day as pretreatment is applied.

J. Concrete and Unit Masonry: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

K. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

L. Uncoated Steel and Iron: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

M. Shop Primed Steel: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

N. Interior Wood: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

O. Exterior Wood: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.

P. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

Q. Wood Doors: Seal top and bottom edges with 2 coats of spar varnish sealer.

3.3 PROTECTION OF ADJACENT WORK

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

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

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

D. Remove empty paint containers from site.

3.4 WORK NOT TO BE PAINTED

A. Painting is not required on surfaces in concealed and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces and duct shafts.

B. Do not paint metal surfaces such as stainless steel, chromium plate, brass, bronze, and similar finished metal surfaces.

C. Do not paint anodized aluminum or other surfaces which are specified to be factory pre-finished.

D. Do not paint sandblasted or architecturally finished concrete surfaces.

E. Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or identifications.

3.5 APPLICATION

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

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

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand lightly between coats to achieve required finish.

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

G. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.

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

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

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

K. Paint mill finished door seals to match door or frame.

L. Paint primed steel glazing stops in doors to match door or frame.

M. Cloudiness, spotting, lap marks, brush marks, runs, sags, spikes and other surface imperfections will not be acceptable.

N. Where spray application is used, apply each coat of the required thickness. Do not double back to build up film thickness of two coats in one pass.

O. Where roller application is used, roll and redistribute paint to an even and fine texture. Leave no evidence of roller laps, irregularity of texture, skid marks, or other surface imperfections.

P. For painting of exterior patchwork, paint to the nearest surface break.

3.6 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment. Do not paint shop prefinished items.

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

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

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

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

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

G. Paint grilles, registers, and diffusers which do not match color of adjacent surface.

H. Paint all mechanical and electrical equipment, vents, fans, and the like occurring on roof.

I. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts.

J. Do not paint over labels or equipment identification markings.

K. Do not paint mechanical room specialties such as compressors, boilers, pumps, control panels, etc.

L. Do not paint switch plates, light fixtures, and fixture lenses.

3.7 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.8 PROTECTION OF COMPLETED WORK

A. Protect finished installation under provisions of Section 01 87 00.

B. Erect barriers and post warning signs. Maintain in place until coatings are fully dry.

C. Confirm that no dust generating activities will occur following application of coatings.

3.9 PATCHING

A. After completion of painting in any one room or area, repair surfaces damaged by other trades.

B. Touch-up or re-finish as required to produce intended appearance.

3.10 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

B. The [Owner][District] reserves the right to invoke the following test procedure at any time and as often as the [Owner][District] deems necessary.

C. The [Owner][District] will engage the services of an independent testing agency to sample paint material being used.

D. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

E. The testing agency will perform appropriate quantitive materials analysis and other characteristic testing of materials as required by the [Owner][District].

F. If test results show materials being used and their installation do not comply with specified requirements or manufacturer's recommendations, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing and repaint surfaces to acceptable condition.

3.11 COLOR SCHEDULE

A. Paint and finish colors shall be custom color, mixed and formulated to match existing finishes.

B. Access doors, registers, exposed piping, electrical conduit and mechanical/electrical panels if not stainless steel; generally the same color as adjacent walls.

C. Exterior and interior steel doors, frames and trim; match adjacent existing door frames.

D. Doors: Match adjacent existing door paint or varnish.

E. Interior and Exterior Steel Fabrications, if not Stainless Steel: Match existing or adjacent walls.

3.12 SCHEDULE - EXTERIOR SURFACES

A. The following paint systems shall be used:

1. Wood-Painted (Flat Acrylic) - Exterior Trim and Exposed Wood Framing

1st coat:	W708 EZ Prime
2nd coat:	EVSH10 Evershield
3rd coat:	EVSH10 Evershield

2. Wood-Painted (Semi-Gloss Acrylic)

1st coat: W708 EZ Prime
2nd coat: EVSH50 Evershield
3rd coat: EVSH50 Evershield

3. Wood-Painted (Gloss Alkyd)
   1st coat: W708 EZ Prime
   2nd coat:
   3rd coat:

4. Wood - Semi-Transparent
   1st coat: "OKON"

5. Concrete (Flat Acrylic) - Exposed concrete indicated on drawings to be painted
   1st coat: Eff-Stop Premium
   2nd coat: EVSH10 Evershield
   3rd coat: EVSH10 Evershield

6. Concrete Masonry Units (Flat Acrylic)
   Fill coat: Smooth Blocfil Premium
   1st coat: EVSH10 Evershield
   2nd coat: EVSH10 Evershield

7. Cement Plaster (Flat Acrylic)
   1st coat: Eff-Stop Premium
   2nd coat: EVSH10 Evershield
   3rd coat: EVSH10 Evershield

8. Cement Plaster (Flat Elastomeric)
   1st coat: Enduraseal W360V
   2nd coat: Endurawall W370
   3rd coat: Eudurawall W370

9. Steel-Primed or Unprimed (Flat Acrylic)
   1st coat: ULGM00-WH Ultrashield or equal
   2nd coat: EVSH10 Evershield
   3rd coat: EVSH10 Evershield

10. Steel-Primed or Unprimed (Semi-Gloss Acrylic)
    1st coat: ULGM00-WH Ultrashield or equal
    2nd coat: EVSH50 Evershield
    3rd coat: EVSH50 Evershield

11. Steel-Primed or Unprimed (Gloss-Alkyd)
    1st coat: ULGM00-WH Ultrashield or equal
    2nd coat: 10A Syn-Lustro
    3rd coat: 10A Syn-Lustro

12. Steel-Galvanized (Flat Acrylic)

1st coat:	ULGM00-WH Ultrashield or equal
2nd coat:	ULGM00-WH Ultrashield or equal
3rd coat:	EVSH10 Evershield
4th coat	EVSH10 Evershield

13. Steel-Galvanized (Semi-Gloss - Acrylic)

1st coat:	ULGM00-WH Ultrashield or equal
2nd coat:	ULGM00-WH Ultrashield or equal
3rd coat:	EVSH50 Evershield
4th coat	EVSH50 Evershield

14. Steel-Galvanized (Gloss - Alkyd)

1st coat:	ULGM00-WH Ultrashield or equal
2nd coat:	ULGM00-WH Ultrashield or equal
3rd coat:	10A Syn-Lustro
4th coat	10A Syn-Lustro

15. Pavement Marking [_____]

1st coat:	[_____]
2nd coat:	[_____]

3.13 SCHEDULE - INTERIOR SURFACES

A. The following paint systems shall be used:

1. Steel - Primed or Unprimed (Semi-Gloss-Alkyd) - Steel Doors/Frames

1st coat:	ULGM00-WH Ultrashield or equal
2nd coat:	9A Syn-Lustro Semi-Gloss
3rd coat:	9A Syn-Lustro Semi-Gloss

2. Gypsum Board (Eggshell-Acrylic) - Gypsum Board Walls and Ceilings

1st coat:	
2nd coat:	W440V Decosheen
3rd coat:	W440V Decosheen

3. Gypsum Board (Semi-Gloss -Acrylic) - Wipe down areas

1st coat:	
2nd coat:	EVSH50 Evershield
3rd coat:	EVSH50 Evershield

END OF SECTION

SECTION 10 14 00
Signage

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Door and wall signage.

B. Exterior metal signs.

C. Cast letters and numbers.

D. Traffic Signs.

E. Cast metal plaques.

1.2 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Submit dimensioned elevations of each sign configuration.

1. Show sign sections indicating materials, thicknesses and attachment methods.

2. Show anchors and reinforcement.

3. Provide complete signage schedule indicating all signs and locations, key to room numbers and elevations. Provide space for Architect to indicate sign type and location.

C. Product Data:

1. Manufacturer's current published specifications.

2. Manufacturer's installation instructions.

D. Samples:

1. Provide two Samples of each sign type required in the profiles and sizes indicated on the Drawings. Signs approved with correct color and type may be used in the final installation at the request of the Contractor.

2. Provide Samples of all proposed fasteners and accessories.

3. Three copies of manufacturer's color chart indicating all available standard colors for selection by the Architect.

E. Closeout: Manufacturer's warranty.

1.3 PROJECT CONDITIONS

A. Environmental Requirements: Install signs only when interior air and substrates have reached equilibrium moisture and temperature approximating that of normal occupied conditions.

B. Do not install adhesive tape mounted signs when ambient temperature is below 7°F. Maintain this temperature during and after installation of signs. Unless otherwise noted by manufacture recommendations.

1.4 REGULATORY REQUIREMENTS

A. Conform to California Building Code – Chapter 11B and American Disability Act (ADA) for accessibility requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver signs safely packed to prevent damage during shipment and prior to installation.

B. Keep signs in protective wrapping until ready for installation.

C. Handle carefully to prevent damage. Replace damaged parts at no cost to the District.

D. Comply with the additional requirements specified in Section 01 87 00.

1.6 SCHEDULING

A. Do not install signs until walls and/or doors have received final finish.

1.7 WARRANTY

A. Procedures: In accordance with Section 01 78 36.

B. Furnish manufacturer's written warranty agreeing to replace signs which fade or discolor under normal environmental exposure.

C. Warranty Period: 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Subject to compliance with requirements specified herein. See Kaiser specification standards for further information and guidelines.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 DOOR AND WALL SIGNAGE

A. Cast Acrylic Sheet:

1. Digital Information Display,

2. ASI Signage, asisignage.com

3. Modulux, www.modulex.com

B. Mohawk Sign Systems Inc., or approved equal.

1. Monolithic tactile plaque sign with fully integrated graphics composed of high-impact polyester acrylate resins, pressure molded into a single polymerized component, using manufacturer's co-molding process.

a. Depth: 0.25" thickness.

b. Panel Appearance: Specify from manufacturer's standard, high contrast semi-matte color chart.

c. Surface Texture: Matte non-glare.

d. Letter Styles and Sizes and Layout Position: Specify from manufacturer's standard letter styles and color chart.

e. Text Schedule: Verify correct capitalization.

f. Sign Size: As indicated on the Drawings.

g. Sign Shape: As indicated on the Drawings. Square or rectangular shapes shall have radiused corners.

h. Installation: Provide countersunk mounting holes for mechanical fasteners.

i. Sign Copy: Shall be integrally molded with sign body per manufacturer's standard bonding process.

j. Application: Rated for exterior and interior applications.

k. Background Appearance: Solid color from manufacturer's standard color charts.

l. Braille: Integral domed-shaped California Grade 2 Braille dots, each distinct and separate.

2. Flame Resistance: Application of a lighted match shall not produce melting,

flashing, flaring or distortion. Signs shall not ignite at a temperature less than 800°F.

3. Vandal resistant surface which can be cleaned using industrial cleansers, including acetone.

C. Fasteners: All screws, bolts and fasteners to be tamper resistant stainless steel. All fasteners to be to be provided with solid anchorage to studs, blocking or concrete; do not use toggle bolts.

D. Colors: High contrast semi-matte integral colors for graphics. All integral resins are U.V stabilized resins utilizing automotive grade pigments.

E. Location of signs as shown on Drawings.

2.3 EXTERIOR METAL SIGNAGE

A. Galvanized steel plate, 0.0538" thick, mechanically mounted.

B. Porcelain copy, 1" high, colors as selected by Architect. Text and size shall be all uppercase as indicated on Drawings.

C. Location of signs as shown on Drawings.

D. Shop Fabricated Signs: All joints, returns and the like shall be properly joined together and welded edges shall be ground smooth to proper aluminum finish.

E. Shapes shall be saw-cut smooth and straight and shall be deburred prior to final finishing and assembly. Square or rectangular shapes shall have radiused corners.

F. Vandal resistant surface which can be cleaned using industrial cleansers, including acetone.

G. Fasteners: All screws, bolts and fasteners to be tamper resistant stainless steel. All fasteners shall be to be provided with solid anchorage to studs, blocking or concrete; do not use toggle bolts.

H. Colors: High contrast non-glare or semi-matte integral colors for graphics. All integral resins are UV stabilized resins utilizing automotive grade pigments.

2.4 CAST LETTERS AND NUMBERS

A. Manufacturer:

1. Digital Information Display,

2. ARK Ramos, arkramos.com

3. Metal Arts Inc.,

4. ASI Signage, asisignage.com

5. Modulux, www.modulux.com or approved equal.

B. Standard cast letters, color to be selected by Architect.

C. Verify location as shown on Exterior Elevations. Verify all text with District prior to ordering signage.

D. Size of Letters: See details

E. Text: See signage plan

2.5 FABRICATION

A. General Requirements:

1. Shop-fabricate signs to requirements indicated for materials, thicknesses, designs, shapes, sizes and details of construction.

2. Sign panel surfaces shall be smooth, even and fabricated to remain flat under installed conditions. Ease all edges and corners of signs.

3. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant regulations and requirements indicated for size, style, spacing, content, position and colors.

B. Tactile Graphics and Text:

1. Conform to C.B.C. Title 24, Chapter 11, Section 11B-Division 7. 11B-703.2.5, Table 11B-703.3.1, 11B-703.3.2.

2. California Grade 2 Braille must accompany raised text characters. Provide tactile copy and Grade 2 Braille raised 1/32" minimum from plaque using manufacturer's co-molding process:

a. Letters and numbers shall be raised 1/32" (0.794 mm) and shall be sans-serif uppercase characters accompanied by California Grade 2 Braille symbols.

b. Braille Symbols: Rounded or domed California Braille dots, each distinct and separate. Dots shall be 1/10" (2.54 mm) on centers in each cell with 2/10" (5.08 mm) space between cells. Dots shall be raised a minimum of 1/32" (0.794 mm) from a plaque surface.

c. Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60% minimum and 110% maximum of the

height of the uppercase letter "I".

d. Character Height: Characters and numbers on signs shall be 5/8" minimum and 2" maximum high and as shown on the Drawings.

e. Contrast of Characters and Symbols: Characters and symbols shall be light characters with dark background with a contrast of 70% minimum.

3. Raised Characters and Pictorial Symbol Signs:

a. Letter Type: Letters and numbers on signs shall be raised 1/32" (0.794 mm) minimum and shall be sans-serif uppercase characters accompanied by California Grade 2 Braille.

b. The stroke thickness of the uppercase letter "I" shall be 15% maximum of the height of the character. Reference to CBC 11B Division 7, 11B-703.2.6.

c. Symbol Size: Raised characters or symbols shall be a minimum of 5/8" (15.9 mm) and as shown on the Drawings.

d. Pictorial Symbol Signs (Pictograms): Pictorial symbol signs (pictograms) shall be accompanied by the equivalent verbal description placed directly below the pictogram as shown on the Drawings.

e. Contrast between letters and/or characters and background color must be 70% minimum.

C. Silkscreening: All silkscreened graphics shall be produced with ABS paint compatible with the substrate, using mesh of 390 or finer to produce clean, sharp edges. All media are to be opaque, with full even coverage, and free from dust bubbles, blemishes and other foreign matter. Characters and symbols shall contrast 70% minimum with their background. Characters shall be light colors with dark background.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces to receive units are true and plumb. Correct inadequate surfaces before installation of signs.

B. Verify that moisture and temperature levels of substrate and environment have been stabilized and are acceptable prior to proceeding with the Work.

C. Take field measurements prior to shop fabrication where necessary in order to ensure proper fitting of Work.

D. Do not begin Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in locations and at mounting heights indicated on Drawings.

1. Keep perimeter lines straight, plumb, and level.

2. Install within 1/4" tolerance vertically and horizontally of intended location and in accordance with manufacturer's recommendations.

3. Install product at heights to conform to current CBC and ADA Accessibility Guidelines .

B. Installation on Walls: Attach securely through finish wall to rigid backing.

C. Installation Method: Install with vandal - resistant fasteners.

3.3 CLEANING, PROTECTION AND REPAIR

A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5'.

B. Clean installed products in accordance with manufacturer's instructions prior to District's acceptance.

END OF SECTION

SECTION 10 28 00
Toilet and Bath Accessories

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Toilet and washroom accessories.

B. Mirror units.

C. Concealed anchor devices and backing plate reinforcements furnished to other Sections.

D. Attachment hardware.

1.2 REFERENCES

A. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. CBC – California Building Code, Chapter 11B.

C. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

E. ASTM B456 – Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

F.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide Product Data on accessories, describing size, finish, details of function, attachment methods.

C. Submit manufacturer's installation instructions.

1.4 KEYING

A. Supply two keys for each accessory to [Owner][District].

B. Master key all accessories.

1.5 REGULATORY REQUIREMENTS

A. Conform to CBC and ADAAG for access for the handicapped.

1.6 COORDINATION

A. Coordinate the Work of this Section under provisions of Section 01 31 19.

B. Coordinate the Work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Bobrick, Inc., www.bobrick.com

B. American Specialties, Inc. (ASI)., americanspecialties.com

C. Bradley Corporation., www.bradleycorp.com

D. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Sheet Steel:.

B. Stainless Steel Sheet: , Type 304.

C. Tubing: ASTM A269, stainless steel, Type 304.

D. Adhesive: Two-component epoxy type waterproof.

E. Fasteners, Screws, and Bolts: Hot-dip galvanized, tamperproof.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

A. Weld and grind smooth joints of fabricated components.

B. Form exposed surfaces from single sheet of stock, free of joints.

C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

D. Back-paint components where contact is made with building finishes to prevent electrolysis.

E. Shop-assemble components and package complete with anchors and fittings.

F. Provide steel anchor plates, adapters, and anchor components for installation.

G. Hot-dip galvanize all ferrous metal and fastening devices.

2.4 FACTORY FINISHING

A. Galvanizing: ASTM A123 to 1.25 ounces per square yard.

B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

C. Stainless Steel: No. 4 satin finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive Work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.3 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturer's instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Verify that no equipment in accessible toilet stalls protrudes past the face of the wall by more than 3".

3.4 SCHEDULE

A. Model numbers refer to [Bobrick] products, as a standard of quality and performance.

Model No.	Description	Power	Remark
B-7120	Surface Mt.Hand dryer - ADA		
	Semi-recessed Automatic Universal Roll Paper Towel Dispenser	-	-
B-68137.99	1-1/2" dia. X 36" x 54" horizontal two-wall shower compartment grab bar	-	-
B-1659	Glass Mirror, reference Drawings for sizes	-	-
B-295	Stainless steel shelf	-	-
B-221	Toilet seat cover dispenser	-	-
	Custodian's mop and broom rack w/shelf	-	-
B-2888, B-3888	Toilet tissue dispenser, non-accessible stalls	-	-
B-3888 B-4388	Toilet tissue dispenser, accessible stalls	-	-
B-2112	Soap dispenser	-	-
B-1556	Frameless stainless steel mirror, see drawings for sizes	-	-
B-233	Stainless steel clothes hook	-	-
B-3706 25	Recessed sanitary napkin dispenser - ADA	-	-
B-4388	Recessed toilet tissue dispenser	-	-
B-204/204-1	Curtain rod, curtain, & hooks see drawings for sizes	-	-
		-	-
B-270	Sanitary napkin disposal	-	-
B-354	Partition-Mounted Sanitary Napkin Disposal		
B-6806-99	1-1/2" diameter x 36" long grab bar refer to Drawings for anchorage	-	-
B-517	14-3/4" x 32-7/8" x 22-11/16" folding shower seat		
See Plumbing Drawings	Flexible spray hose 60" lg., single lever mixing valve control and shower and wand support.		
	1-1/2" diameter x 24" x 36" horizontal two-wall shower compartment grab bar		
B-35303/ B3513	Recessed sanitary napkin disposal		

END OF SECTION

SECTION 11 31 00
Appliances

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Range hood and motor.

1.2 SYSTEM DESCRIPTION

A. Equipment: Conform to applicable code for UL approval.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide data on equipment and accessories.

C. Operating and Maintenance Instructions: Include relevant instructions.

D. Submit manufacturer's installation instructions.

1.4 WARRANTY

A. Provide one year warranty from each appliance manufacturer.

PART 2 - PRODUCTS

2.1 RANGE HOOD AND MOTOR

A. Thermador Model, or approved equal; 24" x 48" stainless steel hood complete with filter housing and two enclosed light fixtures. Provide duct connection fittings as required to connect exhaust duct.

B. Ventilator Control Housing: VCH-3.

C. Ventilator: VTN 1000Q.

1. CFM: 1000.

2. Amps: 7.8.

3. Voltage: 120.

4. Phase: 1.

D. Roof Jack: 1255-6.

E. Provide square stainless steel duct enclosure from top of hood to underside of ceiling.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that openings and utility services are ready to receive Work and opening dimensions are as instructed by the manufacturer.

3.2 INSTALLATION

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

B. Set and adjust units level and plumb.

C. Activate units to confirm correct operation.

END OF SECTION

SECTION 12 20 00
Window Coverings

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manual sunscreen roller shades.

B. Motorized sunscreen roller shades.

C. Shroud and fascia assemblies.

D. Operating hardware.

E. Local group and master control system for shade operation.

F. Related Work:

a. Section 06 10 00 Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories

b. Section 09 29 00 Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories

c. Division 26 Electrical: Electric service for motor controls

1.2 REFERENCES

A. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. NFPA 701 – Standard Method of Fire Test for Flame Propagation of Textiles and Films.

D. NFPA 70® - National Electrical Code®

1.3 SYSTEM DESCRIPTION

A. Fabric window shades.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00. Coordinate with window submittals.

B. Submit Shop Drawings indicating opening sizes, tolerances required, installation of blind at window opening, method of attachment, clearances, and operation.

C. Submit Product Data indicating physical and dimensional characteristics such as light filtration capabilities and operating features.

1. Preparation instructions and recommendations.

2. CHPS Low-Emitting Materials Product List or by a 3rd party certification program listing low-emitting material products that meet the State testing requirements, as identified on the CHPS website.

3. Styles, material descriptions, dimensions of individual components, profiles, features, finishes, light filtration capabilities and operating instructions.

4. Storage and handling requirements and recommendations.

5. Mounting details and installation methods.

6. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

D. Submit two 6" long Samples illustrating material weave and fabric color.

E. Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with ten years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 87 00.

B. Deliver products wrapped and crated in a manner to prevent damage to components or marring of surfaces.

C. Store in a clean, dry area, laid flat and blocked off ground to prevent sagging, twisting, or warping.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are

maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY

A. Roller Shade Hardware, Chain: Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.

C. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.

D. Roller Shade Installation: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Levolor Contract., www.levolor.com

B. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Roller Shades: Based on MechoShade manually-operated units as a standard of quality.

1. Shade: "Ecoveil" sunscreen, open basket-weave, 1% openness factor meeting the requirements of and ASTM E84-90 for flame spread 17, smoke density index 118.

2. Openness Factor:

a. All windows: 5%

b. Verify all Openness Factor with Architect.

3. Operator: One-piece, chain operated clutch molded and a linear disc-brake opposed to a flat steel backing plate and concealed variable adjustment system, adjustable from 100% friction (static) to 15% friction (dynamic).

4. Fascia Concealer: Snap-on extruded aluminum, clear anodized.

5. Accessories: As required for mounting directly to window frame assembly.

6. Cord: Chain (ball type).

7. Factory Finishing: Manufacturer's standard color shade. Clear anodized aluminum accessories.

2.3 MOUNTING

A. Mounting Types:

1. Outside Mounting: Shade mounts through back of head assembly to outside of window opening on wall surface. Slats or shade shall overlap the opening by minimum 1" each side.

2. Inside Mounting: Shade mounts through top of head assembly to inside of window opening. Slats or shade shall be sized with current clearance not to come in contact with sides of window opening, and shall be wide enough to block the maximum amount of light.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive the Work.

B. Do not commence fabrication until field measurements are confirmed.

C. Ensure head rail supports are correctly placed.

D. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

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

B. Secure in place with concealed fasteners.

C. Verify that wands and other operators are easily reachable for easy operation at floor level.

3.3 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/8".

B. Maximum Offset From Level: 1/16".

3.4 ADJUSTING

A. Adjust Work under provisions of Section 01 77 00.

B. Adjust shades for smooth operation.

3.5 CLEANING

A. Clean Work under provisions of Section 01 77 00.

3.6 SCHEDULE

A. Abbreviations: I - Inside, O - Outside, RH - Right Hand, LH-Left Hand.

B. Schedule of Installation:

Location	Blind Type Window/ Frame Type	Nominal Opening Size in Inches Width x Height	Mounting Type	Control Location
1. TBD	B	47" x 54"	(O)	RH
2. TBD	C	104" x 28"	(I)	LH
3. TBD	H	51" x 33"	(O)	RH
4. TBD		47" x 96"	(I)	RH

END OF SECTION

SECTION 13 34 23
Modular and Relocatable Buildings

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. DSA Pre-Approved (PC) plans and specifications complying with the 2019 California Building Code, applicable versions of the California Energy Code and the California Green Building Standards Code.

1. DSA approval of existing and refurbished buildings.
2. Delivery and placement of buildings onto concrete foundations and footings by others.
3. Exterior doors and windows.
4. Interior finishes.
5. HVAC system.
6. Electrical wiring and fixtures.
7. Door Hardware.
8. Signage.

1.2 REFERENCES

A. DSA BU 22-01 – Bulletin: 2019 Pre-Check Extension and Renewals to the 2022 CBC.

B. DSA PR 18-02: Pre-Check (PC) Permanent Modular or Relocatable Building Designs Building Designs CALGreen/Energy Code Compliance Review.

C. (ADA) Accessibility Guidelines for Buildings and Facilities.

D. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

E. ASTM A36 – Standard Specification for Carbon Structural Steel.

F. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.

G. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

H. ASTM C635 – Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

I. ASTM C665 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

J. AWS D1.1 - Structural Welding Code.

K. SSPC - Steel Structures Painting Council.

L. CBC – 2019 California Building Code.

M. California Energy Code

N. CalGreen – California Green Building Standards Code

1.3 SYSTEM DESCRIPTION

A. Standard Portable Unit: Consists of a steel moment resisting building frame structure with a wood floor, "Texture 1-11" plywood exterior siding wall finish and a metal roof.

Modules: Six (6) approximately 12' x 40' classroom portables to be placed onto the site to form a single complete building of approximately 5760 s.f. The completed building shall have connecting hallways (by others) to allow for through passage between portables.

B. Modules: Set to maintain alignment of finish floors and to permit non-destructive detachment for future relocation and reassembly. Waterproof joints of the removable hallway assemblies.

C. Modules: Capable of resisting all vertical and lateral loads during transportation and relocation. Jackable at corners or with lift lugs front and back for relocation without damage.

D. Structural System: Three dimensional steel moment resisting space frame.

1. Members and joints capable of resisting and carrying all vertical and lateral forces primarily by flexure.

2. Fully welded and developed main transverse and longitudinal roof and floor beams and supporting columns. Joints fully detailed to develop all action flange faces and weld shears.

3. All main roof beams shall be clear span, with columns only in each corner.

4. Space Frame Drift Deflection: Maximum 0.005 x story height as required by CBC Chapter 16, Section 1616A

5. Space Frame: Resist lateral forces in accordance with CBC Chapter 16, Section 1616A

6. Dead and Live Load Deflection: Conform to CBC Chapter 16, 1606A – 1607A.

E. Horizontal Roof and Floor Diaphragms: Wood or steel construction at Contractor's option. Maximum span width ratio shall not exceed 3 to 1 in accordance with CBC Chapter 16, Section 1609A.5

F. Walls: Wood frame or steel stud construction.

G. Roofing: Preformed metal.

H. Photovoltaic and battery storage system: Conform to California Energy Code.

I. Thermal resistance of Wall System: R-value of 11.

J. Thermal Resistance of Roof System: R-value of 19.

K. Members to withstand dead load, and design loads due to pressure and suction of wind calculated in accordance with CBC Chapter 16, Section 1609A..

L. Metal or concrete ramps by others to finish grade meeting all applicable ADA and DSA requirements. Coordinate with the Architect prior to setting the units.

1.4 BID SUBMITTALS

A. Approved Drawings and Specifications: As part of bid, submit one complete set of drawings and specifications bearing stamp of approval of Division of State Architect, and meeting requirements of this Specification.

B. Location of Utility Rough-Ins: Drawings shall indicate exact location of all utility connection points.

1.5 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing prefabricated modular relocatable buildings with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to the applicable code edition.

1. California Building Code.
2. California Administrative Code.
3. California Electrical Code.
4. California Mechanical Code.
5. California Plumbing Code.
6. California Energy Code.
7. California Fire Code.
8. California Green Building Standards Code.

B. ADA Standards for access for the handicapped.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - BUILDING SYSTEM

A. American Modular Systems, www.americanmodular.com

B. Mobile Modular Corp., www.mobilemodular.com

C. Silver Creek Industries, LLC, https://silvercreekmodular.com/

D. Enviroplex, https://www.enviroplex.com/

E. Global Modular Inc., https://www.globalmodular.net

F. Substitutions: Must be on the current Division of the State Architect's List of DSA Approved Pre-Checked Projects.

2.2 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36.

B. Structural Tubing: ASTM A500, Grade B.

C. Steel Sheets for Light Gage Sections:, Grade 33, hot dip galvanized.

D. Anchor Bolts: ASTM A307.

E. Bolts, Nuts, and Washers: ASTM A307.

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

G. Primer: SSPC 15, Type 1, Red Oxide.

2.3 MATERIALS - FLOOR, WALL AND ROOF SYSTEM

A. Framing Lumber: Douglas Fir/Larch No. 2 or better. Pressure treated where below subfloor.

B. Blocking: Douglas Fir/Larch No. 3 or better.

C. Roof Sheathing: APA rated plywood sheathing, EXP1, minimum 15/16" thick.

D. Plywood Subfloor: APA rated "Sturd-I-Floor," 1-1/8" thick, T&G, EXP1.

E. Exterior Siding: APA 303-0C, "Texture 1-11" with grooves 8" on center, 5/8" thick.

F. Trim: Western Red Cedar, B and better.

G. Sealant: Manufacturers standard type, non-staining, elastomeric.

2.4 WOOD, PLASTICS, AND COMPOSITES

A. Provide shelving on all walls per plan. Confirm layout with District.

2.5 THERMAL AND MOISTURE PROTECTION

A. Building insulation shall provide minimum R19 insulation at walls and R30 insulation at roof. Building shall meet California Title 24 energy requirements.

2.6 METAL DOORS AND FRAMES

A. Doors: SDI-100 Grade II, Heavy Duty, Model 1, minimum 18 gauge faces.

1. Exterior doors to have awning at least four feet in depth, or roof overhang with four feet in depth.

B. Frames: Welded, 16 gauge material.

C. Hardware: BHMA 626 Dull Chromium finish, as follows:

1. 1-1/2 pair butts: Hager 1279BB 4-1/2 x 4-1/2 NRP PC.

2. Panic Device: VonDuprin #99L 26D with cylinder surface mount rim device.

3. Closer: LCN 4041.

4. Threshold: Pemko 271A.

5. Door Bottom: Pemko 345AV.

6. Weatherstrip: Pemko 292.

7. Pull Handle: #RN P857-689 (Less Cylinder).

8. Lock Set: Per OUSD Architectural and Material Standards.

2.7 ALUMINUM WINDOWS

A. Horizontal Sliding Windows: HS-C40 in accordance with AAMA 101, bronze anodized, glazed with 1/4" solar bronze double glass. Operable sash shall be equipped with aluminum screen. Size shall be 6' horizontal x 4' vertical. Two per portable.

2.8 FINISHES

A. Walls:

1. Typical: 5/8" screw-applied gypsum wallboard, covered with vinyl fabric-wrapped tackable panels, adhesive applied.

a. Panel Material: "Homosote 440 Board," 26-28 lbs. per cubic foot density, 2" thick.

b. Vinyl Fabric: Brewster Wallcovering Company, "Queens Guard Hopsacking," flame spread 20, smoke developed 10.

B. Ceiling:

1. Typical: Acoustical Ceiling: Heavy-duty classification in accordance with ASTM C635.

a. Suspension System: 24 gauge cold-rolled, pre-painted steel. Direct hung in accordance with CBC Chapter 8, Section 808.

b. Acoustical Panels: 5/8" thick mineral fiberboard square edge lay in panels, 24" x 48", ASTM flame spread Class I, equivalent to Armstrong "Ultima" with NRC=0.75 and CAC=35 or better.

C. Flooring: VCT 12" x 12" Armstrong or Rikett.

D. Base: 1/8" x 4" high top-set molded rubber cove base equivalent to Burke Rubber Co. 502P.

E. Paint Materials: Kelly-Moore, colors selected by Architect may be from manufacturer's standard palette or custom mixed.

1. Exterior Wood Siding and Trim: First coat, Exterior Wood Primer #255,

stain resistant acrylic primer; Second and Third Coats, #1250-Acry-Lustre Acrylic Semi-Gloss.

2. Exterior Ferrous Metal: First Coat, #1725; Second and Third Coats, #1680.

3. Galvanized Metal and Aluminum: First Coat, #1725; Second and Third Coats, #1680.

4. Gypsum Drywall: First Coat, #95-25 Pigmented Wall Sealer; Second and Third Coats, #1640 Eggshell Latex Enamel.

5. Wood Trim: First Coat, #975 Undercoat; Second and Third Coats, #1640 Eggshell Latex Enamel.

2.9 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

A. HVAC heat pump with minimum cooling capacity of 46,000 BTU/hour and 10KW heat strip, equivalent to Bard 48KW. System shall maintain indoor temperature of 78°F in summer and 68°F in winter with 45% relative humidity when outdoor dry bulb temperature varies between 100°F in summer and 10°F in winter and a web bulb temperature of 75°F (average), with damper adjusted to use approximately one- third fresh air. Provide a welded 16 gauge galvanized sheet metal cover for each unit. Cover shall not impede air movement required by unit to function properly.

B. Controls: 24 volt automatic control system with tamper proof thermostat. Tork 7000 Series 24 hours skip-a-day timer control to shut unit off on nights and weekends. M.H. Rhodes "Marktimer" 90-007 0-6 hour interval timer to provide manual operation nights and weekends.

2.10 FIRE ALARM

A. Alarm System: Per OUSD Fire Alarm System Standards (system by others).

B. Fire Extinguisher: Dry chemical type equivalent to J.L. Industries "Cosmic" Model 5E, UL 2A:10B:C.

C. Fire Extinguisher Cabinet: Non-rated cabinet equivalent to J.L. Industries "Cosmic" Model Number 5E with 1836 doors, 1836 trim and clear glazing.

2.11 ELECTRICAL

A. Panelboard: Single phase 120/208 volt flush mounted load center.

B. Wire and Cable: Type TW for branch circuits and Type AF for wiring within the fixtures, minimum #12 AWG for all branch circuits.

C. Conduit: Rigid aluminum service conduit, EMT for ground wire.

D. Receptacles: Duplex, 125 volt, 20 ampere 3-wire grounding type. Minimum of 10 receptacles per portable.

E. Toggle Switches: 20 ampere, Hubbell or approved equal.

F. Lighting Fixtures: Interior LED light fixtures shall be recessed and braced complying. Use 12, 3-lamp, light fixtures. Exterior fixtures shall be shall be in weather and vandal resistant housing with photocell.

G. Clock: Spartus or approved equal.

H. Rigid Galvanized Raceway: Connecting all portable units within 2' of next portable unit. Coordinate with Architect for location of raceway. Individual Christy boxes at each portable unit not required.

I. Intercom: One J-box home run stubbed to ceiling. Coordinate with Architect.

J. Data: Six data J-boxes stubbed to ceiling. Coordinate with Architect.

2.12 INTRUSION ALARM SYSTEM

A. One covered J-Box for future infrared intrusion alarm stubbed to ceiling.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that foundation, mechanical and electrical utilities, and placed anchors are in correct position.

3.2 INSTALLATION

A. Set modules on foundations. Shim and adjust for finish floor alignments to adjacent module(s)

B. Complete tie-down to foundation.

C. Seal and trim hallway assemblies between modules.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of This Section, Common Work Results for Plumbing, apply to all sections in Division 22.

C. All Sections of Division 22 are interrelated. When interpreting any direction, material, and method specified in any section of Division 22 consider it within the entirety of Work in Division 22.

1.2 SUMMARY

A. The intent of Division 22 Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 22 and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.

B. The Division 22 Specifications and the accompanying Drawings are complimentary and what is called for by one shall be as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications shall supersede drawings in case of conflict.

C. Imperative language is frequently used in Division 22 Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.

D. The Drawings that accompany the Division 22 Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions shall be assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in fixture location prior to roughing-in, without cost impact.

1.3 RELATED WORK

A. The General and Supplemental Conditions apply to this Division, including but not limited to:
   1. Drawings and specifications.
   2. Public ordinances, permits.
   3. Include payments and fees required by governing authorities for work of this Division.

B. Division 1, General Requirements, applies to this Division.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

B. Materials and equipment shall be new. Work shall be of good quality, free of faults and defects and in conformance with the Contract Documents.

C. Apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.

D. The entire plumbing system and apparatus shall operate at full capacity without objectionable noise or vibration.

E. All equipment shall be installed level and true. Housekeeping pads and curbs shall account for floor or roof slope.

F. Materials and Equipment:
1. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish all materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number shall be considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for all changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.

G. Workmanship:
1. General: All materials shall be installed in a neat and professional manner.
2. Manufacturer’s Instructions: Follow manufacturer’s directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 22 Specifications, obtain clarification before starting work.

H. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting shall be performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction shall be made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Beams or columns shall not be pierced without permission of Architect and then only as directed.
5. All new or existing work cut or damaged shall be restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces shall be repaired, refinished, and left in condition existing prior to commencement of work.

1.5 SUBMITTALS

A. Shop Drawings:
   1. The Contract Drawings indicate the general layout of the piping, and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of all piping, and equipment installations. Shop Drawings shall be new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. All drawings shall be same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings. All drawings shall be fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
   2. Shop drawings shall be prepared in **[two-dimensional]** format.
   3. Shop drawings shall include but are not limited to:
      a. Plumbing site plan drawn to same scale as Site Plan.
      b. Complete floor plans with plumbing to a minimum of 1/4-inch equals 1'-0" scale.
      c. Plumbing in mechanical rooms to a minimum of 1/2-inch equal 1'-0" scale.
      d. Sections of congested areas to a minimum of 1/2-inch = 1'-0" scale.
      e. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment shall not be less than 1/2-inch equals 1'-0" scale.
      f. Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, **plumbing piping and equipment**, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2**"** = 1"-0" scale.
      g. Superplot plans of below ground work with a colored overlay of all trades including, but not limited to, structural footings and foundation, HVAC piping, civil piping**, plumbing piping**, and power conduit to a minimum of 1/2**"** = 1"-0" scale.
      h. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4" = 1'-0" scale.
      i. Slab penetration drawings of HVAC, **plumbing**, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1"-0" scale.
   4. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:
   1. In general, submit product data for review on all scheduled pieces of equipment, on all equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data sheets shall include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.
   2. List the name of the motor manufacturer and service factor for each piece of equipment.
   3. Indicate equipment operating weights including bases and weight distribution at support points.
   4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:
   1. Shop Drawings and Product Data:
      a. Refer to Division 1 for additional requirements related to submittals.

b. Submit copies of shop drawings and product data for Work of Division 22 in a 3-ring loose leaf binder with each item filed under a tab and labeled with its respective specification section number, article and paragraph, and mark if applicable.
c. Submit electronic copies of shop drawings and product data for Work of Division 22 in PDF format with each item filed under a folder and labeled with its respective specification section number, article, and paragraph and mark, if applicable.
d. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
e. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, shall be included with the original submittal. Controls and Instrumentation submittals may lag but shall be complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder shall include a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities: It shall be the Contractor's responsibility to:
1. See that all submittals are submitted at one time and are in proper order.
2. Ensure that all equipment will fit in the space provided.
3. Assure that all deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.6 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS

A. Refer to Division 1 for additional requirements.

B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature shall be on 8-1/2"x11" sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for all electrically powered equipment.

C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions shall cover all phases of control.

D. Furnish competent engineer knowledgeable in this building system for minimum of five 8-hour days to instruct Owner in operation and maintenance of systems and equipment. Contractor shall keep a log of this instruction including dates, times, subjects, and those present and shall present such log when requested by Architect.

1.7 PROJECT CONDITIONS

A. Existing Conditions: Prior to bidding, verify and become familiar with all existing conditions by visiting the site, and include all factors which may affect the execution of this Work. Include all related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City and Utility Company.

1.8 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

1.9 PROVISIONS FOR LARGE EQUIPMENT

A. Contractor shall make provisions for the necessary openings in building to allow for admittance of all equipment.

1.10 TEST REPORTS AND CERTIFICATES

A. Contractor shall submit one copy of all test reports and certificates specified herein to the Architect.

1.11 SUBSTITUTIONS

A. Contractor shall submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 - PRODUCTS

2.1 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.2 PIPE SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.

B. Interior Wall and Floor Sleeves (fire rated): Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves: Cast iron.

D. On Grade Floor Sleeves: Same as exterior wall sleeves.

E. Water Tight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

2.3 FLOOR, WALL AND CEILING PLATES

A. Furnish stamped split type plates as follows:
   1. Floor Plates: Cast brass, chromium plated.
   2. Wall and Ceiling Plates: Spun aluminum.

2.4 MACHINERY GUARDS

A. Furnish guards for protection on all rotating and moving parts of equipment. Provide guards for all metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.

B. Design guards so as not to restrict air flow at fan inlets resulting in reduced capacity.

C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards shall be easily removable for pulley adjustment or removal and changing of belts.

D. All guards shall meet OSHA requirements including back plates.

E. Provide inlet and outlet screens on all fans in plenums or where exposed to personnel.

2.5 ELECTRICAL EQUIPMENT

A. General: All equipment and installed work shall be as specified under Division 26, Electrical.

B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available interrupting current (AIC) rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment that meets the bracing requirement.

C. Motors:
   1. Motors shall be furnished as integral part of driven equipment. They shall be drip-proof induction type with ball bearings unless noted otherwise. Motors 1 HP and above shall be premium energy efficient type, except for emergency equipment motors. Motors shall be built to NEMA Standards for the service intended. The motors shall be rated for the voltage specified, suitable for operation within the range of 10% above to 10% below the specified voltage.
   2. Energy efficient motors shall be Baldor, Westinghouse, General Electric or approved equal.
   3. The motor shall meet the efficiency standards identified in the table below as determined using the IEEE Method B test at full load.

MINIMUM MOTOR EFFICIENCIES					
		RPM IEEE 112B Efficiency			
HP	**KW**	**900**	**1200**	**1800**	**3600**
1	0.75	--	82.5	85.5	80.0
1.5	1.15	--	86.5	86.5	85.5
2	1.53	--	87.5	86.5	86.5
3	2.3	84.0	89.5	89.5	88.5
5	3.8	85.5	89.5	89.5	89.5
7.5	5.6	87.5	91.7	91.7	91.0
10	7.5	88.5	91.7	91.7	91.7
15	7.5	88.5	91.7	92.4	91.7

20	15.9	90.2	92.4	93.0	92.4
25	18.8	91.0	93.0	93.6	93.0
30	22.5	91.0	93.6	94.1	93.0
40	30.0	91.7	94.1	94.5	93.6
50	37.5	92.4	94.1	94.5	94.1
60	45.0	93.0	94.5	95.0	94.1
75	56.3	93.0	95.0	95.4	94.5
100	75.0	93.0	95.4	95.4	95.0
125	93.8	94.5	95.4	95.4	95.4
150	112.5	94.5	95.8	95.8	95.4
200	150.0	94.5	95.8	96.2	95.8
250	187.5	94.5	95.1	96.2	95.1
300	225.0	94.5	95.3	96.2	95.3
350	225.0	94.5	95.3	96.2	95.3
400	300.0	94.5	95.4	96.2	95.4
450	337.5	94.5	95.5	96.2	95.5
500	375.0	94.5	95.6	96.2	95.6

4. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage and phase.
5. Refer to individual product sections for additional motor requirements.
6. Motors shall have built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors shall have quick trip devices.
7. All motors controlled by variable frequency drives shall be inverter duty rated and have Class F insulation or better. They shall also be able to withstand repeated voltage peaks of 1600 volts with rise times of 0.1 microseconds and greater in accordance with NEMA Standard MG1 Part 31.
8. Motors served from variable frequency drives shall be equipped with shaft grounding system which shall provide a path for current to flow between the shaft and motor frame. SGS or equal.
9. Motors located in environment air plenums not tied to air handling functions shall be totally enclosed type motors.

D. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.

E. Equipment Wiring: Interconnecting wiring within or on a piece of mechanical equipment shall be provided with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.

F. Control Wiring: All control wiring for plumbing equipment shall be provided herewith.

G. Codes: All electrical equipment and products shall bear the Underwriters label as required by governing codes and ordinances.

PART 3 - EXECUTION

3.1 ACCESS PANELS

A. Install in accord with manufacturer's recommendations, coordinated with architectural features.

B. Provide 2-hour fire rated doors where required bearing the U.L. label.

C. Furnish 18x18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12x12-inch for walls unless indicated otherwise.

D. Furnish where indicated and where required to access valves, trap primers, shock arresters, and other appurtenances requiring operation, service or maintenance. Submit proposed locations for review prior to installation.

3.2 SLEEVES

A. Interior Floor and Wall Sleeves: Provide sleeves large enough to provide 3/4-inch clearances around pipe or ductwork. Where pipe or ductwork is insulated, insulation shall pass continuously through sleeve with 3/4-inch clearance between insulation and sleeve. Penetrations through mechanical room and fan room floors shall be made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.

B. Sleeves Through Rated Floors and Walls: Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves Below Grade: Provide water tight sleeves. Install at pipes entering building below grade and where shown. Adjust to provide positive hydrostatic seal. Contractor shall be responsible for following manufacturer's procedure for installing and tightening seal. Secure sleeves against displacement.

D. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.

E. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.

F. Layout work prior to concrete forming. Do all cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.

G. All floor sleeves shall maintain a water barrier by providing a water tight seal or they shall extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves shall extend 2 inches above finished floor level. Sleeves through roof shall extend 8 inches above roof. Wall sleeves shall be flush with face of wall unless otherwise indicated. Waste stacks using carriers shall have sleeves flush with floor and sealed. Sleeves through planters shall extend 8 inches above planter base.

H. Do not support pipes by resting pipe clamps on floor sleeves. Supplementary members shall be provided so pipes are floor supported.

I. Special sleeves detailed on drawings shall take precedence over this section.

3.3 CLEANING

A. General: Clean plumbing equipment, fixtures and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.4 EQUIPMENT PROTECTION

A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.5 ACCESSIBILITY

A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms and walkways.

3.6 FLOOR, WALL AND CEILING PLATES

A. Install on piping and ductwork passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates shall completely cover opening around pipe.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates shall not penetrate insulation vapor barriers.

D. Plates not required in mechanical rooms or unfinished spaces.

3.7 PAINTING

A. General: Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting. All exposed work under this division shall receive either a factory painted finish or a field prime coat finish, except:
   1. Exposed copper piping.
   2. Aluminum jacketed outdoor insulated piping.

B. Equipment Rooms and Finished Areas:
   1. Insulation: Not painted.
   2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
   3. Steel Valve Bodies and Bonnets: One coat of black enamel.

4. Brass Valve Bodies: Not painted.
5. Equipment: One coat of grey machinery enamel. Do not paint nameplates.

C. Concealed Spaces (above ceilings, not visible):
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.

D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

E. Exterior Black Steel Pipe: Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel. Painting schemes shall comply with ANSI A13.1.

3.8 ADJUSTING AND CLEANING

A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.

B. Use particular care in lubricating bearings to avoid damage by overlubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.9 ELECTRICAL EQUIPMENT

A. Piping for plumbing systems not serving electrical space shall not be installed in any switchgear room, transformer vault, telephone room, or electric closet except as indicated.

B. Piping for plumbing systems shall not pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.10 EQUIPMENT CONNECTIONS

A. Make final connections to equipment specified in sections other than Division 22 of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.

B. Piping:
1. Connections shall include hot and cold water, deionized water, distilled water, natural gas, medical gases, medical air and vacuum, dental air and vacuum, lab air and vacuum, sanitary waste and vent, lab waste and vent and fuel oil.
2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
3. All piping connections shall be independently supported to prevent undue strain on equipment.

END OF SECTION

SECTION 22 05 18

PLUMBING EXPANSION COMPENSATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Expansion joints and compensation.

B. Related Sections include:
1. Section 22 05 29 Hangers, Supports and Anchors for Plumbing.
2. Section 22 05 48 Vibration and Seismic Controls for Plumbing Piping and Equipment
3. Section 22 21 13 Pipe and Pipe Fittings Plumbing.

1.3 QUALITY ASSURANCE

A. The expansion joints, pipe guides, and related supports, braces, and anchorages to building structure shall be designed to absorb thermal expansion and contraction of piping and terminal movement, as well as resist the static and dynamic loads due to fluid flow at design conditions, hydraulic testing pressures, and seismic forces.

B. The system of expansion joints, guides, and related supports, braces, and anchorage to building structure shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.

C. Use expansion joints in straight lengths of rigid pipe; preferably welded steel, anchored and guided in accordance with best practices recommendations of Crocker and King, Piping Handbook, latest edition.

D. Avoid use of expansion joints in conjunction with U-bends or other piping systems with “inherent” flexibility, such as Victaulic piping with flexible couplings. If expansion joints are used in piping with bends, thorough analysis of pipe stresses and deflections shall be conducted and extra care and attention shall be paid to radial thrust capacity of pipe guides, braces, and anchors.

E. Design shall include:
1. Pipe stress analysis indicating loads, deflections, and pipe stress at critical points throughout the piping systems under the following conditions:
   a. At hydraulic design test pressure and ambient water temperature.
   b. At design operating temperature, pressure, and flow.

c. Model number, size, location, and details of expansion joints, compensator guides, supports, braces, and anchorage to building structure, with substantiating calculations that the components and building can accept the calculated loads and deflections.
d. Detailed shop drawings stamped and signed by a registered professional engineer.
e. Structural details and calculations stamped and signed by a registered professional structural engineer.

F. Expansion Joints to be designed and manufactured to the current Expansion Joint Manufacturers Association (EJMA) standards. Manufacturer of expansion joints to be certified by EJMA.

1.4 SUBMITTALS

A. Submit the following:
1. Product data.
2. Shop Drawings showing details of construction, dimensions, arrangement of components, and isolation.
3. Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.
4. Specified testing requirements.
5. Operating and maintenance data.

PART 2 - PRODUCTS

2.1 EXPANSION JOINTS AND COMPENSATORS

A. Acceptable Manufacturers:
1. Flexonics, Keflex, Hyspan, Metraflex.
2. Other Manufacturers: Submit Substitution Request.

B. Description:
1. Expansion compensators to be of the packless, externally pressurized type to allow for axial movement constructed of stainless steel bellows, stainless steel shroud, integral guide rings, internal liner, limit stops, with drain port and plug.
2. All materials of construction and pressure ratings shall be appropriate for the application as specified for each piping material and service.

2.2 DWV EXPANSION JOINTS

A. Acceptable Manufacturers:
1. Canplas, Fernco.
2. Other Manufacturers: Submit Substitution Request.

B. Expansion Joint:
1. DWV piston or sphere expansion/compression joint suitable for use with non-pressurized DWV piping.
2. All materials of construction and pressure ratings shall be appropriate for the application as specified for each piping material and service.

2.3 EXPANSION LOOPS / SEISMIC EXPANSION JOINTS

A. Acceptable Manufacturers:
   1. Metraflex Metraloop.
   2. Other Manufacturers: Submit Substitution Request.

B. Description:
   1. Flexible stainless steel hose and braid connector. .
   2. Connector shall accept differential support displacement without damaging pipe, equipment connections, or support connections.
   3. All materials of construction and pressure ratings shall be appropriate for the application as specified for each piping material and service.

2.2 PIPE GUIDES
   a. Acceptable Manufacturers: Hyspan, Grinnell, Flexonics, Adsco, Pipe Shields Inc., Unistrut, or equal.
   b. Spider Clamp Assembly: Heavy gauge pressed steel, fusion welded, bolted construction, black enamel finish. Hyspan series 9500, or equal.

PART 3 - EXECUTION

3.1 EXPANSION JOINTS AND COMPENSATORS

A. Install in all piping risers in wood structures to compensate for ½" of shrinkage per floor. Contractor is responsible to determine quantities and locations required.

B. Install in piping to compensate for thermal expansion and contraction. Contractor is responsible to determine quantities and locations required.

C. Install in other locations indicated on the drawings.

D. Provide and install pipe alignment guides as recommended by the expansion joint manufacturer with the first guide no more than 4 pipe diameters away from the expansion joint or compensator and second guide no more than 14 pipe diameters from first guide.

E. Install per manufacturer's installation instructions.

3.2 EXPANSION LOOPS / SEISMIC EXPANSION JOINTS

A. Install at building seismic expansion joints.

B. Install in piping to compensate for thermal expansion and contraction. Contractor is responsible to determine quantities and locations required.

C. Install in other locations indicated on the drawings.

D. Install per manufacturer's installation instructions.

END OF SECTION

SECTION 22 05 19

METERS AND GAUGES FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Thermometers, pressure gauges, water meters, water flow meters, vacuum gauges.

1.3 SUBMITTALS

A. Submit the following:
1. Products listed in this section.
2. Water flow meters, include graph of output signal vs. gpm for each device.
3. Operating and Maintenance Data.

PART 2 - PRODUCTS

2.1 THERMOMETERS, WATER

A. Acceptable Manufacturers:
1. Ashcroft, Weiss, Trerice, Marsh, Weksler, Tel-Tru.
2. Other Manufacturers: Submit Substitution Request.

B. Direct drive 5-inch dial type, stainless steel case, separable sockets, stem length to penetrate minimum of 1/2 pipe diameter, adjustable face, extension necks where required to clear insulation.

C. Range:

Plumbing Systems	**Temperature °F**	**Graduations (°F)**
Domestic Cold Water	25-125	1
Domestic Hot Water	30-180	2

2.2 PRESSURE GAUGES - GENERAL

A. Acceptable Manufacturers:
1. Marsh, Ashcroft, Weiss, Trerice, Weksler, Tel-Tru.
2. Other Manufacturers: Submit Substitution Request.

B. Description: 4-1/2-inch dial, molded black polypropylene turret case.

C. Range:

Plumbing Systems	Pressure (psi)	Graduations (psi)
Domestic Cold Water	0-160	1
Domestic Hot Water	0-160	1
Other ranges may be listed on Drawings in which case they take precedence		

2.3 WATER METER

A. Acceptable Manufacturers:
1. Hersey Model HD, similar Badger, Sparling.
2. Other Manufacturers: Submit Substitution Request.

B. Description:
1. Disc type meter, bronze split casing, magnetic drive.
2. Heavy duty gear train, completely sealed, circular meter, totalize in cubic feet with sweep hand.
3. Comply with AWWA performance standards.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Provide meters and gauges where shown on Drawings.

B. Install all gauges and meters as required and as recommended by equipment manufacturer or their representative.

C. Extend all connections, wells, cocks, or gauges to a minimum of l-inch beyond insulation thickness of the various systems.

D. Locate all gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area, i.e., platform, catwalk, etc.

E. Install instruments over 6'-6" above floor, to be viewed from the floor, with face at 30 degrees to horizontal.

3.2 INSTALLATION - PRESSURE GAUGES

A. Provide instrument gauge cock at inlets. Locate pressure gauge taps for measuring pressure drop or increase across pumps, etc., as close to the device as possible.

3.3 WATER METER

A. Installed in accord with manufacturer’s recommendations and as shown on the Drawings.

END OF SECTION

SECTION 22 05 23

GENERAL DUTY VALVES AND SPECIALTIES FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Valves, general purpose gauge cocks, and balance fittings.

1.3 SUBMITTALS

A. Submit product data.

1.4 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. PTFE: Polytetraflouroethylene plastic.

H. SWP: Steam working pressure.

I. Lead Free: Refers to the wetted surface of pipe, fittings, and fixtures in potable water systems that have a weighted average lead content ≤0.25% per Safe Drinking Water Act as amended January 4th 2011. Section 1417 *Add specific state requirements as needed.

1.5 QUALITY ASSURANCE

A. ASME Compliance:
   1. ASME B16.10 for ferrous valve dimensions.
   2. ASME B31.9 for building services piping valves.

B. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 371 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER VALVES

A. General: Where only NIBCO INC. figure numbers are listed, equivalent products by those specified below are acceptable.
   1. Gate, Globe, Swing Check: Victaulic, Crane, Kennedy, Stockham, Milwaukee, Walworth and Hammond.
   2. Silent Check: Mueller, Metraflex, Victaulic, Bell and Gossett, Milwaukee and Gruvlok.
   3. Balancing: DeZurik, Homestead, Bell and Gossett, Armstrong, Walworth, Taco, Wheatley, Tour and Andersson, Victaulic, Gruvlok, and Nibco.
   4. Butterfly: Victaulic, Gruvlok, Crane, Walworth, Milwaukee and Metraflex.
   5. Ball: Gruvlok, Apollo, Crane, Hammond, Milwaukee and Victaulic.
   6. Medical Gas Valves: Hill Rom, Oxequip, Allied (Chemtron), Puritan Bennett, Medaes.

B. Other Manufacturers: Submit Substitution Request.

C. All such valves shall be of one manufacturer.

D. Valve ends may be threaded, flanged, soldered, or grooved, as applicable to piping system. Refer to Section 22 21 13 for allowable fittings.

2.2 GATE VALVES

A. Bronze Gate: Bronze body, bronze trim, bronze screwed bonnet; solid wedge, 150 psi steam rating, 300 psi WOG, Nibco 134.

B. Lead Free Bronze Gate: Lead Free Silicon Bronze corrosion resistant body and trim, screwed bonnet; solid wedge, NSR,, 300 psi CWP, NIBCO S/T-113-LF.

C. Iron Gate, OS&Y: Iron body, bronze trim, OS and Y pattern, solid wedge, 150 psi rating; Nibco 637.

D. Lead Free Iron Gate: Class 125, OS&Y, Cast or Ductile Iron body, Stainless steel or Lead Free silicon bronze corrosion resistant trim, OS and Y pattern, solid wedge, 200 psi rating; NIBCO F-617-O-LF or F-619-RW.

2.3 GLOBE VALVES

A. Bronze Globe and Angle Globe: Bronze body, bronze mounted, renewable composition disc, 150 psi rating; Nibco 235 or 335.

B. Bronze Globe and Angle Globe High Pressure: Bronze body, stainless steel disc, union bonnet, 300 psi steam; Nibco 276-AP or 376-AP.

2.4 CHECK VALVES

A. Horizontal Bronze Swing Check: Bronze body, bronze mounted, regrinding bronze disc, 150 psi steam rating, 300 psi WOG; Nibco 433-Y.

B. Lead Free Horizontal Bronze Swing Check: Lead Free Silicon Bronze corrosion resistant body, and trim, PTFE renewable seat and disc, 300 psi CWP; NIBCO S/T 413-Y-LF.

C. Horizontal Iron Swing Check: Iron body, bronze mounted, regrinding bronze disc and seat ring, 125 psi rating; Nibco 918.

D. Lead Free Horizontal Iron Swing Check: ASTM A 126 gray Iron body, Stainless steel or Lead Free silicon bronze corrosion resistant trim, 200 CWP psi rating; NIBCO F-918-LF.

2.5 BALL VALVES

A. Bronze Ball: Bronze cast body, chrome-plated full port ball, with handle, Teflon seat, 600 psi WOG, 150 psi steam; Nibco 585-80.

B. Lead Free Bronze Ball: Two piece, full port, Lead Free silicon bronze body, Stainless steel or silicon bronze trim, Reinforced PTFE or TFE seats, 600 psi CWP NIBCO T/S-585-80-LF or T/S-585-66-LF.

C. Bronze Ball, Clean Service: Bronze body, union fittings, bronze ball, self-cleaning, Buna-N ball seats 400 psi WOG factory cleaned, capped and bagged for oxygen service in accordance with CGA4.1 (Cleaning equipment for oxygen service) & NFPA 99, Ohmeda 207 series.

D. PVC Ball: PVC Body, trunion mounted, Teflon seat, Viton seals; True Blue GSR Asahi.

2.6 BUTTERFLY VALVES

A. Ductile iron body, nickel chrome plated disc and stainless steel shaft, with lever handle and locking feature on valves 6-inches and less, gear operator on valves 8-inches and over; stem neck length to accommodate insulation where applicable, EPDM liner, 200 psi water; Nibco 2000, Nibco 4765.

B. Lead Free Butterfly Valve: Ductile iron body, Lead Free Aluiminum Bronzedisc and stainless steel stem, with lever handle and locking feature on valves 6-inches and less, gear operator on valves 8-inches and over; stem neck length to accommodate insulation where applicable, EPDM liner, 200 psi water; NIBCO LD- 2000N-3/5,

C. Copper Grooved Piping System Butterfly Valve: Nylon coated or Cast bronze body per Copper Development Agency-836, ductile iron disc encapsulated with EPDM coating, lever handle up to 6-inches, gear operator on valves 8-inches and greater, stem length to accommodate insulation, 300 psi water; Victaulic Series 608, per ASTM A-584
   1. Grooved ends shall be manufactured to copper-tubing sizes. Flaring tube or fitting ends to accommodate alternate sized couplings is not permitted.

2.7 BALANCING VALVE

A. Calibrated:
   1. Bronze, Ametal (copper-alloy), or ductile iron body, brass globe or ball, differential pressure readout valves with integral checks, calibrated plate, integral pointer, suitable for tight shutoff, memory stops, threaded, grooved or soldered ends, 250 psi water, Victaulic, Tour Anderson, Bell and Gossett CB.
   2. Size balancing valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.

2.8 SPECIALTY VALVES

A. Gas Cock: Forged brass body, hard chromium plated forged brass ball, with handle, rubber seats meeting ASTM D471, 175 psi WOG, entire unit tested to latest version of ANSI Z21.15, AGA and UL listed; Wooster, Parker, Watts, Jamesbury, PGL, ASCO.

B. Emergency Gas Shutoff: Cast steel, normally closed, manually opened, electrically held open, automatic closing upon power interruption, Maxon Series CMM11. Provide manual gas cock upstream of emergency gas shut-off valve.

C. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4 inch; Apollo 41 series.

D. Drain Valves: Bronze globe valve or full port ball valve, garden hose end, cap and chain 3/4 inch size.

2.9 WATER PRESSURE REDUCING VALVE ASSEMBLY

A. Acceptable Manufacturers: Watts No. 223S, similar and equal Fisher, Armstrong Cash Acme.

B. Description: Bronze body with inlet strainer, water tight cage assembly, 200 psi working pressure and suitable for 200°F.

2.10 SYSTEM SPECIALTIES

A. Manual Air Vents: Coin type; Dole No. 9 or approved equal.

B. Pressure/Temperature Test Plug:
1. Acceptable Manufacturers:
   a. Peterson Engineering, Inc., Universal Lancaster, Sisco, Trerice.
   b. Other Manufacturers: Submit Substitution Request.
2. General: 1/2-inch N.P.T. fitting to receive either a temperature or pressure probe 1/8-inch O.D., fitted with a color coded and marked cap with gasket.
3. Material: Solid brass with valve core of Nordel.
4. Rating: Minimum 300 psig at 275°F.
5. Gauges and Thermometers: Supply Owner with two pressure gauge adapters with 1/8-inch O.D. probe and two five-inch stem pocket test thermometers 25°F to125°F for chilled water, 40°F to 240°F for heating water.

2.11 WATER RELIEF VALVES

A. Acceptable Manufacturers:
1. Consolidated, Kunkle, B&G, Armstrong, Cash Acme.
2. Other Manufacturers: Submit Substitution Request.

B. Description: Bronze or steel body, stainless steel or bronze, pressure settings to 160 psi at 250°F, conforming to Section IV of ASME Code, size per manufacturer's recommendations based on Code, setting as indicated; Kunkle Model 537.

2.12 STRAINERS

A. Acceptable Manufacturers:
1. Armstrong, McAlear, Sarco, Steamflo, Mueller, R.P. & C. Company Titan Flow Control.
2. For Grooved Coupling Systems: Gruvlok or Victaulic.
3. Other Manufacturers: Submit Substitution Request.

B. Wye Pattern:
1. Bronze: Bronze body, 250 psi, 1/16-inch perforated type 304 stainless screen.
2. Ductile Iron: Ductile iron body, 300 psi, 1/16 or 1/8-inch 304 stainless steel screen.
3. Cast Iron: Cast iron body, 125 psi, 1/16-inch perforated type 304 stainless screen.

4. Cast Iron, High Pressure: Cast iron body, 250 psi, 1/16-inch perforated type 304 stainless screen.

2.13 BACKWATER VALVE

A. Acceptable Manufacturers:
1. J.R. Smith, Zorn, Josam.
2. Other Manufacturers: Submit Substitution Request.

B. Description: J.R. Smith 7022Y cast iron backwater valve with threaded cover and no-hub connections. Model 7022S may be substituted for shallow bury applications where vault access is not required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide valves at connections to equipment where shown or required for equipment isolation.

B. Provide separate support for valves where necessary.

C. Provide drain valves in all low points in the piping system, at coils and equipment, and as indicated.

D. Coordinate gas pressure regulator selection with inlet pressure available at the regulator and the capacity and outlet pressure required by the equipment served. Install in accordance with manufacturer's recommendations. All gas cocks and gas regulator shall be located to be readily accessible for servicing. Provide approved gas cock immediately upstream of each gas pressure regulator. Provide separate vent to the outside for each regulator.

3.2 APPLIED LOCATIONS PLUMBING VALVES

A. In piping 2-inches and smaller:

System	**Valve Types**				
	Gate	**Globe**	**Swing Check**	**Ball**	**Butterfly**
Domestic Hot	Bronze	Bronze	Bronze	Bronze	Not Allowed
Domestic Cold	Bronze	Bronze	Bronze	Bronze	Not Allowed

B. Calibrated balancing valves on domestic hot water.

C. Silent check valves on pump discharge for domestic cold water, solar hot water, reclaimed water, cold process water, process grey water.

D. Check valves on vertical discharge of sump pumps and sewage ejector pumps, iron swing check with outside weight and lever. Mount in piping at 45 degree angle..

3.3 VALVE IDENTIFICATION

A. General: Identify valves to indicate their function and system served.

B. See Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.4 CHAIN OPERATORS

A. All valves in equipment rooms or fan rooms used for equipment or coil isolation and more than 8 feet above floor shall be installed with stem horizontal and equipped with chain wheels and chains extending to 6 feet above floor.

3.5 WATER PRESSURE REDUCING VALVE ASSEMBLY

A. Two valve assembly with smaller valve approximately 33 percent of the total larger valve approximately 66 percent of the total demand. See schedule on drawings for GPM flow rates and pressure settings of valves.

3.6 INSTALLATION

A. Grooved joints shall be installed in accordance with the manufacturer's published installation instructions. Gaskets shall be molded and produced by the coupling manufacturer, and shall be suitable for the intended service. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the project site to ensure best practices in grooved installation are being followed. (A distributor's representative is not considered qualified to conduct the training of field visits.)

B. Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.

C. Pressure Reducing Valves:
1. Install where indicated and in accordance with manufacturer's recommendations with 3 valve bypass.

D. Water Relief Valves:
1. Install where indicated, and in accordance with manufacturer's instructions. Pipe discharge to nearest floor drain using Schedule 40 steel pipe.

E. Strainer:
1. Applied Locations Plumbing:
   a. Bronze wye, in piping 2-inch and smaller; domestic water, solar hot water, reclaimed water, cold process water, process grey water.
   b. Cast iron, in piping 2-1/2-inch and larger; solar hot water, reclaimed water, cold process water, process grey water
   c. Cast iron, high pressure wye, in piping 2-1/2-inch and larger; domestic water.

F. Backwater Valves:
1. Install backwater within vault indicated. If vault not indicated (shallow bury application), provide soil pipe extension to install ferrule and cover at top and flush with floor surface.

END OF SECTION

SECTION 22 05 29

HANGERS, SUPPORTS AND ANCHORS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Supports and anchors for piping systems and equipment.

B. Related Sections include:
1. Section 22 05 48 Vibration and Seismic Controls for Plumbing Piping and Equipment.
2. Section 22 07 00 Insulation for Plumbing.
3. Section 22 21 13 Pipe and Pipe Fittings Plumbing.

1.3 SUBMITTALS

A. Submit the following:
1. Shop Drawings of contractor fabricated piping support structures.
2. No other submittals required under this section.

PART 2 - PRODUCTS

2.1 SUPPORTS, ANCHORAGE AND RESTRAINT

A. General: Provide pipe and equipment hangers and supports in accordance with the following:
1. When supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor shall be responsible for their design.
2. Seismic restraints and anchorages shall resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
3. Seismic restraint shall not introduce excessive stresses in the piping caused by thermal expansion or contraction.
4. Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
5. Seismic restraints shall be in accordance with the latest edition of the SMACNA “Seismic Restraint Manual - Guidelines for Mechanical Systems” for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
6. Seismic restraints shall be in accordance with the applicable code.
7. Seismic restraints shall follow the provisions described in Section 22 05 48 Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Engineered Support Systems: The following support systems shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
   1. Supports and seismic restraints for suspended piping and equipment.
   2. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
   3. Equipment and piping support frame anchorage to supporting slab or structure.

2.2 SUPPORTS, GENERAL

A. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.

B. Acceptable Manufacturers: Unistrut, Superstrut, Powerstrut and Kinline, B-Line Systems, AnvilStrut.

C. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.

D. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.

E. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

2.3 PIPE ATTACHMENTS

A. Acceptable Manufacturers: Anvil as noted or equivalent products by Superstrut, B-Line Systems, Tolco, Michigan Hanger.

B. Uninsulated Horizontal Copper Piping:
   1. 2-inch and Smaller: Anvil CT-65, CT-69, CT-99C.
   2. Larger than 2-inch: Anvil 260 field or factory copper plated, plastic coated or other recognized industry methods. Electricians' tape is unacceptable.

C. Insulated Horizontal Copper Pipe with Hangers Inside of Insulation: Same as Uninsulated Horizontal Copper Pipe.

D. Insulated Horizontal Copper Pipe with Hangers Outside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

E. Other Uninsulated Horizontal Pipe:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

F. Other Insulated Horizontal Pipe With Hangers Inside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
   2. Larger than 2-inch: Anvil 260.

G. Other Insulated Horizontal Pipe with Hangers Outside of Insulation:
   1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
   2. Larger than 2-inch: Anvil 260.

H. Riser Clamps Copper Pipe:
   1. 4-inch and Smaller: Anvil CT-121, CT-121C or 261C.

2. Larger than 4-inch: Anvil 261C.

I. Riser Clamps Other Piping: Anvil 261.

2.4 PIPE ROLLERS, INSULATION PROTECTION SHIELDS AND INSULATION PROTECTION SADDLES

A. Acceptable Manufacturers: Anvil as noted or equivalent Super Strut, B-Line Systems, Tolco, Michigan Hangers.

B. Pipe Rollers: Anvil 174 or 274 as required. Size for pipe plus insulation for insulated pipe.

C. Insulation Protection Shields: Anvil 167.

D. Insulation Protection Saddles: Anvil 160 through 166A as required. Saddles for copper pipe, factory or field copper plated.

2.5 BUILDING ATTACHMENTS

A. Acceptable Manufacturers: Anvil as listed or equivalent products by Elcen, Superstrut, B-Line Systems, Tolco, Michigan Hangers.

B. Beam Hangers:
1. On piping 6-inch and smaller: Anvil 86 with retaining clip Fig. 89.
2. On piping larger than 6-inch: Anvil 228, or 292.

C. Inserts: Anvil 152 malleable iron or 281 steel inserts. Inserts sized for required rod to support load being carried.

D. Expansion Plugs: Similar and equal to Phillips “red-head” self-drilling flush shell selected for safety factor of 4.

E. Powder actuated fasteners with silencers as approved by Architect.

PART 3 - EXECUTION

3.1 HANGERS AND SUPPORTS

A. General:
1. Install all support systems as detailed and in accordance with manufacturer’s recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required and as detailed on the Drawings.
2. Provide adjustable hangers for all pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
4. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
5. Install all cast iron piping in accordance with Cast Iron Soil Pipe Industry (CISPI) Standards.
6. Support all piping within 2 feet of each change of direction on both sides of fitting.

B. Insulated Piping Systems:
   1. See Section 22 07 00 for insulation requirements.
   2. Insulated Piping Systems with Vapor Barrier Insulation:
      a. Install hangers outside of insulation.
      b. On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
   3. Insulated Piping Systems with Non-Vapor Barrier Insulation:
      a. As specified for Insulated Piping Systems with Vapor Barrier Insulation.
   4. Insulation Protection:
      a. Band insulation protection shields firmly to insulation to prevent slippage.
      b. Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.

C. Vertical Piping:
   1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
   2. Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
   3. Risers that are not subject to thermal change to be supported at each floor of penetration.
   4. Risers that are subject to thermal change require engineered supports. Size supports to carry all forces exerted by piping system when in operation. Riser supports shall follow the provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.

D. Horizontal Piping:
   1. Trapeze Hangers: Multiple pipe runs where indicated shall be supported on channels with rust resistant finish. Provide all necessary rods and supporting steel.
   2. Support Spacing: Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:
      a. Support piping within 2 feet of each change in direction.
      b. Steel Pipe, Copper Tubing:

Minimum Pipe Size	Max. Span Steel	Max. Span Copper	Rod Size
1-inch and smaller	7 feet	5 feet	1/4-inch
1-1/4-inch to 2-inch	8 feet	8 feet	3/8-inch
2-1/2-inch to 3-inch	11 feet	9 feet	1/2-inch
4-inch to 5-inch	14 feet	12 feet	1/2-inch
6-inch	17 feet	14 feet	1/2-inch
8-inch or larger	19 feet	16 feet	5/8-inch
10-inch	20 feet	18 feet	3/4-inch
12-inch	23 feet	19 feet	7/8-inch
14-inch	25 feet		1-inch
16-inch	27 feet		1-inch

      c. Fuel Gas Piping: Support in accordance with local code requirements.
      d. Plumbing Piping: Support in accordance with local plumbing code.
      e. Plastic Pipe: Supported a maximum of 3 feet on center for piping 1-inch and smaller and 4 feet on center for piping 1-1/4-inch and larger with rod sizes as recommended by the manufacturer.
      f. Piping provided with acoustical lagging wrap shall be supported a maximum of 5 feet on center. Install hangers outside of acoustical lagging.

E. Building Attachments:
   1. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support all piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
   2. Provide horizontal bracing on all horizontal runs 1-1/2 inch and larger and exceeding 50 feet in length at 75 foot intervals and as required to provide stabilized piping systems.
   3. Provide all additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
   4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

END OF SECTION

SECTION 22 05 48

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes:
   1. Isolation of mechanical equipment as indicated on the Drawings and specified herein.
   2. Seismic restraint of equipment and piping.

B. Related Sections include:
   1. Section 22 05 29 Hangers, Supports and Anchors for Plumbing.

1.3 QUALITY ASSURANCE

A. A single manufacturer shall select and furnish all isolation required, except packaged equipment with integral isolators meeting all the isolation and seismic requirements of this specification.

B. Isolation performance requirements are indicated on the Drawings. All deflections indicated are nominal static deflections for specific equipment supported.

C. Seismic snubbers, restrained isolator housings and cable system components shall have anchorage preapproval “OPA” number from OSHPD in the State of California verifying the maximum certified load ratings.

D. Isolator Stability and Rated Capacity:
   1. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
   2. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

E. Seismic Restraints:
   1. Restraint of equipment and piping to be in accordance with the current state and local Building Code.
   2. All calculations shall be in accordance with current state and local Building Code.

1.4 SUBMITTALS

A. Submit the following:
   1. Submit Shop Drawings showing complete details of construction for steel and concrete bases including:
      a. Equipment mounting holes.
      b. Dimensions.

c. Isolation selected for each support point.
d. Details of mounting brackets for isolator.
e. Weight distribution for each isolator.
f. Code number assigned to each isolator.

2. Submit product data and calculation sheets for isolators, showing:
   a. Size, type, load rating and rated deflection of each required isolator.
   b. Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.

B. Installation report as specified in Part 3 of this section.

C. Operation and maintenance data.

1.5 EQUIPMENT VIBRATION ISOLATION

A. Provide a balanced set of vibration isolators for each piece of equipment listed in the Equipment Schedules.

B. Isolation work to include, but not necessarily be limited to, the following:
1. Isolation support of motor-driven equipment.
2. Inertia base frames in conjunction with isolation.
3. Isolation support of piping and piping risers.
4. Penetration isolation of pipework and conduits through walls, floors or ceilings.
5. Flexible connections of piping to equipment.

C. Each piece of rotating equipment must meet a reasonable criterion for maximum vibration levels at each bearing, while in operation. The criteria for varying operating speeds are given as follows:
1. Rotating equipment operating peak vibration velocities must not exceed 0.08 in./sec.
2. If it is discovered that the operating vibration velocities exceed this criteria, the equipment shall be repaired or replaced at no expense to the owner until approval of the equipment is given by the engineer.

D. Any components or materials not specially mentioned herein, but necessary to the proper vibration isolation of the equipment, shall be provided.

1.6 ACCEPTABLE MANUFACTURERS

A. Amber Booth.
B. Mason Industries, Inc.
C. Kinetics Corporation.
D. Vibrex.
E. Approved equal, meeting all of the conditions and requirements specified herein.

1.7 CONTRACTOR RESPONSIBILITY

A. All vibration isolation devices, including auxiliary steel bases and pouring forms, shall be designed and furnished by a single manufacturer or suppliers.

B. Adequately restrain all equipment and piping to resist seismic forces. Design and select restraint devices to meet seismic requirements as defined in the latest issue of the International Building Code under Earthquake Design and applicable state and local codes.

C. In addition, the contractor shall have the following responsibilities:

1. Selection, installation, adjustment and performance of vibration isolators which will meet the requirements given on the plans or in the specifications.
2. Provide Engineering drawings, details, supervision, and instruction to assure proper installation and performance.
3. Provide whatever assistance necessary to ensure correct installation and adjustment of the isolators.

PART 2 - PRODUCTS

2.1 TYPE 1 - NEOPRENE WAFFLE PAD

A. 3/4-inch thick neoprene waffle pads with pattern repeating on 1/2-inch centers.
B. Select Duro rating for maximum deflection at average load rating.
C. Include load distribution steel plate as required.
D. Include anchor bolt grommet as required.
E. Acceptable Manufacturer: Mason Type “Super W” or “Super WM” and “HG Grommet”; Similar Amber-Booth, Kinetics Corporation.

2.2 TYPE 2 - RESTRAINED NEOPRENE MOUNT

A. Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2-inches and all directional seismic capability.

B. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements.

C. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation.

D. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications.

E. Manufacturer: Mason type BR.

2.3 TYPE 3 - SPRINGS

A. Free standing springs without housings.

B. 1/4-inch thick molded neoprene cup with steel reinforcement washer or neoprene acoustical friction pads between base plate and support.

C. All mounting shall have leveling bolts with height saving brackets.

D. Springs mounted outboard of channels.

E. Attach baseplate screws using neoprene bushings and washers.

F. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.

G. Manufacturer: Mason type SLF, Amber-Booth type SW, Kinetics Corporation, Vibrex.

2.4 TYPE 4 - SPRINGS WITH RESTRAINTS

A. Same as springs except housing with seismic restraints to be added.

B. Seismic restraint with molded all directional neoprene bushings an integral part of isolator.

C. Seismic restraint selected for minimum safety factor of 2 from ultimate seismic capacity.

D. Spring mount must have neoprene cup or pad inside the seismic housing to allow anchoring of the housing baseplate without short circuiting pad.

E. Manufacturer: Mason type SSLR or SLRS with seismic restraints; similar Amber-Booth, Kinetics Corporation Model FYS, Vibrex.

2.5 TYPE 5 - BASE WITH SPRINGS

A. Steel Isolating Frame: Mason WFSL with WF steel beams with a minimum depth of 10% of the span between supports. Provide external height saving brackets.

B. Manufacturer: Mason as indicated, similar Amber-Booth, Kinetics Corporation, Vibrex.

2.6 TYPE 6 – INERTIA BASE WITH SPRINGS

A. Inertia Bases: Mason BMK or KSL with 1/2-inch square bar reinforcing, integral height saving brackets and steel templates with anchor bolts sleeves. Bases must be sized to fit stanchions for pump elbows or suction diffusers. Depth of base equal to 8% of the span between supports, 6-inch minimum.

B. Manufacturer: Mason as indicated, similar Amber-Booth, Kinetics Corporation, Vibrex.

2.7 TYPE 7 - ISOLATING SPRING HANGERS

A. Combination rubber-in shear and steel spring isolators installed on the hanger rods.

B. Isolators shall have the proper deflection to allow the piping to deflect as a unit with the pump isolators.

C. Hangers designed for 30 degree angular movement.

D. Minimum deflection shall be one inch.

E. Manufacturer: Mason 30N, similar Amber-Booth, Consolidated Kinetics, Vibrex.

2.8 TYPE 8 – ISOLATING NEOPRENE HANGERS

A. Double deflection neoprene hangers shall have a minimum static deflection of 0.35-inches.

B. Provide projecting bushing to prevent steel to steel contact.

C. Manufacturer: Mason HD, similar Amber-Booth, Consolidated Kinetics, Vibrex.

2.9 ISOLATING SLEEVES

A. Provided for all piping through walls and floors of penthouses and chiller room. Size for piping as required.

B. Manufacturers: Potter-Roemer PR isolators or Grinnell Semco Trisolators.

2.10 SEISMIC RESTRAINTS

A. General Requirements:
   1. Seismic restraints shall be provided for all equipment and piping, both supported and suspended.
   2. Bracing of piping shall be in accordance with the code and with the provisions set forth in the SMACNA seismic restraint manual.
   3. The structural requirements for the restraints, including their attachment to the building structure, shall be reviewed and approved by the structural engineer.
   4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment:
   1. All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene.
   2. Bushing shall be replaceable and a minimum of 1/4-inch thick. Rated loadings shall not exceed 1000 psi.
   3. An air gap of 1/4-inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces.
   4. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to ensure no short circuits exist before systems are activated.
   5. Snubber shall be type Z-1225 as manufactured by Mason Industries, Inc.

C. Bracing of Pipes:
   1. Provide seismic bracing of all piping as detailed below to meet the building code requirements:
      a. Exception: Piping suspended by individual hanger's 12-inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced where the following criteria are met.
         1) Seismic braces are not required on high deformability piping when the Ip=1.0 and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 3-inches diameter or less.
         2) Seismic braces are not required on high deformability piping when the Ip=1.5 and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 1-inch diameter or less.
   2. Seismic braces for pipes on trapeze hangers may be used.
   3. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints, or where pipes connect to equipment.
   4. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12-inches or more from the supporting structure, shall be braced on each side of a change in direction of 90 degrees or more. Riser joints on unsupported sections of piping shall be braced or stabilized between floors.
   5. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high or for piping subject to thermal change all risers shall be engineered individually.

D. Suspended Equipment and Piping:
   1. Seismic cable restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint.

2. Cable must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement.
3. Cable assemblies shall be type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod and the clevis or SCBV if clamped to a beam, all as manufactured by Mason Industries, Inc.
4. Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall be type SRC or UC as manufactured by Mason Industries, Inc.
5. Pipe clevis cross-bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.

2.11 FLEXIBLE SPHERE CONNECTOR

A. Flexible EPDM pipe connectors shall be manufactured of multiple plies of Kevlar tire cord fabric and EPDM; both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement.

B. Connectors up to and including 2-inch diameter may have a single sphere and threaded ends. Connectors 2-1/2-inch and larger shall be manufactured with twin spheres up to 12-inches and a single sphere on larger sizes and floating steel flanges recessed to lock the connectors raised face EPDM flanges.

C. All connectors shall be rated a minimum of 150 psi at 220°F. All connections shall be pre-extended as recommended by the manufacturer to prevent additional elongation under pressure.

D. Mason type SFU, SFDEJ or SFEJ.

2.12 FLEXIBLE HOSE CONNECTOR

A. Flexible stainless steel hoses shall be manufactured using type 304 stainless steel hose and braid with one fixed and one floating raised face carbon steel plate flange.

B. Sizes 2-1/2-inch (65mm) and smaller may have threaded male nipples or copper sweat ends. Grooved ends are acceptable in all sizes in grooved piping systems. Weld ends are not acceptable. Copper sweat end hoses for water service shall be all copper or bronze construction.

C. Hose shall have close pitch annular corrugations for maximum flexibility and low stiffness. Tested hose stiffness at various pressures must be included in the submittals.

D. Hose shall be capable of continuous operation at 150 psi and system test pressure when installed in piping systems.

E. Hose shall be the same size as the pipe it connects and have pipe thread connectors on both ends with male or female end adapters as required.

F. Mason type BSS, FFL, MN, CPS or CPSB, similar HCi, Metraflex.

2.13 EXPANSION JOINT/SEISMIC CONNECTOR

A. T304 stainless steel hose and braid, Schedule 40 radius elbows and 180 degree bend, flange or weld end Schedule 40 fittings. ASA certified when used for natural gas service. Metraflex Metaloop only.

B. Connector shall accept differential support displacement without damaging pipe, equipment connections, or support connections.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not install any equipment or pipe which makes rigid contact with the building. "Building" includes slabs, beams, studs, walls, etc.

B. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.

C. Correct, at no additional cost, all installations which are defective in workmanship or materials.

3.2 PREPARATION

A. Treat all isolators, including springs, hardware and housing, with a corrosion protective coating of epoxy powder or electro galvanizing.

B. Coat steel frames exposed to weather with a rustproof metal primer.

C. Provide hot dipped galvanizing on steel frames as indicated on the plans for corrosion protection in severe conditions.

3.3 INSTALLATION

A. General:
   1. Install isolation where indicated on the Drawings by type and location and where indicated below.
   2. The assigned code number shall be marked on the isolators and bases to assure placement in the proper location.
   3. Anchor isolator seismic housing baseplate to floor.
   4. Rubber grommets and washers shall be provided to isolate the bolt from the building structure. Under no circumstances shall the isolation efficiency be destroyed when bolting the isolators to the building structure.

B. Type 7 – Isolating Spring Hangers
   1. Service:
      a. In-Line Circulating Pumps
      b. Piping rigidly connected to rotating equipment

C. Type 8 – Isolating Neoprene Hangers
   1. Service:

a. In-Line Circulating Pumps

D. Flexible Connectors:
1. Mechanical Couplings: Provide three or more flexible couplings as vibration isolation
2. Flexible Sphere Connectors: Provide as indicated on the drawings
3. Flexible Hose Connectors: Provide as indicated on the drawings
4. Expansion Joint/Seismic Connector: Provide for all piping services where they cross expansion or seismic joints.

3.4 SEISMIC RESTRAINTS

A. General:
1. Install and adjust seismic restraints so that the equipment and piping support is not degraded by the restraints.
2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Supported Equipment:
1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
2. Care must be taken so that the 1/4-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

C. Bracing of Pipes:
1. Branch lines may not be used to brace main lines.
2. Transverse bracing shall be at 40 feet maximum, except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes
3. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity to resist both the seismic load and the additional force induced by expansion and contraction.
4. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.
6. Subject to confirmation by field inspection, seismic bracing is not required on piping when the piping is supported by rod hangers and the hangers in the entire run are 12-inches or less in length from the top of the pipe to the supporting structure, hangers are detailed to avoid bending of the hangers and their attachments and provisions are made for piping to accommodate expected deflections.

D. Suspended Equipment, Piping, Cable Method:
1. The cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
2. The uplift and downward restraint nuts and Mason type RW neoprene covered steel rebound washers for the Type 6 hangers shall be adjusted so that there is a maximum 1/4-inch clearance.

3.5 FIELD QUALITY CONTROL

A. Installation Report: Isolation manufacturer's representative shall confirm that all isolation is installed correctly and submit report stating that isolators are installed as shown on Shop Drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Identify valves, piping and equipment components of the mechanical systems to indicate their function and system served.

1.3 SUBMITTALS

A. Submit the following:
   1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
   2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
   3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 - PRODUCTS

2.1 VALVE IDENTIFICATION

A. Valve Tags:
   1. General: Identify valves with metal tags, legends to be stamped or embossed. It shall indicate the function of the valve and its normal operating position; i.e.,
      56 HW (NUMBER AND CONTENT OF PIPE)
      ISOLATION (VALVE FUNCTION)
      NO (NORMAL OPERATION POSITION)
   2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
   3. Material: Use 0.050 or 0.064-inch brass tags.
   4. Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, “lamicoid” or equal. Form letters by exposing center ply.
   5. Buildings Systems: Contact the **[Owner]** for coordination with existing building tagging system and supplementary information required for any specific system before valve tagging begins.

B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.

2.2 PIPING MARKERS

A. Acceptable Manufacturers:
   1. W.H. Brady, Seton, Marking Systems, Inc. (MSI).

2. Other Manufacturers: Submit Substitution Request.

B. Pipes shall be labeled with all-vinyl, self-sticking labels or letters. For pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters. The pipe markers shall be identified and color coded as follows with black directional arrows.

PLUMBING SERVICE	BACKGROUND PIPE MARKER *	COLOR
COLD WATER	"DOMESTIC COLD WATER"	GREEN
HOT WATER	"DOMESTIC HOT WATER SUPPLY"	YELLOW
	"DOM. HOT WATER RECIRC"	YELLOW OR GREEN
SANITARY WASTE	"SANITARY WASTE"	GREEN
STORM DRAIN	"STORM DRAIN"	GREEN
OVERFLOW DRAIN	"OVERFLOW DRAIN"	GREEN
VENT	"VENT"	GREEN

* Directional arrow applied adjacent to pipe marker indicating direction of flow.

** Provide custom marker labels for all piping for which no standard manufactured marker is available. Submit sample for approval.

2.3 EQUIPMENT IDENTIFICATION

A. Nameplates:
1. Tag all pumps, converters, and miscellaneous items of mechanical equipment with engraved nameplates. Nameplates shall be 1/16-inch thick, 3 x 5 laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
2. Identify unit with code number as shown on Drawings and area served.

B. Equipment Nameplate Directory: List pumps, and other equipment nameplates. Include Owner and Contractor furnished equipment. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

PART 3 - EXECUTION

3.1 VALVE IDENTIFICATION

A. Valve Tags:
1. Attach to valve with a brass chain.
2. Valve tag numbers shall be continuous throughout the building for each system. Contractor shall obtain a list for each system involved from the **[Owner.] [to establish numbers following the listed sequences:]**

B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

3.2 PIPING MARKERS

A. Unless recommendations of ANSI A13.1, 1981 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:

1. Every 20 feet along continuous exposed lines.
2. Every 10 feet along continuous concealed lines.
3. Adjacent to each valve and stubout for future.
4. Where pipe passes through a wall, into and out of concealed spaces.
5. On each riser.
6. On each leg of a “T”.
7. Locate conspicuously where visible.
8. Provide pipe identification (over insulation) for all reclaimed water systems in accordance with current local codes and rulings.

B. Further, apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.

C. Install tags on specialty gas piping valves with brass chain.

3.3 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

END OF SECTION

SECTION 22 05 90

PRESSURE TESTING FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Pressure testing of piping systems.

1.3 QUALITY ASSURANCE

A. Code Compliance: Perform required tests in the presence of the authority having jurisdiction.

B. Owner Witness: Perform all tests in the presence of the Owner's representative.

C. Engineer Witness: The Engineer or Engineer's representative reserves the right to observe all tests or selected tests to assure compliance with the specifications.

D. Simultaneous Testing: Test observations by the authority having jurisdiction, the Owner's representative and the Engineer's representative need not occur simultaneously.

1.4 SUBMITTALS

A. Submit the following:
   1. Test Reports:
      a. Submit certificate of completion, inspection and test by authority having jurisdiction on required piping systems.
      b. Submit certificate of test approval by Owner's representative on all systems.
      c. The Engineer's representative will record witnessed tests.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.1 GENERAL

A. Piping: Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties. Conduct tests with all valves but those used to isolate the test section 10% closed.

B. Leaks: Repair all leaks and retest until stipulated results are achieved.

C. Notification: Advise the **[Architect] [Engineer] [Construction Manager]** 72 hours in advance of each test. Failure to so notify will require test to be rescheduled.

D. Testing Equipment: Provide all necessary pumps, gauges, connections and similar items required to perform the tests.

3.2 TESTING REQUIREMENTS

A. Sanitary and Roof Drainage Systems: Test entire system or sections of system by closing all openings in piping except highest opening and filling system with water to point of overflow. If system is tested in sections, plug each opening except highest opening of section under test and fill each section with water, but none with less than l0-feet head of water. Keep water in system or in portions under test for at least 45 minutes before inspection starts. Test for two (2) hours with no drop allowed. Locate and repair leaks.

B. Domestic and Reclaimed Water Systems: Test per current State and local codes.

END OF SECTION

SECTION 22 07 00

INSULATION FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Insulation for piping, and equipment.

B. Related Sections include:
1. Section 22 05 29 Hangers, Supports and Anchors for Plumbing.

1.3 QUALITY ASSURANCE

A. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.

B. Source Quality Control:
1. Service: Use insulation specifically manufactured for service specified.
2. Labeling: Insulation labeled or stamped with brand name and number.
3. Insulation and accessories shall not provide any nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, shall not react corrosively with equipment, piping, or ductwork, and shall be asbestos free.

1.4 SUBMITTALS

A. Submit the following.
1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Johns Manville
2. Knauf
3. Owens Corning
4. CertainTeed

B. Other Manufacturers: Submit Substitution Request.

C. All such insulation shall be of one manufacturer.

2.2 PIPE INSULATION

A. Fiberglass: Split sectional or snap-on type with 0.23 per inch maximum thermal conductivity (K-factor) at 75°F mean temperature, 850°F maximum service rating and white, vapor barrier jacket with pressure sensitive closure system. Johns Manville Microlok HP.

B. Calcium Silicate: Sectional with 14 pcf nominal density, 0.40 maximum K-factor at 300°F mean temperature and 1200°F maximum service rating. Johns Manville Thermo-12 Gold.

C. Elastomeric: Expanded closed cell, 0.27 per inch maximum K-factor at 75°F mean temperature, 220°F maximum service rating with fitting covers and paintable surface. Armacell AP Armaflex, Rubatex.

D. Polyolefin: Semi-rigid polyolefin form snap-on or slip over type with 0.24 per inch maximum thermal conductivity (K-factor) at 75°F mean temperature -165°F to 210°F service factor and paintable surface. End joints in insulation on piping with fluid temperatures normally below 65°F fuse sealed in accordance with the manufacturer's instructions. Joints longitudinal joints and other end joints made with manufacturer's approval contact adhesive in accordance with the manufacturer's instructions. Joints may be pre-glued or pre-coated with adhesive where applicable.

2.3 PIPE ACOUSTICAL WRAP

A. Barrier shall be constructed of a 0.10-inch thick mass loaded, limp vinyl sheet bonded to a layer of reinforced aluminum foil on one side. The barrier shall have a nominal density of 1 lb per square foot and minimum STC rating of 28. The barrier shall have a minimum thermal conductivity value of 0.29 and a rated service temperature range of -40°F to 220°F. Barrier shall have a flame spread index of no more than 10 and a smoke development index of less than 40.

B. The decoupling layer shall be a combination of 1-inch fiberglass batting, non woven porous scrim-coated glass cloth, quilted together in a matrix of 4-inch diamond stitch pattern which encapsulates the glass fibers. The composite material shall be fabricated to include a nominal 6-inch wide barrier overlap tab extending beyond the quilted fiber glass to facilitate a leak-tight seal around field joints.

C. Kinectics Noise Control model KNM-100ALQ.

2.4 BLOCK INSULATION

A. Fiberglass: 1-1/2-inch thick unless specified or shown otherwise with 3 pcf nominal density, 0.23 per inch maximum K-factor at 75°F mean temperature and 450°F minimum operating temperature limit. Johns Manville 1000 Series.

2.5 ACCESSORIES PIPING

A. Adhesives:
   1. Fiberglass: Zeston Z-Glu.
   2. Calcium Silicate: Benjamin Foster 30-36.
   3. Elastomeric: Armacell 520.
   4. Polyolefin: As approved by the insulation manufacturer.

B. Cements:
   1. Insulating: Ryder.
   2. Heat Transfer: Zeston Z-20.

C. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.

D. Pipe Fitting Covers: One piece PVC insulated pipe fitting covers. Zeston, Ceel-Co.

E. Grooved Coupling Insulation: One piece PVC insulated fitting cover, Zeston, Ceel-Co.

F. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.

G. Cloth Facing: Presized fiberglass cloth.

H. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150°F. Zeston Z-tape.

I. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes and adhesives.

PART 3 - EXECUTION

3.1 GENERAL

A. Workmanship:
1. Installation: Insulation installed in first class, neat professional manner.
2. Applicators: Applicators shall be employed by firm that specializes in insulation work.

B. Preparation: Surfaces of piping and equipment clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels shall not be covered.

D. Jacketing: For insulation installed anywhere outdoors or where piping is exposed to sunlight or moisture, provide metal pipe jacket. For all other locations, provide all-service vapor-retarding jacket.

3.2 PLUMBING PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

A. Insulation Applied Locations – Plumbing Piping:

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
Domestic Cold Water, Above Grade	3/4-inch and smaller	Fiberglass or Elastomeric	1-inch	Note 1 Note 2
	1-inch and above	Fiberglass, all purpose jacket	1 1/2-inch	Note 1
Domestic Hot Water Supply/Return, Above Grade	1 1/2-inch and smaller	Fiberglass, all purpose jacket or Elastomeric or Polyolefin	1 1/2-inch	Note 1 Note 2
	Above 1 1/2-inch	Fiberglass, all purpose jacket	2-inch	Note 1

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
	Above 1 1/2-inch	Fiberglass, all purpose jacket	2-inch	Note 1
Interior Storm Drain and Interior Overflow Drains	All	Fiberglass, all purpose jacket	1/2-inch	Note 3
Traps and trap priming lines (In unheated Spaces)	All	Fiberglass, all purpose jacket	1-inch	Insulate over heat tape
Irrigation Piping, Inside Building	All	Fiberglass, all purpose jacket or Elastomeric or Polyolefin	1/2-inch	Note 2
Condensate or other cold water drains	All	Elastomeric or Polyolefin	1/2-inch	Note 2
Storage Tanks	All	Fiberglass, all purpose jacket	3 1/2-inch	
		Elastomeric or Polyolefin	3 1/2-inch	

Note 1: Cover with metal pipe jacket where exposed to weather and over heat trace cable.
Note 2: Elastomeric or polyolefin insulation not allowed over heat trace cable.
Note 3: Drain bodies, insulate the first 10 feet connected to the drain body, and all horizontal piping. Do not insulate main vertical stack.

B. The following piping is not insulated:
   1. Waste and vent, except where heat traced.
   2. Natural gas.
   3. Fuel oil.
   4. Specialty gases.
   5. Medical gases.
   6. Domestic cold water runouts to single fixture less than 12-inch long and exposed supplies.
   7. Priming lines except where heat traced.

C. Insulation shall include all fittings, unions, flanges, mechanical couplings, valve bodies, valve bonnets, piping through sleeves, except valve bonnets, unions and flanges need not be insulated on the following systems: Domestic and solar hot water, inside building.

D. Valves and irregular fittings shall be insulated with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36 lagging adhesive. The contractor shall have the option on all flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 oz. glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge S.S. lacing wire.

E. Expansion Joints and Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.

3.3 PIPING INSTALLATION

A. General:
   1. Joints: Coat both sides of complete joining area with applicable adhesive.
      a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
      b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
      c. Multiple Layered Insulation: Joints staggered.
   2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
   3. Voids: Fill all voids, chipped corners and other openings with insulating cement or material compatible with insulating material. In insulation with Heat Tracing: Where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement.
   4. Seal joints, seams and fittings of metal watertight jackets at exterior locations.

B. Fiberglass Insulation: Exterior insulation encased in metal jacket.

C. Calcium Silicate Insulation:
   1. Secure with 18-gauge wire embedded into insulation.
   2. Cover with continuous vapor barrier jacket.

D. Elastomeric and Polyolefin Insulation:
   1. Slit full length and snap around pipe.
   2. Make cuts perpendicular to insulating surface leaving no cut section exposed.
   3. Do not stretch insulation to cover joints or fittings.
   4. Seal joints in elastomeric insulation with adhesive.
   5. Seal joints in polyolefin as specified hereinbefore.
   6. Exterior insulation painted with two coats of specified paint in accordance with the manufacturer's instructions and encase in metal jacket.
   7. Sealing joints with tape will not be allowed.

E. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.
   1. On Elastomeric and Polyolefin Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.
   2. In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.

F. Unions, Mechanical Joints, Valves, Etc.:
   1. General:
      a. As specified for fittings.
      b. Minimum thickness same as specified for piping.
   2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
   3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
   4. Flanged Valves: Insulation with square corners.

G. Vapor Barrier Insulation:
   1. Refer to Section 22 05 29 for support requirements.
   2. Piping which requires vapor barrier protection shall have a continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:

a. Domestic cold water.
b. Industrial cold water.
c. Non-potable cold water.
d. All other piping systems with a nominal operating temperature below 65°F.

3. Vapor Barrier Insulation:
   a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
   b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 22 05 29.

H. Non-Vapor Barrier Insulation:
1. Refer to Section 22 05 29 for support requirements.
2. For pipe 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
3. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation. Provide pipe shield specified in Section 22 05 29.

I. Acoustical Wrap:
1. Install in accordance with the manufacturer's instructions.
2. Applied locations for piping systems:
   a. Where specified or indicated on drawings.

3.4 EQUIPMENT INSTALLATION

A. General: Install true and smooth. Insulation over curved surfaces shall conform to curves of surface.
1. Access: Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance shall be provided with covers or section that are easily removable and replaceable. Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.
2. Voids, Depressions and Cavities: All voids, chipped corners and other openings shall be filled with insulating cement or material compatible with insulating material.
3. Vapor Barriered Insulation: Where insulation is specified to have a vapor barrier, the barrier shall not be pierced or broken.
   a. Tears, etc., shall be coated with vapor barrier mastic and patched with insulation facing or tape.
   b. Staples brush coated with vapor barrier coating.
   c. All raw edges coated with vapor barrier mastic shall be covered and cover shall be sealed to equipment surface.
4. Non-Vapor Barriered Insulation:
   a. Tears, etc., shall be patched with insulation facing or tape.
   b. All raw edges shall be covered and neatly beveled to the equipment surface.
5. Multilayered Insulation: With staggered joints.

B. Fiberglass Block:
1. Anchors: Lug nuts 10 gauge black annealed iron wire welded to metal surfaces.
2. Banding: Block secured to surface with 1/2-inch wide stainless steel bands maximum 18-inches on center and secured to anchors.
3. Insulating Cement: Block covered with insulating cement minimum thickness of 1/2-inch with smooth finish.
4. Vapor Barriered System: On vapor barriered system, apply continuous coat of vapor barrier mastic.
5. Finish: Finish with cloth facing secured with adhesive and lapped a minimum of 2 inches. Defects touched up with finishing cement.

C. Elastomeric Blanket: Cut insulation to size, make corners with mitering cuts to preclude raw edges, continuously cement insulation to equipment with adhesive. Cement both surfaces of joints and butt tightly together and cover raw edges with two coats of adhesive.

D. Expansion Joints: Covered with larger size pipe insulation to allow full movement and be removable, ends turned back to pipe, coat with vapor barrier mastic on joints in vapor barriered system and finished with cloth facing cemented to insulation with adhesive.

E. Heat Exchangers: Insulation thickness and material as specified for piping and applicable service.

3.5 FIELD QUALITY CONTROL

A. Field Test: All systems shall be tested and approved prior to installation of insulation.

B. Existing Insulation:
1. Repair existing insulation damaged during construction.
2. Make neat connections where new and existing insulation meet.
3. Where existing piping, or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION

SECTION 22 08 00

COMMISSIONING FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

C. The Work of this Section is supplemental to and does not supersede any other requirements of the Contract Documents.

1.2 SUMMARY

A. The commissioning process is described in Section 01 91 00 Commissioning.

B. Provide all labor and materials required to complete the commissioning of those Division 22 systems and equipment identified as Commissioned Systems and Equipment in Section 01 91 00 Commissioning.

C. Related Sections include:
1. Section 01 91 00 Commissioning.
2. All Sections of Division 22.

1.3 SUBMITTALS

A. Refer to Section 01 91 00 Commissioning.

1.4 COMMISSIONING SCOPE OF WORK - COMMISSIONING AGENT

A. Refer to Section 01 91 00 Commissioning.

1.5 COMMISSIONING SCOPE OF WORK - CONTRACTOR

A. Refer to Section 01 91 00 Commissioning.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Refer to Section 01 91 00 Commissioning.

PART 3 - EXECUTION

3.1 MEETINGS

A. Refer to Section 01 91 00 Commissioning.

3.2 INSTALLATION, CHECK-OUT, START-UP AND PREFUNCTIONAL CHECKS

A. Refer to Section 01 91 00 Commissioning.

3.3 FUNCTIONAL TESTING

A. Refer to Section 01 91 00 Commissioning.

3.4 TRAINING OF FACILITY OPERATING STAFF AND BUILDING OCCUPANTS

A. Refer to Section 01 91 00 Commissioning.

END OF SECTION

SECTION 22 21 13

PIPE AND PIPE FITTINGS PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Furnish piping, pipe fittings, and incidental related items as required for complete piping systems.

B. Related Sections Include:
1. Section 22 25 00 Plumbing Water Treatment.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Piping material and installation to meet requirements of the local plumbing, fire, and building codes and serving utility requirements.
2. Provide chlorination of domestic cold and hot water piping in accordance with County and State health requirements.

B. All grooved joint couplings and fittings shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
1. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

C. Pipe Cleaning: Should any pipe be plugged or should foaming of water systems occur, disconnect piping, reclean, and reconnect without additional expense to the Owner.

D. Correct any damage to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.

1.4 SUBMITTALS

A. Submit the Following:
1. List of piping materials indicating the service it is being used for. (Do not submit piping product data).
2. Product data on mechanical couplings and related components, double wall fuel oil pipe and fittings, and polypropylene waste and vent pipe.

B. Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.

C. Other: Make certified welders' certificates available.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. As indicated.

2.2 CAST IRON SOIL PIPE, SERVICE WEIGHT (NO-HUB)

A. General: A code approved hubless system conforming to Cast Iron Soil Pipe Institute Standard 301.

B. Pipe and Fittings: Service weight hubless cast iron conforming to ASTM A 74, marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International. Tyler, AB&I, or Charlotte.

C. Gaskets: Compression type conforming to ASTM C 564.

D. Couplings:
1. Above Grade: Band type coupling in conformance with Cast Iron Soil Pipe Institute (CISPI) 310-90, consisting of stainless steel clamp and corrugated shield assemblies with a neoprene sealing sleeve ANSI A21.6, ANSI A21.10 Fittings.
2. Buried: Husky 28 gauge 304 stainless steel hubless type clamp and orange corrugated shield assemblies (80-inch pound torque) with neoprene sealing gaskets (ASTM-C-564), or Clamp-All (125-inch pound torque), 24 gauge 304 stainless steel hubless type clamp, and shield assemblies with neoprene sealing gaskets (ASTM-C-564).

E. Service:
1. Sanitary, storm, and overflow drain.
2. Vent piping 2 inches and above.

2.3 CAST IRON SOIL PIPE, SERVICE WEIGHT (HUB AND SPIGOT)

A. General: Code approved hub and spigot pipe and fitting system conforming to ASTM A74 marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.

B. Gaskets: Compression type gaskets conforming to ASTM C564.

C. Service:
1. Below Grade: Sanitary waste, storm and overflow drain.

2.4 GALVANIZED STEEL PIPE

A. Pipe: Schedule 40 conforming to ASTM A 135 or A 53.

B. Fittings: 150 lb. screwed galvanized malleable iron on 2-inch and below, Victaulic, Gruvlok, Gustin-Bacon, or Mech Line full flow galvanized, grooved end on 2-1/2-inch and above. Provide grooved type gasketed couplings and fittings for pipe 2-1/2-inch and above.

C. Service:
   1. Miscellaneous indirect waste piping.
   2. At Contractor's option, waste and vent piping 1-1/2 inches and under, above grade.
   3. Pumped waste (above grade only).

2.5 STEEL TUBING

A. Low Pressure Tubing: Annealed seamless steel tube, minimum 0.035-inch wall thickness. Minimum size: 5/8-inch O.D.

B. High Pressure Tubing: Annealed seamless steel tube, minimum 0.083-inch wall thickness. Minimum size: 5/8-inch O.D.

C. Service:
   1. Low Pressure Tubing: Motor oil piping, hydraulic oil, transmission fluid, and antifreeze.
   2. High Pressure Tubing: Grease piping.

2.6 COPPER PIPE

A. Pipe: Hard drawn copper tubing, Class L or K, ASTM B 88.

B. Fittings: Wrought copper, 150 psi; ANSI B16.22 for soldered joints, ANSI B16.50 for brazed joints; Chase, Revere, Mueller or approved equal. At contractor's option, a system using mechanically extracted collars in main with branch line inserted to not obstruct flow may be used on domestic water piping above ground, similar to T-drill.

C. Service:
   1. Domestic hot and cold water piping below ground (Type K, hard drawn) on piping 3 inches and smaller.
   2. Domestic hot and cold water piping above ground (Type L, hard drawn) on piping 4 inches and smaller.
   3. Trap priming lines (Type L, annealed).
   4. Industrial cold water above grade (Type L) on piping 4-inch and smaller.
   5. Pumped waste (DWV).
   6. Reclaimed water.
   7. Solar hot water.
   8. Miscellaneous drains and overflows.

2.7 COPPER, STAINLESS, AND BLACK STEEL GROOVED PIPING SYSTEM

A. Acceptable Manufacturers: Victaulic or Gruvlok only.

B. Pipe: Copper tube, ASTM B-88 Type L roll grooved in accordance to Victaulic current listed standards. No flairing of grooved copper allowed.

C. Mechanical Couplings:
   1. Victaulic Style 607H Installation-Ready (copper) or Style 107H Installation-Ready (steel) or Series 89 (galvanized ductile iron for stainless steel pipe) angle bolt pad rigid couplings for copper, black steel or stainless steel consisting of a ductile iron cast housing, a synthetic rubber gasket of a central cavity pressure-response design with ASTM A449 plated nuts and bolts to secure the unit together.
   2. Coupling housings shall be cast ductile iron conforming to ASTM A-536.

D. Gaskets: Molded synthetic rubber of elastomers having properties as designated in ASTM D-2000. Gaskets shall be UL classified in accordance with ANSI-NSF-61 for potable water service.

E. Flange Adapters: Victaulic Style 641 (copper) , Series 741 (black steel), or Series 741 (DI) and 441 (SS) for Stainless Steel, ductile iron ASTM A-536, engaging directly into roll grooved copper or stainless steel tube and fittings and directly to ANSI Class 125 cast iron and Class 150 steel flanged components.

F. Fittings:
1. Victaulic full flow copper or stainless steel fittings with grooves designed to accept Victaulic grooved end couplings.
2. Copper per ANSI B16.22 wrought copper and ASTM B-75 alloy C12200 or Bronze sand casting per ANSi B16.18 and ASTM B 584-87 copper alloy CDA 844.
3. Stainless Steel Schedule 10 fittings ASTM A403 or factory-fabricated from segmentally welded 316SS.
4. Victaulic Style 47 dielectric waterway when connecting dissimilar metals.

G. Service: Domestic cold water piping above ground (Type L, hard drawn copper or schedule 10 stainless steel) on piping 2 inches through 4 inches.

2.8 PVC PIPE (DWV)

A. Pipe: PVC, wall thickness equal to Schedule 40 standard steel pipe, conforming to ASTM D2665-85a.

B. Fittings: PVC building drain, waste, and vent fittings conforming to ASTM D2665-85 and ASTM D3311-82.

C. Solvent Cement: For PVC pipe conforming to ASTM D2564-80.

D. Service: Sanitary waste and vent, except not allowed in return air plenums.

2.9 ABS PIPE (DWV)

A. Pipe: ABS, wall thickness equal to schedule 40 standard steel pipe, conforming to ASTM D2661-85a.

B. Fittings: ABS waste and vent fittings conforming to ASTM D2661-85a and ASTM D3311-82.

C. Solvent Cement: For ABS pipe conforming to the requirement of ASTM D2235-81.

D. Service: Sanitary waste and vent, storm and overflow, except not allowed in return air plenums.

2.10 CPVC PIPE

A. Pipe: CPVC pipe compound shall meet cell class 24448 as defined by ASTM D1784 and shall meet or exceed requirements of ASTM F-441. Pipe shall be certified NSF International for use with potable water.

B. Fittings: CPVC fitting compound shall meet cell class 23447 as defined by ASTM D1784 and shall meet or exceed the requirements of ASTM F-441.

C. Solvent Cement: For CPVC pipe conforming to the requirements of ASTM F493. Solvent cement shall be certified by NSF International for use with potable water.

D. Service: Domestic cold, hot and re-circulating hot water systems above grade, except not allowed in return air plenums.

2.11 PEX POTABLE WATER TUBING

A. Acceptable Manufacturers:
   1. Wirsbro, Uponor.
   2. Other Manufacturers: Submit Substitution Request.

B. Regulatory Listings: Submit appropriate NSF International, UL, Warnock Hesey or CSA listings as proof of compliance with local building and plumbing codes.

C. PEX tubing and components shall be installed in full compliance with all local jurisdictional codes, standards and requirements.

D. Submit listings that indicated that the PEX tubing system has been certified to ANSI/NSF Standards 14 and 61.

E. Quality Assurance:
   1. Installer Qualifications: Installer experienced in performing work of this Section who has specialized in installation of work similar to that required for this project.
   2. Installer shall provide in writing to the Owner that the PEX tubing and components furnished under this Section conforms to the material and mechanical requirements specified herein.

F. Materials:
   1. Tube Materials: Tube shall be cross-linked polyethylene (PEX) manufactured by PEX-A or peroxide method. Provide “blue” colored PEX for cold water systems and “red” colored PEX for hot water systems.
   2. Tubing Type: PEX tubing shall be manufactured in accordance with ASTM F876, ASTM F877 and CAN/CDA-B137.5. The tube shall be listed to ASTM by an independent third party agency.
      a. PEX tubing shall have Standard Grade hydrostatic design and pressure ratings of 200°F at 80 psi and 180°F at 100 psi. Temperature and pressure ratings shall be issued by the Plastic Pipe Institute (PPI).
      b. Minimum bend radius for cold bending of the PEX tubing shall not be less than 6 times the outside diameter. Bends with the radius less than stated shall require the use of a bend support as supplied by tube manufacturer.
   3. Manifold Type: Wirsbro Type “L” Q-Series copper manifold with integral valves.
   4. Fittings: Fittings shall be brass. Fittings shall be PEX-A cold expansion type fitting. Wirsbro ProPEX fittings.
      a. Fittings shall be supplied by the PEX tubing manufacturer.
      b. PEX fittings shall be manufactured in accordance with ASTM F1960. The fittings shall be listed to ASTM by an independent third party agency.
      c. PEX-A cold expansion type fittings shall be an assembly consisting of insert and PEX-A cold expansion ring.

G. Accessories:
   1. Wall Penetration Brackets: Brackets designed for wall membrane penetrations shall be supplied by PEX tubing manufacturer; Wirsbro Drop Ear Bend Support.
   2. Concrete Tube Support Brackets: Brackets to hold PEX tubing in place in structural concrete slabs shall be of rigid PVC construction and be designed for that purpose.
   3. Wirsbro “Stand-Up” bracket.

H. Service: Domestic cold and hot water supply drops to individual lavatories, sinks, tank type toilets and to the shower mixing valves. PEX tubing shall not serve any fixtures with fast closing valves (flush valves, solenoid valves, etc.) and shall not be used downstream of the shower mixing valve. Domestic water piping distribution systems serving PEX manifolds shall be copper.

2.12 FLANGED JOINTS

A. Flanged Joints: Flanges shall be cast iron or steel for screwed piping and forged steel welding neck for welded line sizes. Pressure rating and drilling shall match the apparatus, valve, or fitting to which they are attached. Flanges shall be in accordance with ANSI B16.1; 150 lb. for system pressures to 150 psig; 300 lb. for system pressures 150 psig to 400 psig. Gaskets for all flanged services, except steam and pumped condensate, shall be Garlock 3700 or equal, 1/8-inch thick, non-metallic type. Gaskets for steam and pumped condensate shall be Flexitaulic Style CG or equal, 1/8-inch thick, semi-metallic type. Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psig; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psig to 400 psig. Use length of bolt required for full nut engagement. Provide electro-cad plated bolts and nuts on cold and chilled water lines.

2.13 UNIONS

A. 150 psi malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200 psi WOG bronze, ground joint, solder type for copper tubing.
   1. Unions or flanges for servicing or disconnect are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as disconnect points.)

B. Dielectric fittings shall be nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F-492. Fittings shall be suitable for the pressure and temperature to be encountered.

2.14 MECHANICAL PIPE COUPLINGS AND FITTINGS

A. Acceptable Manufacturers:
   1. Victaulic.
   2. Anvil Gruvlok 7401, 7001.
   3. Other Manufacturers: Submit Substitution Request.

B. Coupling: Ductile iron conforming to ASTM A 536, Grade 65-45-12, rust inhibiting paint.

C. Fittings: Ductile iron conforming to ASTM A 536, Grade 65-45-12. Elbows shall be long radius type.

D. Bolts and Nuts: Zinc electroplated track head bolts conforming to ASTM A 183.

E. Gasket: Grade “E” EPDM.
   1. Temperature Range: -30°F to 230°F.

F. Service: Compressed air mains.

2.15 SOLDER AND BRAZING

A. Brazed Joints:

1. Wrought Copper Piping Fittings: Westinghouse Phos-Copper or Dyna-Flow by J.W. Harris Co., Inc.
2. Applied locations:
   a. All below grade piping.
   b. All above grade piping larger than 2-inches for the following services: Industrial cold water, domestic hot and cold water, and pumped waste.
   c. Oxygen, nitrous oxide, carbon dioxide, medical vacuum, lab vacuum and lab air. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.
   d. Joints in Domestic Hot and Cold Water Piping: Use mechanically extracted collars. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.
   e. Solar hot water.

B. Soldered Joints:
1. Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
2. Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.
3. Applied locations: Above grade piping 2-inch and smaller for the following services: Industrial cold water, domestic hot and cold water, pumped waste, trap priming lines.

2.16 UTILITY MARKERS

A. Provide plastic tape utility markers over all buried piping. Provide identification on tape.

B. Material to be Brady Identoline plastic tape, 6-inch, Seton, or as approved.

2.17 PIPE WRAPPING

A. For all below ground steel piping and fittings, provide complete covering of Scotchrap No. 51, 20 mil thickness, protective tape applied over Scotchrap pipe primer applied at 1 gal/800 SF of pipe surface.

B. At Contractor's option as approved, pipe may be furnished with factory applied jacket of "X-tru-coat" with Scotchrap as previously specified for field joints.

2.18 VACUUM CLEANING SYSTEM TUBING

A. Pipe and Fittings: All tubing and fittings shall be 16 gauge galvanized steel tubing. All fittings shall be specifically designed for vacuum cleaning service with long sweep elbows and branches and expanded socket type ends (similar to U.S. Turbine or approved equal).

B. Service: Cleanup vacuum piping from vacuum unit to outlet nozzles.

2.19 FLEXIBLE CONNECTOR

A. Expansion Joint/Seismic Connector:
1. T304 stainless steel hose and braid, Schedule 40 radius elbows and 180° bend, flange or weld end Schedule 40 fittings. ASA certified when used for natural gas service. Metraflex Metaloop only.
2. Connector shall accept differential support displacement without damaging pipe, equipment connections, or support connections.

3. In steel piping systems, three Victaulic flexible couplings may be used in lieu of a flexible connector for vibration attenuation and stress relief at equipment connections. The couplings shall be placed in close proximity to the vibration source.

B. Service:
1. Miscellaneous drains and overflows.
2. Domestic hot and cold water piping.

2.20 ABS DWV EXPANSION JOINT

A. Expansion Joint:
1. DWV expansion/compression joint made from ABS. Certified by NSF International. UPC approved. Canplas.
2. See ABS Pipe (DWV) piping specifications for required pressure and temperature rating.

B. Service:
1. Sanitary waste and vent, storm and overflow piping above grade.

PART 3 - EXECUTION

3.1 PREPARATION

A. Measurements, Lines and Levels:
1. Check dimension at the building site and establish lines and levels for work specified in this Section.
2. Establish all inverts, slopes, and manhole elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
3. Use established grid and area lines for locating trenches in relation to building and boundaries.

3.2 EXCAVATION AND BACKFILL

A. General: Perform all necessary excavation and backfill required for the installation of mechanical work in accord with Division 2. Repair pipelines or other work damaged during excavation and backfilling.

B. Excavation: Excavate trenches to the necessary depth and width, removing rocks, roots, and stumps. Include additional excavation to facilitate utility crossovers, additional offsets, etc. Excavation material is unclassified. Width of trench shall be adequate for proper installation of piping. The trench shall be widened, if not wide enough for a proper installation.

C. Bedding: All cast iron, steel, and copper piping shall be full bedded on sand. Place a minimum 4-inch deep layer on the leveled trench bottom for this purpose. Remove the sand to the necessary depth for piping bells and couplings to maintain contact of the pipe on the sand for its entire length. Lay all other piping on a smooth level trench bottom so that contact is made for its entire length.

D. Backfill: Place in layers not exceeding 8 inches deep, and compact to 95% of standard proctor maximum density at optimum moisture content. Earth backfill shall be free of rocks over 2 inches in diameter and foreign matter. Disposal of excess material as directed.
1. Interior: All backfill under interior slabs shall be bank sand or pea gravel.
2. Exterior: Excavated material may be used outside of buildings at the Contractor's option. The first 4 inches shall be sand, and final 12-inch layer course shall be soil in any event.

3.3 PIPING INSTALLATION

A. Install unions in all non-flanged piping connections to apparatus and adjacent to all screwed control valves, traps, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.

B. Mechanical Pipe Couplings and Fittings:
   1. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
   2. Flexible couplings to be used only when expansion, contraction, deflection or noise and vibration is to be dampened, as detailed or specified.
   3. On systems using galvanized pipe and fittings, fittings shall be galvanized at factory.
   4. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
   5. Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
   6. Gaskets shall be molded and produced by the coupling manufacturer, and shall be suitable for the intended service.
   7. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the project site to ensure best practices in grooved installation are being followed. (A distributor's representative is not considered qualified to conduct the training or field visits.)

C. Install all piping as to vent and drain. Install according to manufacturer's recommendations.

D. Support all piping independently at apparatus so that its weight shall not be carried by the equipment.

E. Run piping clear of tube cleaning or removal/replacement access area on heat exchangers, water heaters, etc.

F. Utility Marking: Installed over the entire length of the underground piping utilities. Install plastic tape along both sides and the center line of the trenches at the elevation of approximately 12 inches above the top of utility.

G. Underground Water System: Prior to testing pipe provide concrete thrust blocks at changes in direction. Block size as required for types of fittings involved.

H. Dielectric Fittings: Provide dielectric couplings, unions, or flanges between dissimilar metals. In addition, provide dielectric couplings as required to isolate cathodically protected piping and equipment.

I. No-Hub Couplings: Install per manufacturer's instructions.

J. Copper Grooved Piping System: Install in strict accordance with latest manufacturer's published literature.

K. PEX System: Installation shall comply with manufacturer's product data, including product technical bulletins, installation instructions and product carton instructions for installation.
   1. PEX tubing passing through metal studs shall be provided with grommets or sleeves at the penetration.
   2. Protect PEX tubing with sleeves where abrasion may occur.

3. Use strike protectors where PEX tubing has the potential for being struck with a screw or nail.

3.4 PIPING JOINTS

A. Pipe and fittings shall be joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. shall be done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.

B. Copper Piping: Pipe cut evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished. Joint shall be uniformly heated, and capillary space completely filled with solder or braze material, leaving full bead around entire circumference.

C. No couplings installed in floor or wall sleeves.

D. Steel Piping:
   1. Screwed Joints: Pipes cut evenly with pipe cutter reamed to full inside diameter with all burrs and cuttings removed. Joints made up with Teflon liquid dope or Teflon tape applied to male threads only, leaving two threads bare. Joints tightened so that not more than two threads are left showing. Junctions between galvanized steel waste pipe and bell of cast iron pipe shall be made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
   2. Flanged Joints: Pressure rating of flanges shall match valve or fitting joined. Joint gaskets shall be coated with graphite and oil.

E. Welded Joints:
   1. Preparation for Welding: Bevel piping on both ends before welding:
      a. Use following weld spacing on all buttwelds:

Nominal Pipe Wall Thickness	Spacing	Bevel
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2

      b. Before welding, remove all corrosion products and foreign material from surfaces.
   2. Welded Joints: Joints shall be made by the “arc-welding” process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for all turns, use welding tees for all tees. Reducing fittings must be used for size reduction. “Weldolets” may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.
   3. Welding Operation:
      a. After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
      b. Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld shall present professional appearance and be free of depressions below surface of jointed members.
      c. No welding shall be done when temperature of base metal is lower than 0°F. Material to be welded during freezing temperatures shall be made warm and dry before welding is started. Metal shall be “warm to the hand” or approximately 60°F.

F. Flexible Connector: Provide where indicated on the Drawings.

G. PVC Piping: Socket weld joints with solvent cement and application method recommended by manufacturer. Use power saw and miter box to cut PVC pipe, except DI piping must be cut with a wheel cutter specifically made for plastics. Allow proper curing time based on temperature range during cure period before pressure testing.

H. ABS Piping: Socket weld joints with solvent cement and application method recommended by manufacturer, use power saw and miter box to cut ABS pipe. Allow proper curing time based on temperature range during cure period before pressure testing.

3.5 ABS DWV EXPANSION JOINT

A. ABS DWV Expansion Joint:
   1. Install per manufacturer's installation instructions.
   2. Contractor is responsible to determine quantities and locations required.

3.6 INSTALLATION, PIPE WRAP

A. Apply per manufacturer's written instructions.

B. Apply wrapping to fittings in field after installation.

3.7 ADJUSTING AND CLEANING

A. General:
   1. Clean interior of all piping before installation.
   2. Flush sediment out of all piping systems after installation before connecting plumbing fixtures to the piping.
   3. When placing the water systems in service during construction, each system shall be cleaned by circulating a solution with 1000 ppm (1#20 gallon) of trisodium phosphate for 24 hours, then drained, flushed and placed in service.
   4. Clean all strainers prior to placing in service.

END OF SECTION

SECTION 22 21 23

HYDRONIC PUMPS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Provide centrifugal pumps.

1.3 QUALITY ASSURANCE

A. Select pump impellers such that impellers shall not be greater than minimum impeller size plus 90 percent of the difference between the maximum and minimum impeller size for pump selected.

B. Select motor to be non-overloading under all operating conditions.

C. Select pump with a minimum efficiency as listed in schedule.

1.4 SUBMITTALS

A. Submit the following:
   1. Product data for each pump including performance curves, pump efficiency, motor data, operating weights, and pressure ratings. Submit control information and wiring diagrams for packaged equipment.
   2. Operating and maintenance data for each product specified under this Section.

PART 2 - PRODUCTS

2.1 IN-LINE CIRCULATING PUMPS

A. Acceptable Manufacturers:
   1. Bell and Gossett, Armstrong, Paco, Peerless, Grundfos, Aurora.
   2. Other Manufacturers: Submit Substitution Request.

B. Description:
   1. Pipe mounted, integral centrifugal pump and resiliently mounted motor.
   2. Mechanical shaft seals.
   3. Bronze fitted construction.
   4. Rising head characteristics with decrease in volume.
   5. Drip-proof construction.

6. Motors: 1750 RPM or 3500 RPM maximum speed as scheduled, drip proof. Refer to Section 22 05 00 for energy efficient motor requirements. Provide totally enclosed motors for pumps located in any ceiling or space used as an air plenum.

PART 3 - EXECUTION

3.1 IN-LINE CIRCULATING PUMP INSTALLATION

A. Motor in horizontal or vertical depending on normal design of pump.

B. Provide for convenient access to oil cups and as required by the manufacturer.

C. Provide valves and specialties as detailed on Drawings.

D. Lubricate in accordance with manufacturer's instructions before operation.

E. Support and isolate circulators as specified and as scheduled on the Drawings.

END OF SECTION

SECTION 22 25 00

PLUMBING WATER TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Treatment of domestic water systems and solar hot water systems.

1.3 SUBMITTALS

A. Submit the following:
   1. Shop drawings.
   2. Product data.
   3. Operating and maintenance data.
   4. Certificate of completion.
   5. Treatment Reports.

PART 2 - PRODUCTS

2.1 ACCEPTABLE CHEMICAL TREATMENT MANUFACTURER/SUPPLIER

A. Nalco, Mogul, Chemax, Chemcoa, DuBois Chemicals.

B. Other Manufacturer/Suppliers: Submit Substitution Request.

2.2 PLUMBING WATER TREATMENT

A. Domestic Water Chlorination:
   1. Chlorination shall be accomplished by personnel in employed of firm licensed to do this type of work.
   2. As a minimum, potable water systems shall be disinfected prior to use as outlined within the current state or local Plumbing Code or as prescribed by the Health Authority, whichever requirements are more stringent.
   3. Chemicals: Sodium Hypochlorite 12.5% EPA registered for drinking water application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Plumbing Domestic Water Systems:

1. Provide 1/2-inch injection point on incoming water line immediately after the backflow device.
2. Flush system with fresh water to remove all dirt and construction debris.
3. Open all fixtures to develop slow rate of flow through system.
4. Injection Sodium Hypochlorite solution at a rate to achieve greater at 100ppm chlorine at all fixtures.
5. Flush entire system so no chlorine is present.
6. Bacteriological samples shall be submitted to a certified laboratory who shall certify that the water is suitable for drinking. The certificate stating purity of water shall be delivered to the Architect.

3.2 FINAL ADJUSTMENT

A. When the systems are accepted by the Owner the chemical treatment supplier shall make final adjustments in the required concentrations.

B. Submit report of indicating initials and final concentrations and system chemistry.

END OF SECTION

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Water heaters, domestic water expansion tanks, backflow preventers, utility vaults, oil/water separators, catch basin, heat trace, acid neutralization systems, pH monitoring system, fuel oil fill stations.

B. Related Sections include:
1. Section 22 40 00 Plumbing Fixtures.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Water heaters to meet state energy code requirements.

1.4 SUBMITTALS

A. Submit the following:
1. Product data for each item specified.
2. Operating and maintenance data.

PART 2 - PRODUCTS

2.1 WATER HEATERS

A. Electric Water Heater:
1. Acceptable Manufacturers:
   a. State Industries, Rudd, Rheem, A.O. Smith, Bradford-White.
   b. Other Manufacturers: Submit Substitution Request.
2. Description:
   a. Construct heater of heavy gauge steel, fluorocarbon polymer, epoxy, or glass lined, 150 psi working pressure (ASME rated for 125 gallon size and above).
   b. Equip heater with sacrificial magnesium anode unless fluorocarbon polymer lined.
   c. Heating elements of the inconel sheath rod type.
   d. One external adjusting thermostat for each element.
   e. Immersion thermostats to switch magnetic contactors through a staged sequence control (60 KW and larger).
   f. Insulate tank with foam insulation to comply with ASHRAE 90 standards and local codes, with a baked enamel steel jacket.

g. Manual reset high limit thermostat, ASME rated temperature and pressure relief valve and drain valve.
h. Heater UL listed, prewired, and factory tested.
i. See Drawings for size and capacity.

2.2 BACKFLOW PREVENTERS

A. Acceptable Manufacturers:
1. Watts, Febco, Wilkins, Hersey, Ames.
2. Other Manufacturers: Submit Substitution Request.

B. Reduced Pressure Backflow Assembly (RPBA) Type:
1. 2-inch Size and Smaller: Screwed ends with bubble-tight ball valves, bronze main valve body and cover, bronze main valve with stainless steel 316 trim and four (4) test cocks. Maximum working pressure of 150 psi unless scheduled.
2. 2-1/2-inch Size and Larger: Flanged ends with non-rising stem shutoff valves, cast iron main valve body and cover with epoxy coated interior, bronze main valve trim, bronze differential relief valve with stainless steel 316 trim and four (4) test cocks. Maximum working pressure of 150 psi unless scheduled.

C. Double Check Valve Assembly (DCVA) Type:
1. 2-inch Size: Flanged ends, bronze, check valve body and cover and bronze check valve trim. Complete unit consisting of two independently acting spring-loaded toggle lever check valves, and two (2) shutoff valves and four (4) test cocks.
2. 2-1/2-inch through 10-inch Size: Flanged ends, cast iron check valve body and cover and bronze check valve trim. Complete unit consisting of two independently acting spring-loaded toggle lever check valves, and two (2) shutoff valves and four (4) test cocks.

D. Double Check Detector Assembly (DCDA) Type: 3-inch through 10-inch size with 3/4-inch bypass line, OS&Y type of shutoff valve with tattle-tale meter, main line check valve body and cover cast iron epoxy coated internally, bypass line check valve body and cover bronze and check valve trim (all) bronze, and four (4) test cocks.

E. Vacuum Breakers:
1. Atmospheric Type (AVB): 1/2-inch through 2-inch size, all brass body, non-spilling type, 150 psig working pressure with maximum temperature of 140°F. Rough brass finish.

2.3 DOMESTIC WATER EXPANSION TANK

A. Acceptable Manufacturers: Amtrol, Bell & Gossett, Armstrong, Wheatley, Taco, or equal.

B. Expansion Tank: Diaphragm type of welded steel, constructed and stamped in accordance with ASME code for 150 psi working pressure. Heavy-duty butyl diaphragm shall meet FDA requirements for potable water supply. Support with steel legs or bases for vertical installation or steel saddles for horizontal installation. Tank shall be precharged with compressed air to minimum fill pressures as indicated on the Drawings.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install per manufacturer's installation instructions and in accordance with all applicable codes.

B. Provide pressure/temperature relief valve on storage tanks. Provide piping from relief valve to floor drain utilizing a 1-inch air gap at discharge point.

C. Support: Install water heater oriented so that controls and devices needing service and maintenance have adequate access. Install water heaters level. Provide required strapping to structure and floor in accordance with code requirements.

D. Water Piping: Provide hot and cold water piping to units with shutoff valves, unions, and specialties as detailed on the Drawings. Provide recirculating water line to unit with shutoff valve, check valve, and union.

E. Condensate Management System: Install in strict compliance with manufacturer's installation instructions, and local authority having jurisdiction.

3.2 BACKFLOW PREVENTERS

A. Install at height and location suitable for testing purposes by the local governing authority.

B. Provide funnel drain below reduced pressure backflow device for collecting periodic discharge and testing purposes. Pipe 2-inch indirect waste from funnel drain to floor drain. Discharge indirect waste above floor drain utilizing a 1-inch air gap.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes:
   1. Plumbing fixtures.
   2. Fixture trim.
   3. Drainage products.
   4. Miscellaneous plumbing items.

1.3 SUBMITTALS

A. Submit the following:
   1. Product data for each item specified.
   2. Operating and Maintenance Data:
      a. Electric water coolers.
      b. Whirlpool baths.
      c. Hot water dispensers.
      d. Garbage disposals.
      e. Sensor operated faucets.
      f. Sensor operated flush valves.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers stated for each fixture specified and the following manufacturers are approved for bidding except when indicated "only". Final approval for the installation based upon approval of submittal data.

B. Drainage Products and Carrier Products: J.R. Smith, Josam, Zurn, Wade, Sioux Chief, Watts Drainage.

C. Fixtures: American Standard, Kohler, Eljer.

D. Seats: Olsonite, Church, Beneke, Bemis.

E. Electric Water Coolers: Elkay, Halsey Taylor, Oasis, Sunroc, Haws.

F. Mixing Valves: Powers, Leonard, Symmons, Chicago.

G. Emergency Fixtures: Haws, Bradley, Speakman, Encon.

H. Emergency Fixture Mixing Valves: Leonard, Bradley, Lawler.

I. Stainless Steel Products: Elkay, Just.

J. Mop Sinks: Fiat, Williams, Mustee.

K. Faucets: Chicago, Delta Commercial, Grohe, Moen Commercial, T&S Brass.

L. Metering Faucets: Chicago, Symmons.

M. Disposals and Hot Water Dispenser: In-Sink-Erator.

N. Flush Valves: Sloan, Zurn.

O. Sensor Operated Flush Valves: Sloan Optima, Zurn.

P. Sensor Operated Faucets: Sloan Optima, Moen Commercial, T&S Brass.

Q. Shock Arrestors: PPP, J.R. Smith.

R. Trap Primer Stations: PPP.

S. Exposed Waste and Supply Piping Insulation Kits: Truebro, McGuire.

T. Other Manufacturers: Submit Substitution Request.

2.2 FIXTURE TRIM

A. Supply Stops: Chicago No. 1006 cast brass flexible riser supplies with loose key angle stops, wall flanges, NPT female inlet, all chrome plate finish; equivalent NPT McGuire (H21 LK series) or NPT stops by fixture supplier.

B. Traps:
1. For floor drains, provide coated cast iron P-trap; recessed, screw jointed or bell and spigot.
2. For other fixtures, provide 17 gauge, chrome plated cast brass P-Traps with solder bushings, and clean-out.

C. Support Rims: Hudee s/s rims, if sink not furnished with integral rim.

D. Vacuum Breakers: Chicago Faucet, A.W. Cash or Febco chrome plated.

2.3 PLUMBING FIXTURES

A. WC-1 Water Closet (ADA):
1. American Standard Madera 16”H EL 1.6 2305.100, vitreous china, elongated bowl, siphon jet action, floor mounted, 1-1/2-inch top spud, 16-1/8" floor to rim.
2. Sloan 111 diaphragm type flush valve (1.6 gpf).
3. Olsonite #95 white open-front seat.

B. L-1 Lavatory (ADA):
1. American Standard Lucerne 0355.012 20x18-inch, vitreous china, 4-inch centers, wall hung, concealed arm support, 2411.015 grid drain.

2. Chicago No. 802A-E28 faucet with dual lever handles, 1/2 GPM laminar outlet, vandal proof.
3. J.R. Smith Series 700-Z concealed arm, floor mounted carrier or Smith series 800 wall plate.

C. SK-2 Sink (ADA):
1. American Standard Lucerne 0355.012 20x18-inch, vitreous china, 4-inch centers, wall hung, concealed arm support, 2411.015 grid drain.
2. Chicago No. 802A-E28 faucet with dual lever handles, 1/2 GPM laminar outlet, vandal proof.
3. J.R. Smith Series 700-Z concealed arm, floor mounted carrier or Smith series 800 wall plate.

D. L-2 Lavatory (ADA):
1. American Standard Lucerne 0355.012 20x18-inch, vitreous china, 4-inch centers, wall hung, concealed arm support, 2411.015 grid drain.
2. Chicago No. 2200-4-E32 faucet with single lever handle mixing valve, 1/2 GPM laminar flow outlet, vandal proof, trim plate.
3. J.R. Smith Series 700-Z concealed arm, floor mounted Carrier or Smith series 800 wall plate.

E. SK-1 Sink:
1. Elkay LR-2219, 22x19x7-1/2-inch single compartment 18 gauge, type 302, 3-hole, self rimming stainless steel sink LK-18 grid strainer.
2. Chicago No. 2300-8-CP-E32 single lever mixing valve faucet, 8-inch trim plate, 2 GPM laminar flow outlet, vandal proof.

F. MS-1 Mop Sink:
1. Fiat Model MSB-2424, 24x24x10-inch molded stone mop basin.
2. Chicago No. 540-LD-897S-WXF-CP wall mounted service faucet with vacuum breaker, hose thread outlet, wall bracket, 5-foot hose.
3. Bumper guards, two sides.

G. SH-1 Shower (ADA) (without enclosure):
1. Powers P413-A-6V lever handle 3 port pressure balancing mixing valve with concealed check stops, hand held shower with chrome plated hose, wall bar, elevated vacuum breaker.
2. J.R. Smith 2005A floor drain with nickel bronze grate.

H. Master Mixing Valve Assembly: Leonard Type TM-186 exposed factory tested and assembled mixing valve assembly consisting of but not limited to: large and small rough bronze finish thermostatic mixing valves, high temperature limit stops, angle checkstops, outlet ball valve shutoffs, pressure regulating valve with pressure gauges, thermometer, inlet piping manifolds with unions. Unit to control discharge temperature to ±1%. See schedule on drawings for capacities.

I. Mixing Valve (Point-of-Use): Leonard Model 270 thermostatic point of use mixing valve, bronze body, locked temperature adjustment cap (vandal resistant), integral check valves on hot and cold inlets, minimum flow 0.5 GPM and maximum 3.5 GPM flow rates at 5 PSI loss.

J. SB-1 Supply Box: Guy Gray Model BB-200TS washing machine supply box with top valve supplies 2-inch drain outlet.

2.4 DRAINAGE PRODUCTS

A. HB-1 Hose Bibb: Chicago 952, chrome-plated, loose key, 3/4-inch hose thread, integral vacuum breaker.

B. WH-1 Wall Hydrant: J.R. Smith Fig. 5609QT, bronze finish, loose key, 3/4-inch hose thread,

C. FD-1 Floor Drain: J.R. Smith Fig. 2005-U-A, round nickel bronze vandalproof grate, cast iron body with flashing collar and adjustable strainer head.

D. WCO Wall Cleanout: J.R. Smith Fig. 4530-U, round stainless steel vandalproof cover and screw.

E. FCO Floor Cleanout: J.R. Smith Fig. 4020-U, round vandalproof, nickel bronze top.

F. CTG Cleanout to Grade: J.R. Smith Fig. 4220-U, round, extra heavy duty cast iron top set in 12x12x4-inch deep concrete pad.

G. Trap Priming Valves: Precision Plumbing Products Prime-time electronic trap priming manifold including but not limited to: atmospheric vacuum breaker, pre-set 24 hour clock, manual over ride, 120V solenoid valve, calibrated manifold for equal water distribution, 3/4-inch water hammer arrestor. Components pre-installed in recessed steel cabinet with SS access door.

H. Water Hammer Arrester: Precision Plumbing Products Model SC (Maintenance-Free).

2.5 FIXTURE TRIM

A. Provide plumbing fixture trim where applicable on fixtures, including but not limited to supply stops, traps, support rims, flush valve, and vacuum breakers.

B. Provide rough-in and final piping connection to fixtures. Carefully review all construction documents to assure that all fixtures are provided with necessary services for a complete operating system.

C. Rigidly secure rough-in piping, carriers and supports, and other service piping to structure.

2.6 PLUMBING FIXTURES

A. Americans with Disabilities Act:
   1. Those fixtures indicated by “ADA” shall comply with and be installed in accordance with Americans with Disabilities Act Guidelines (A.D.A.A.G.). Where applicable building code requirements are more stringent than ADAAG guidelines, building code requirements shall be followed.
   2. Water Closets: Mount flush valve for ADA water closets on wide side of enclosure.
   3. Lavatories: Provide insulation kits on exposed hot water and waste piping beneath ADA lavatories.
   4. Sinks: Provide insulation kits on exposed hot water and waste piping beneath ADA sinks.

B. Mounting Heights: All fixtures standard rough-in catalogued heights unless shown otherwise on the Architectural Drawings.

C. Water Supplies: When both hot and cold water to a fixture is required, connect the hot on the left and the cold on the right.

D. Floor Mounted Supports and Chair Carriers: Secure floor mounted supports and chair carriers to slab with a minimum of 1/2-inch bolts. Install supports and carriers per manufacturer's installation instructions.

E. Lavatories and Urinals with Electronic Sensors:
   1. Install lavatory and urinal sensors, wiring and piping as recommended by manufacturer.
   2. Mount lavatory wiring box on bottom of countertop for total concealment. Coordinate with Division 26 for plug-in transformer and receptacle locations.
   3. Provide vandalproof screws on wiring boxes for lavatories and sensor boxes for urinals.
   4. Reference electrical drawings for 120 volt power to urinal electrical boxes. Provide (1) 24 volt transformer for each bank of (10) urinal flushometers.

F. Floor Drain and Floor Sinks:
   1. Set top flush with finished floor.
   2. Provide flashing clamp for all drain bodies installed in floors provided with waterproof membranes.

G. Cleanout:
   1. Where shown or required.
   2. Cover set flush with finished surface.

H. Water Hammer Arresters: Provide where shown and where recommended by Plumbing Drainage Institute (PDI).

I. Mixing Valves: Provide piping connections per manufacturer's installation instructions. Provide spring check valves on hot and cold water inlets when not provided integral to valve.

2.7 PRIMING VALVES

A. All floor drains, floor sinks and similar traps shall be primed. Use minimum 3/8-inch type K annealed copper tubing. Primer line to be continuous and without joints.

B. Where priming valves are installed in finished rooms, conceal in wall and provide access panel.

C. Coordinate locations of electronic trap primer stations with electrical contractor for 120V service.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of This Section, Common Work Results for HVAC, apply to all sections in Division 23.

C. All Sections of Division 23 are interrelated. When interpreting any direction, material, and method specified in any section of Division 23, consider it within the entirety of Work in Division 23.

1.2 SUMMARY

A. The intent of Division 23 Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 23 and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.

B. The Division 23 Specifications and the accompanying Drawings are complimentary and what is called for by one shall be as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications shall supersede drawings in case of conflict.

C. Imperative language is frequently used in Division 23 Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.

D. The Drawings that accompany the Division 23 Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions shall be assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in outlet location prior to roughing-in, without cost impact.

1.3 RELATED WORK

A. The General and Supplemental Conditions apply to this Division, including but not limited to:
   1. Drawings and specifications.
   2. Public ordinances, permits.
   3. Include payments and fees required by governing authorities for work of this Division.

B. Division 1, General Requirements, applies to this Division.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. General: All work and materials shall conform to the local and State codes, and all Federal, State and other applicable laws and regulations.
   2. Contractor responsible for obtaining and payment for all permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.

B. Materials and equipment shall be new. Work shall be of good quality, free of faults and defects and in conformance with the Contract Documents.

C. Apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.

D. The entire mechanical system and apparatus shall operate at full capacity without objectionable noise or vibration.

E. All equipment shall be installed level and true. Housekeeping pads and curbs shall account for floor or roof slope.

F. Materials and Equipment:
   1. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name along with other manufacturers.
   2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
   3. Furnish all materials and equipment of size, make, type, and quality herein specified.
   4. Equipment scheduled by performance or model number shall be considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for all changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.

G. Workmanship:`
   1. General: All materials shall be installed in a neat and professional manner.
   2. Manufacturer’s Instructions: Follow manufacturer’s directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 23 Specifications, obtain clarification before starting work.

H. Cutting and Patching:
   1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting shall be performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
   2. Additional openings required in building construction shall be made by drilling or cutting. Use of jackhammer is specifically prohibited.
   3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
   4. Beams or columns shall not be pierced without permission of Architect and then only as directed.

5. All new or existing work cut or damaged shall be restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces shall be repaired, refinished, and left in condition existing prior to commencement of work.

1.5 PROTECTION OF WORK

A. Equipment and materials shall be stored on dunnage and remain wrapped at all times until installed.

B. Duct and piping shall be remain capped during delivery and storage.

C. During installation, all installed duct and piping shall be capped and protected at the end of each working day.

D. Equipment shall be protected from weather and stored in an enclosed, indoor location.

E. Until final acceptance of the work, protect materials from damage and provide adequate and proper storage facilities. Replace damaged or defective work, material, and equipment before requesting final acceptance.

1.6 SUBMITTALS

A. Shop Drawings:
1. The Contract Drawings indicate the general layout of the piping, ductwork, and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of all piping, ductwork and equipment installations. Shop Drawings shall be new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. All drawings shall be same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings. All drawings shall be fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Shop drawings shall be prepared in two-dimensional format.
3. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:
1. In general, submit product data for review on all scheduled pieces of equipment, on all equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data sheets shall include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.
2. List the name of the motor manufacturer and service factor for each piece of equipment.
3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:
1. Shop Drawings and Product Data:

a. Refer to Division 1 for additional requirements related to submittals.
b. Submit electronic copies of shop drawings and product data for Work of Division 23 in PDF format with each item filed under a folder and labeled with its respective specification section number, article and paragraph and mark if applicable.
c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, shall be included with the original submittal. Controls and Instrumentation submittals may lag but shall be complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder shall include a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities: It shall be the Contractor's responsibility to:
1. See that all submittals are submitted at one time and are in proper order.
2. Ensure that all equipment will fit in the space provided.
3. Assure that all deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.7 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS

A. Refer to Division 1 for additional requirements.

B. Submit one bound copy of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature shall be on 8-1/2"x11" sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for all electrically powered equipment.

C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions shall cover all phases of control.

D. Furnish competent engineer knowledgeable in this building system for minimum of three 8-hour days to instruct Owner in operation and maintenance of systems and equipment. Contractor shall keep a log of this instruction including dates, times, subjects, and those present and shall present such log when requested by Architect.

1.8 PROJECT CONDITIONS

A. Coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

B. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City and Utility Company.

1.9 WARRANTY

A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C. Correct warranty items promptly upon notification.

1.10 PROVISIONS FOR LARGE EQUIPMENT

A. Contractor shall make provisions for the necessary openings in building to allow for admittance of all equipment.

1.11 TEST REPORTS AND CERTIFICATES

A. Contractor shall submit one copy of all test reports and certificates specified herein to the Architect.

1.12 SUBSTITUTIONS

A. Contractor shall submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 - PRODUCTS

2.1 ACCESS PANELS

A. Furnish under this Division as specified in another Division of work.

2.2 PIPE AND DUCT SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.

B. Interior Wall and Floor Sleeves (fire rated): Fire rated and watertight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

C. Exterior Wall Sleeves: Cast iron.

D. On Grade Floor Sleeves: Same as exterior wall sleeves.

E. Watertight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

2.3 FLOOR, WALL AND CEILING PLATES

A. Furnish stamped split type plates as follows:
   1. Floor Plates: Cast brass, chromium plated.
   2. Wall and Ceiling Plates: Spun aluminum.

2.4 MACHINERY GUARDS

A. Furnish guards for protection on all rotating and moving parts of equipment. Provide guards for all metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.

B. Design guards so as not to restrict air flow at fan inlets resulting in reduced capacity.

C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards shall be easily removable for pulley adjustment or removal and changing of belts.

D. All guards shall meet OSHA requirements including back plates.

E. Provide inlet and outlet screens on all fans in plenums or where exposed to personnel.

2.5 ELECTRICAL EQUIPMENT

A. General: All equipment and installed work shall be as specified under Division 26, Electrical.

B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available interrupting current (AIC) rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment that meets the bracing requirement.

C. Motors:
   1. Motors shall be furnished as integral part of driven equipment. They shall be drip proof induction type with ball bearings unless noted otherwise. Motors 1 HP and above shall be premium energy efficient type, except for emergency equipment motors. Motors shall be built to NEMA Standards for the service intended. The motors shall be rated for the voltage specified, suitable for operation within the range of 10% above to 10% below the specified voltage.
   2. Energy efficient motors shall be Baldor, Westinghouse, and General Electric or approved equal.
   3. The motor shall meet the efficiency standards identified in the table below as determined using the IEEE Method B test at full load.
   4. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage and phase.
   5. Refer to individual product sections for additional motor requirements.
   6. Motors shall have built-in thermal overload protection or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors shall have quick trip devices.

D. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.

E. Equipment Wiring: Interconnecting wiring within or on a piece of mechanical equipment shall be provided with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.

F. Control Wiring: All control wiring for mechanical equipment shall be provided under Section 23 09 00, Instrumentation and Controls for HVAC.

G. Codes: All electrical equipment and products shall bear the Underwriters label as required by governing codes and ordinances.

PART 3 - EXECUTION

3.1 ACCESS PANELS

A. Install in accord with manufacturer's recommendations, coordinated with architectural features.

B. Provide 2-hour fire rated doors where required bearing the U.L. label.

C. Furnish 18x18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12"x12" for walls unless indicated otherwise.

D. Furnish where indicated and where required to access valves, fire/smoke dampers, trap primers, shock arresters, and other appurtenances requiring operation, service or maintenance. Submit proposed locations for review prior to installation.

3.2 SLEEVES

A. Interior Floor and Wall Sleeves: Provide sleeves large enough to provide 3/4-inch clearances around pipe or ductwork. Where pipe or ductwork is insulated, insulation shall pass continuously through sleeve with 3/4-inch clearance between insulation and sleeve. Penetrations through mechanical room and fan room floors shall be made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.

B. Sleeves Through Rated Floors and Walls: Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping or duct material, size and service.

C. Sleeves specified or indicated at fire damper penetrations shall take precedence over this article.

D. Exterior Wall Sleeves Below Grade: Provide watertight sleeves. Install at pipes entering building below grade and where shown. Adjust to provide positive hydrostatic seal. Contractor shall be responsible for following manufacturer's procedure for installing and tightening seal. Secure sleeves against displacement.

E. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.

F. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.

G. Layout work prior to concrete forming. Do all cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.

H. All floor sleeves shall maintain a water barrier by providing a watertight seal or they shall extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves shall extend 2 inches above finished floor level. Sleeves through roof shall extend 8 inches above roof. Wall sleeves shall be flush with face of wall unless otherwise indicated.

I. Do not support pipes by resting pipe clamps on floor sleeves. Supplementary members shall be provided so pipes are floor supported.

J. Special sleeves detailed on drawings shall take precedence over this section.

3.3 CLEANING

A. General: Clean mechanical equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

C. Additional requirements are specified under specific Sections of this Division.

3.4 EQUIPMENT PROTECTION

A. Keep pipe, ductwork and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.5 ACCESSIBILITY

A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms and walkways.

3.6 FLOOR, WALL AND CEILING PLATES

A. Install on piping and ductwork passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates shall completely cover opening around pipe and duct.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates shall not penetrate insulation vapor barriers.

D. Plates not required in mechanical rooms or unfinished spaces.

3.7 PAINTING

A. General: Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting. All exposed work under this division shall receive either a factory painted finish or a field prime coat finish, except:
   1. Exposed copper piping.
   2. Aluminum jacketed outdoor insulated piping.

B. Equipment Rooms and Finished Areas:
   1. Insulation: Not painted.

2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
3. Steel Valve Bodies and Bonnets: One coat of black enamel.
4. Brass Valve Bodies: Not painted.
5. Equipment: One coat of grey machinery enamel. Do not paint nameplates.
6. Grilles, Diffusers, Registers: Paint sheet metal and visible ductwork behind grilles, diffusers and registers flat black.

C. Concealed Spaces (above ceilings, not visible):
1. Insulation: Not painted.
2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.

D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

3.8 ADJUSTING AND CLEANING

A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.

B. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.9 ELECTRICAL EQUIPMENT

A. Ductwork or piping for mechanical systems not serving electrical space shall not be installed in any switchgear room, transformer vault, telephone room, or electric closet except as indicated.

B. Ductwork or piping for mechanical systems shall not pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.10 EQUIPMENT CONNECTIONS

A. Make final connections to equipment specified in sections other than Division 23 of the specifications and Owner furnished equipment in accordance with manufacturer’s instructions and shop drawings furnished and as indicated.

B. Piping:
1. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
2. All piping connections shall be independently supported to prevent undue strain on equipment.

C. Ductwork: Make duct connections to equipment in strict accordance with manufacturer’s instructions.

END OF SECTION

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes:
   1. Isolation of mechanical equipment as indicated on the Drawings and specified herein.
   2. Seismic restraint of equipment, piping and ductwork.

B. Related Sections include:
   1. Section 23 05 18 HVAC Expansion Compensation.
   2. Section 23 05 29 Hangers, Supports and Anchors for HVAC.
   3. Section 23 31 01 HVAC Ducts and Casing-Low Pressure.
   4. Section 23 31 02 HVAC Ducts and Casing-Medium Pressure.

1.3 QUALITY ASSURANCE

A. A single manufacturer shall select and furnish all isolation required, except packaged equipment with integral isolators meeting all the isolation and seismic requirements of this specification.

B. The system of vibration isolators and seismic controls shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.

C. Isolation performance requirements are indicated on the Drawings. All deflections indicated are nominal static deflections for specific equipment supported.

D. Seismic snubbers, restrained isolator housings and cable system components shall have anchorage preapproval “OPA” number from OSHPD in the State of California verifying the maximum certified load ratings.

E. Isolator Stability and Rated Capacity:
   1. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
   2. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

F. Seismic Restraints:
   1. Restraint of equipment, piping and ductwork to be in accordance with the current state and local Building Code.
   2. All calculations shall be in accordance with current state and local Building Code.

1.4 SUBMITTALS

A. Submit the following:
   1. Submit Shop Drawings showing complete details of construction for steel and concrete bases including:
      a. Equipment mounting holes.
      b. Dimensions.
      c. Isolation selected for each support point.
      d. Details of mounting brackets for isolator.
      e. Weight distribution for each isolator.
      f. Code number assigned to each isolator.
   2. Submit product data and calculation sheets for isolators, showing:
      a. Size, type, load rating and rated deflection of each required isolator.
      b. Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.
   3. Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.

B. Installation report as specified in Part 3 of this section.

C. Operation and maintenance data.

1.5 EQUIPMENT VIBRATION ISOLATION

A. Provide a balanced set of vibration isolators for each piece of equipment listed in the Equipment Schedules.

B. Isolation work to include, but not necessarily be limited to, the following:
   1. Isolation support of motor-driven equipment.
   2. Inertia base frames in conjunction with isolation.
   3. Isolation support of air-handling housings.
   4. Isolation support of piping, piping risers, and ductwork.
   5. Penetration isolation of pipework, ductwork, and conduits through walls, floors or ceilings.
   6. Flexible connections of ductwork and piping to equipment.

C. Each piece of rotating equipment must meet a reasonable criterion for maximum vibration levels at each bearing, while in operation. The criteria for varying operating speeds are given as follows:
   1. Rotating equipment operating peak vibration velocities must not exceed 0.08 in./sec.
   2. If it is discovered that the operating vibration velocities exceed this criteria, the equipment shall be repaired or replaced at no expense to the owner until approval of the equipment is given by the engineer.

D. Any components or materials not specially mentioned herein, but necessary to the proper vibration isolation of the equipment, shall be provided.

1.6 ACCEPTABLE MANUFACTURERS

A. Amber Booth.

B. Mason Industries, Inc.

C. Kinetics Corporation.

D. Vibrex.

E. Approved equal, meeting all of the conditions and requirements specified herein.

1.7 CONTRACTOR RESPONSIBILITY

A. All vibration isolation devices, including auxiliary steel bases and pouring forms, shall be designed and furnished by a single manufacturer or suppliers.

B. Adequately restrain all equipment, piping, and ductwork to resist seismic forces. Design and select restraint devices to meet seismic requirements as defined in the latest issue of the International Building Code under Earthquake Design and applicable state and local codes.

C. In addition, the contractor shall have the following responsibilities:
   1. Selection, installation, adjustment and performance of vibration isolators which will meet the requirements given on the plans or in the specifications.
   2. Provide Engineering drawings, details, supervision, and instruction to assure proper installation and performance.
   3. Provide whatever assistance necessary to ensure correct installation and adjustment of the isolators.

PART 2 - PRODUCTS

2.1 TYPE 1 - NEOPRENE WAFFLE PAD

A. 3/4-inch thick neoprene waffle pads with pattern repeating on 1/2-inch centers.

B. Select Duro rating for maximum deflection at average load rating.

C. Include load distribution steel plate as required.

D. Include anchor bolt grommet as required.

E. Acceptable Manufacturer: Mason Type “Super W” or “Super WM” and “HG Grommet”; Similar Amber-Booth, Kinetics Corporation.

2.2 TYPE 2 - RESTRAINED NEOPRENE MOUNT

A. Bridge-bearing neoprene mountings shall have all directional seismic capability.

B. Provide minimum deflection of 0.2-inch.

C. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements.

D. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation.

E. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications.

F. Manufacturer: Mason type BR.

2.3 TYPE 8 – ISOLATING NEOPRENE HANGERS

A. Double deflection neoprene hangers.

B. Provide minimum static deflection of 0.35-inches.

C. Provide projecting bushing to prevent steel to steel contact.

D. Manufacturer: Mason HD, similar Amber-Booth, Consolidated Kinetics, Vibrex.

2.4 ISOLATING SLEEVES

A. Provided for all piping through walls and floors of penthouses and chiller room. Size for piping as required.

B. Manufacturers: Potter-Roemer PR isolators or Grinnell Semco Trisolators.

2.5 SEISMIC RESTRAINTS

A. General Requirements:
1. Seismic restraints shall be provided for all equipment, piping and ductwork, both supported and suspended.
2. Bracing of piping and ductwork shall be in accordance with the code and with the provisions set forth in the SMACNA seismic restraint manual.
3. The structural requirements for the restraints, including their attachment to the building structure, shall be reviewed and approved by the structural engineer.
4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment:
1. All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene.
2. Bushing shall be replaceable and a minimum of 1/4-inch thick. Rated loadings shall not exceed 1000 psi.
3. An air gap of 1/4-inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces.
4. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to ensure no short circuits exist before systems are activated.
5. Snubber shall be type Z-1225 as manufactured by Mason Industries, Inc.

C. Bracing of Pipes:
1. Provide seismic bracing of all piping as detailed below to meet the building code requirements:
    a. Exception: Piping suspended by individual hanger's 12-inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced where the following criteria are met.
        1) Seismic braces are not required on high deformability piping when the Ip=1.0 and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 3-inches diameter or less.

2) Seismic braces are not required on high deformability piping when the Ip=1.5 and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 1-inch diameter or less.

2. Seismic braces for pipes on trapeze hangers may be used.
3. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints, or where pipes connect to equipment.
4. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12-inches or more from the supporting structure, shall be braced on each side of a change in direction of 90 degrees or more. Riser joints on unsupported sections of piping shall be braced or stabilized between floors.
5. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high or for piping subject to thermal change all risers shall be engineered individually.

D. Bracing of Ductwork:
1. Brace rectangular ducts with cross sectional areas of 6 square feet and larger. Brace flat oval ducts in the same manner as rectangular ducts. Brace round ducts with diameters of 28 inches and larger. Brace flat oval ducts the same as rectangular ducts of the same nominal size.
2. Exception: No bracing is required if the duct is suspended by hangers 12 inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached, and the Ip=1.0.
3. Transverse bracing shall occur at the interval specified in the SMACNA tables or at both ends if the duct run is less than the specified interval. Transverse bracing shall be installed at each duct turn and at each end of a duct run, with a minimum of one brace at each end.
4. Longitudinal bracing shall occur at the interval specified in the SMACNA tables with at least one brace per duct run. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it if the bracing is installed within four feet of the intersection of the ducts and if the bracing is sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
5. Install duct flex connections at equipment connections to accept expected differential displacement and protect the equipment connection from damage.

E. Suspended Equipment and Piping and Ductwork:
1. Seismic cable restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint.
2. Cable must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement.
3. Cable assemblies shall be type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod and the clevis or SCBV if clamped to a beam, all as manufactured by Mason Industries, Inc.
4. Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall be type SRC or UC as manufactured by Mason Industries, Inc.

5. Pipe clevis cross-bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.

2.6 FLEXIBLE HOSE CONNECTOR

A. Flexible stainless steel hoses shall be manufactured using type 304 stainless steel hose and braid with one fixed and one floating raised face carbon steel plate flange.

B. Sizes 2-1/2-inch (65mm) and smaller may have threaded male nipples or copper sweat ends. Grooved ends are acceptable in all sizes in grooved piping systems. Weld ends are not acceptable. Copper sweat end hoses for water service shall be all copper or bronze construction.

C. Hose shall have close pitch annular corrugations for maximum flexibility and low stiffness. Tested hose stiffness at various pressures must be included in the submittals.

D. Hose shall be capable of continuous operation at 150 psi and system test pressure when installed in piping systems.

E. Hose shall be the same size as the pipe it connects and have pipe thread connectors on both ends with male or female end adapters as required.

F. Mason type BSS, FFL, MN, CPS or CPSB, similar HCi, Metraflex.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not install any equipment or pipe which makes rigid contact with the building. "Building" includes slabs, beams, studs, walls, etc.

B. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.

C. Correct, at no additional cost, all installations which are defective in workmanship or materials.

3.2 PREPARATION

A. Treat all isolators, including springs, hardware and housing, with a corrosion protective coating of epoxy powder or electro galvanizing.

B. Coat steel frames exposed to weather with a rustproof metal primer.

C. Provide hot dipped galvanizing on steel frames as indicated on the plans for corrosion protection in severe conditions.

3.3 INSTALLATION

A. General:
   1. Install isolation where indicated on the Drawings by type and location and where indicated below.
   2. The assigned code number shall be marked on the isolators and bases to assure placement in the proper location.
   3. Anchor isolator seismic housing baseplate to floor.
   4. Rubber grommets and washers shall be provided to isolate the bolt from the building structure. Under no circumstances shall the isolation efficiency be destroyed when bolting the isolators to the building structure.

B. Type 2 – Restrained Neoprene Mount
   1. Service:
      a. Boilers
      b. Roof Exhaust Fans
      c. Ceiling Exhaust Fans
      d. Dryer Booster Fans
      e. Small Cabinet Fans
      f. Inline Centrifugal Fans
      g. Underfloor Fan Powered Terminal Units
      h. Fuel Fired Furnaces
      i. Floor Mounted Air Conditioners
      j. Floor Mounted Heat Pumps
      k. Fan Coil Units

3.4 SEISMIC RESTRAINTS

A. General:
   1. Install and adjust seismic restraints so that the equipment, piping, and ductwork support is not degraded by the restraints.
   2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Supported Equipment:
   1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
   2. Care must be taken so that the 1/4-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

C. Bracing of Pipes:
   1. Branch lines may not be used to brace main lines.
   2. Transverse bracing shall be at 40 feet maximum, except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes
   3. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity to resist both the seismic load and the additional force induced by expansion and contraction.
   4. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.

5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.
6. Subject to confirmation by field inspection, seismic bracing is not required on piping when the piping is supported by rod hangers and the hangers in the entire run are 12-inches or less in length from the top of the pipe to the supporting structure, hangers are detailed to avoid bending of the hangers and their attachments and provisions are made for piping to accommodate expected deflections.

D. Bracing of Ductwork:
1. Hanger straps must be positively attached to the duct within 2 inches of the top of the duct with a minimum of two #10 sheetmetal screws.
2. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
3. Walls, including gypsum board nonbearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide solid blocking around duct penetrations at stud wall construction.
4. Unbraced ducts shall be installed with a 6-inch minimum clearance to vertical ceiling hanger wires.

E. Suspended Equipment, Piping, and Ductwork Cable Method:
1. The cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
2. The uplift and downward restraint nuts and Mason type RW neoprene covered steel rebound washers for the Type 6 hangers shall be adjusted so that there is a maximum 1/4-inch clearance.

3.5 FIELD QUALITY CONTROL

A. Installation Report: Isolation manufacturer's representative shall confirm that all isolation is installed correctly and submit report stating that isolators are installed as shown on Shop Drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Identify valves, piping and equipment components of the mechanical systems to indicate their function and system served.

1.3 SUBMITTALS

A. Submit the following:
   1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
   2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
   3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 - PRODUCTS

2.1 VALVE IDENTIFICATION

A. Valve Tags:
   1. General: Identify valves with metal tags, legends to be stamped or embossed. It shall indicate the function of the valve and its normal operating position; i.e.,
      56 HW (NUMBER AND CONTENT OF PIPE)
      ISOLATION (VALVE FUNCTION)
      NO (NORMAL OPERATION POSITION)
   2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
   3. Material: Use 0.050 or 0.064-inch brass tags.
   4. Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, “lamicoid” or equal. Form letters by exposing center ply.
   5. Buildings Systems: Contact the **[Owner]** for coordination with existing building tagging system and supplementary information required for any specific system before valve tagging begins.

B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.

2.2 EQUIPMENT IDENTIFICATION

A. Nameplates:
   1. Tag all pumps, air handling supply units, fans, terminal units, converters, and miscellaneous items of mechanical equipment with engraved nameplates. Nameplates shall be 1/16-inch thick, 3 x 5 laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
   2. Identify unit with equipment tag as shown on Drawings and area served.
   3. Access points to fire dampers, smoke dampers, and combination fire and smoke dampers shall be permanently identified on the exterior of the duct by a label with letters 1/2-inch in height reading: Fire Damper, Smoke Damper, or Fire/Smoke Damper, as appropriate. Label constructed from same material as equipment nameplates.

B. Equipment Nameplate Directory: List pumps, air handlers, terminal units, and other equipment nameplates. Include Owner and Contractor furnished equipment. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

PART 3 - EXECUTION

3.1 VALVE IDENTIFICATION

A. Valve Tags:
   1. Attach to valve with a brass chain.
   2. Valve tag numbers shall be continuous throughout the building for each system. Contractor shall obtain a list for each system involved from the **[Owner.] [to establish numbers following the listed sequences:]**

B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

3.2 PIPING MARKERS

A. Unless recommendations of ANSI A13.1, 1981 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
   1. Every 20 feet along continuous exposed lines.
   2. Every 10 feet along continuous concealed lines.
   3. Adjacent to each valve and stubout for future.
   4. Where pipe passes through a wall, into and out of concealed spaces.
   5. On each riser.
   6. On each leg of a "T".
   7. Locate conspicuously where visible.

B. Further, apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.

3.3 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

END OF SECTION

SECTION 23 05 90

PRESSURE TESTING FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Pressure testing of piping and ductwork systems.

1.3 QUALITY ASSURANCE

A. Code Compliance: Perform required tests in the presence of the authority having jurisdiction.

B. Owner Witness: Perform all tests in the presence of the Owner's representative.

C. Engineer Witness: The Engineer or Engineer's representative reserves the right to observe all tests or selected tests to assure compliance with the specifications.

D. Simultaneous Testing: Test observations by the authority having jurisdiction, the Owner's representative and the Engineer's representative need not occur simultaneously.

1.4 SUBMITTALS

A. Submit the following:
   1. Test Reports:
      a. Submit certificate of completion, inspection and test by authority having jurisdiction on required piping systems.
      b. Submit certificate of test approval by Owner's representative on all systems.
      c. For ductwork testing, submit the Test Report. Test Report shall contain description of the testing procedure and results, including recommendation for any remedial actions needed. The Engineer's representative will record witnessed tests.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.1 GENERAL

A. Ductwork: Test prior to connection to equipment and before applying insulation.

B. Leaks: Repair all leaks and retest until stipulated results are achieved.

C. Notification: Advise 72 hours in advance of each test. Failure to so notify will require test to be rescheduled.

D. Testing Equipment: Provide all necessary pumps, gauges, connections and similar items required to perform the tests.

3.2 TESTING REQUIREMENTS

A. Low Pressure Ductwork:
   1. Test all ductwork systems at 2-inch static pressure, using a Pacific Air Products "Port-O-Lab" or "Rolok", or a McGill Airflow “LEAK DETECTIVE” testing machine or approved equivalent.
   2. All ductwork testing shall be conducted in accordance with latest published version of the SMACNA “HVAC Air Duct Leakage Test Manual”.
   3. Prior to testing verify that all low pressure ductwork has been sealed to meet the SMACNA Seal Class C. for all joints.
   4. Low pressure ductwork leakage shall be less than or meet the requirement of the following SMACNA Leakage Classes:
      a. Rectangular Metal – Class 24
      b. Round or Flat Oval – Class 12
   5. Maximum allowable leakage is defined as Cubic Feet per Minute (CFM) air leakage per 100 square feet SURFACE AREA of duct section tested.
   6. All low pressure ductworks shall be tested.

C. Ductwork for Smoke Control Systems:
   1. Ducts shall be leak tested to 1.5 times the maximum design pressure.
   2. Leakage shall not exceed 5 percent of design flow.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes:
1. Testing and balancing of air systems.
2. Testing and balancing of hydronic systems.
3. Testing and balancing of miscellaneous mechanical equipment.

B. Related Sections include:
1. Section 23 08 00 Commissioning for Plumbing HVAC.
2. Section 23 09 00 Instrumentation and Controls for HVAC.

1.3 QUALITY ASSURANCE

A. Acceptable Testing and Balancing Firms:

1. RSA Analysis.
2. National Air Balance.
3. AIRCO Commercial Services.
4. United Mechanical Incorporated.

B. Other Firms: Submit Substitution Requests prior to Bid Date.

C. Testing and Balancing Firm Qualifications:
1. The Contractor shall procure the services of an independent balance and testing agency, approved by the Architect, which specializes in the balancing and testing of plumbing, heating, ventilating, and air conditioning systems, to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems as herein specified.
2. The testing agency shall provide proof of having successfully completed at least five projects of similar size and scope. Testing and balancing work shall be done under direct supervision of registered professional engineer who has been employed by the Agency a minimum of one year prior to start of project.
3. Certification: The firm shall be certified by National Environmental Balancing Bureau (NEBB).

D. Industrial Standards: Testing and Balancing shall conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:

1. NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
2. ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.
3. ANSI:
    a. S1.4 Specifications for sound level meters.
    b. S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.

E. Instrument Certification: All instruments used shall be accurately calibrated and certified within six months of balancing and maintained in good working order.

F. Test Observation: If requested, the tests shall be conducted in the presence of the Architect or the Architect's representative.

G. Pre-Balancing Conference: Prior to starting balancing, general techniques shall be reviewed with the Engineer. This conference must occur prior to measuring existing conditions. Measuring of existing conditions must occur prior to any demolition or new work. The conference will review existing conditions and systems to be affected by the project

1.4 SUBMITTALS

A. Submit the following:
1. Balancing Log: Include all air and water outlets, actual field measured air and water volume, and percentage of design volumes. Provide drawings identifying location of all outlets.
2. Equipment Data Sheets: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
3. Additional Data: Submit all additional data as provided by Associated Air Balance Council (AABC) Standard forms.
4. Number of Copies: Submit six (6) copies of the above completed information to the Engineer for review and insertion into the Operating and Maintenance Data.
5. Instrument Certification: When requested, submit certificate of calibration for all equipment to be used.

B. Record data on NEBB forms or forms approved by the Architect.

1.5 PROJECT CONDITIONS

A. Where existing systems are to be adjusted, establish flow rates in all branches prior to making any modifications to system. Submit preliminary report indicating existing conditions prior to making any modifications to existing systems. Adjust central equipment as required and restore all unmodified branches and outlets to original condition. Obtain existing system drawings from Owner and become familiar with extent and nature of existing systems.

B. Do not perform final testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed and operating continuously as required.

C. Conduct air testing and balancing with clean filters in place. Clean strainers, etc., prior to performing hydronic testing and balancing.

1.6 WARRANTIES

A. In addition to the Requirements of the Contract, include an extended warranty of six months after completion of test and balance work during which time the Architect at his discretion may request a recheck or resetting of any equipment or device listed in the test reports.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.1 AIR SYSTEMS

A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.

B. Preliminary:
1. Identify and list size, type, and manufacture of all equipment to be tested including air outlets and inlets.
2. Use manufacturer's ratings for equipment to make required calculations except where field test shows ratings to be impractical.

C. Central System:
1. Adjust fan speeds and motor drives for required air volume within ±5% maximum. Set speed to provide air volume at farthest run without excess static pressure. Provide additional sheaves and belts as required to accomplish speed adjustment.
2. Read and adjust air supply, return, and exhaust fan units to deliver design conditions at minimum O.S.A. and at 100% O.S.A.
3. Adjust all automatic dampers, outside air, return air, and exhaust dampers for design conditions.
4. Read static air pressure conditions on all air handling equipment including filter and coil pressure drops and total pressure across the fan. A Dwyer Series 400 air velocity meter only shall be used for final static pressures at equipment and where critical readings are required.
5. Measure temperature conditions across all outside air, return air, and exhaust dampers to check leakage.
6. Read and record motor data and amperage draw.
7. For variable volume systems, establish minimum static pressure required at sensing point to permit operation over entire VAV range. Adjust supply and return fan speed so that at maximum demand the associated VFD is controlling the motor of motor nameplate RPM to 100%. Adjust return fan speed so that return air volumes track with supply air volume minus exhaust air volume.
8. Assist controls contractor in establishing minimum outside air damper positions.

D. Distribution:
1. Read and adjust all air outlets to design air volumes within ±10% maximum. Advise Engineer if deficiencies are generally noted to enable proper corrective actions.
2. Evaluate all building and room pressure conditions to determine adequate supply and return air conditions. Generally, the building shall be balanced to be slightly positive to outdoors.
3. Evaluate all building and room pressure conditions to determine adequate performance of the system to maintain temperatures without draft.
4. Perform multipoint pitot traverses to confirm instrumentation, shaft tightness, fan operation, etc. Pitot traverses shall be performed using a Dwyer Series 400 air velocity meter only with applicable duct probe.

5. Mark all balancing dampers.

E. Fire Life Safety Systems:
   1. Balance, adjust, and test the stair and elevator pressurization components in order to pass the city test as described in Section 23 09 00, Instrumentation and Controls for HVAC. The balancer shall rebalance the system as necessary until it passes the city tests.

3.2 COORDINATION

A. Coordinate work with other trades to ensure rapid completion of the project.

B. Deficiencies noted during the course of air balancing in the mechanical installation shall be promptly reported to the Architect to allow corrective action to proceed.

C. Periodic review of progress shall be provided as requested.

END OF SECTION

SECTION 23 07 00

INSULATION FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Insulation for piping, ductwork (external), ductwork (internal), and equipment.

B. Related Sections include:
1. Section 23 05 29 Hangers, Supports and Anchors for HVAC.
2. Section 23 31 01 HVAC Ducts and Casing – Low Pressure.
3. Section 23 31 02 HVAC Ducts and Casing – Medium Pressure.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723.
2. Energy Codes: Local Building and Energy Codes shall govern where insulation performance requirements for thickness exceeds thickness specified.

B. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.

C. Source Quality Control:
1. Service: Use insulation specifically manufactured for service specified.
2. Labeling: Insulation labeled or stamped with brand name and number.
3. Insulation and accessories shall not provide any nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, shall not react corrosively with equipment, piping, or ductwork, and shall be asbestos free.

1.4 SUBMITTALS

A. Submit the following.
1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Equivalent products by Johns Manville, Knauf, Owens Corning, and CertainTeed are acceptable.

B. All such insulation shall be of one manufacturer.

C. Other Manufacturers: Submit Substitution Request.

2.2 DUCTWORK BLANKET INSULATION

A. Fiberglass: 1.0 pcf nominal density, 0.25 per inch maximum K-factor at 75°F mean temperature, 250°F minimum operating temperature limit. Johns Manville Microlite Type 100 with facing as follows:
   1. Exposed: FSK facing (foil scrim Kraft) or vinyl - white appearance.
   2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
   3. Concealed without Vapor Barrier: Facing not required.

B. Semi-Rigid Fiberglass: 2.5 pcf nominal density, 0.24 per inch maximum K-factor, at 75°F mean temperature, 250°F minimum operating temperature limit. Johns Manville Micro-Flex with facing as follows:
   1. Exposed: FSK facing (foil scrim kraft) or vinyl-white appearance.
   2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
   3. Concealed without Vapor Barrier: Facing not required.

C. Elastomeric: Expanded closed cell sheets, 0.27 per inch maximum K-factor at 75°F mean temperature and 220°F minimum operating temperature limit. ArmacellArmaflex.

2.3 DUCTWORK BOARD INSULATION

A. Semi-Rigid Fiberglass: 0.23 per inch maximum K-factor at 75°F mean temperature, 250°F minimum operating temperature limit and all purpose vapor barrier facing with white Kraft paper finish. Micro-Aire Duct Board Type LP.

B. Rigid Fiberglass: Same as semi-rigid except with 4.0 pcf density and 0.23 per inch maximum K-factor. Johns Manville Diffuser Board.

2.4 DUCT INSULATION, INTERNAL

A. Description: Fiberglass with airstream surface protected with a glass mat facing that contains an EPA registered anti-microbial agent proven to resist microbial growth as determined by ASTM G21 and G22, 1-inch thick unless indicated otherwise. 2-inch thick insulation shall have 0.24 per inch maximum K-Factor at 75°F mean temperature. Johns Manville Duct Liner PM for rectangular ductwork.

B. Acoustical Absorption Coefficients: With minimum NRC of 0.70 for 1-inch and 0.90 for 2-inch as tested in accordance with ASTM C-423-90, type A mounting.

C. Liner must meet ASTM C1071.

2.5 ACCESSORIES DUCTWORK

A. Adhesives:
   1. Fiberglass: Zeston Z-Glu.
   2. Elastomeric: Armacell 520.
   3. Polyolefin: As approved by the insulation manufacturer.

4. Duct Insulation, Internal: Benjamin Foster 85-20.

B. Weld Pins: Duro-Dyne with NC-1 nylon stop clips.

C. Cements:
1. Insulating: Ryder.
2. Heat Transfer: Zeston Z-20.

D. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.

E. Mastic: Chicago Mastic:
1. Vapor Barrier: 17-475.
2. Outdoor Mastic: 16-110 white.

F. Cloth Facing: Presized fiberglass cloth.

G. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150°F. Zeston Z-tape.

H. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes and adhesives.

PART 3 - EXECUTION

3.1 GENERAL

A. Workmanship:
1. Installation: Insulation installed in first class, neat professional manner.
2. Applicators: Applicators shall be employed by firm that specializes in insulation work.

B. Preparation: Surfaces of piping, ductwork and equipment clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels shall not be covered.

3.2 DUCT INSULATION APPLIED LOCATIONS

A. General:

1. All external insulation with continuous vapor barriers unless specifically noted otherwise.
2. Internally lined shall be lined completely to grille or diffuser or to indicated terminal points. Dimension shown are net inside of liner.
3. Internally lined ductwork need not be externally insulated.
4. In addition to locations described in specification, internally line medium, low, return and exhaust air ductwork where shown on drawings.

B. Insulation Applied Location – HVAC Ductwork:

System	Location	Duct Type	Insulation Type	Thickness	Notes
Medium Pressure	Exposed or Visible	Rectangular	Internally Lined	1 1/2-inch	

System	Location	Duct Type	Insulation Type	Thickness	Notes
Supply*	(Including above a cloud ceiling)	Round/Oval	Internally Lined	1 1/2-inch	Note 3
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1 1/2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	3-inch	Note 3
	15 ft upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 3
Low Pressure Supply*	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	1 1/2-inch	
		Round	Internally Lined	1 1/2-inch	Note 5
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1 1/2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	3-inch	Note 5
	Under Slab Ductwork	All	Internally Lined	2-inch	
	Downstream of Air Terminal Units	All	Internally Lined	1-inch	Note 1 Note 5
	15 ft upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 5
Return Air* (Not insulated except:)	Concealed Outside Building Envelope	All	Externally insulated without vapor barrier	2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	2-inch	Note 5
	Under Slab Ductwork	All	Internally Lined	2-inch	Note 5
	15 ft upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 5

System	Location	Duct Type	Insulation Type	Thickness	Notes
Exhaust Air* (Not insulated except:)	15 ft upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 5
	In Toilet Rooms, 10 ft downstream of exhaust grilles	All	Internally Lined	1-inch	Note 5
Outside Air (Untempered)	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	2-inch	
		Round	Internally Lined	2-inch	Note 5
	Concealed or in mechanical rooms	All	Fiberglass Blanket	2-inch	
Supply and Return Plenums	All	All	Internally Lined	2-inch	Note 2
Grease Hood Exhaust	All	All	Duct Enclosure, Fire Rated	As Indicated	
Transfer Air	All	All	Internally Lined	1-inch	Note 5

* In addition to applied locations listed in this table, provide internally lined ductwork where indicated on drawings.
Note 1: Except ductwork downstream of terminal units serving patient care areas in hospitals
Note 2: Insulation not required on factory fabricated insulated housings and plenums (AHP).
Note 3: Where round or oval ductwork is indicated, provide double walled as specified in 23 31 02.
Note 4: Use semi-rigid blanket for galvanized sheet metal duct and use semi-rigid board for stainless steel duct.
Note 5: Where round or oval ductwork is indicated, provide double walled round/oval ductwork as specified in 23 31 02, or provide internally lined rectangular ductwork with equivalent free area.

3.3 DUCTWORK INSTALLATION

A. General:
1. Install in accordance with manufacturer's instruction.
2. The vapor barrier shall be continuous. Tears, holes, staples, etc. shall be coated with vapor barrier mastic and patch with facing or tape. Joints between insulation and access with vapor barrier mastic.
3. Insulation at access panels to be removable or attached to panel with edges of panel and opening reinforced with metal beading.

B. External Blanket Insulation:
1. Insulation secured to ductwork with 20-gauge snap wires 24 inches on center and at all joints.
2. Joints and seams lapped a minimum of 3 inches and sealed with jacket tape.

C. Board Insulation:

1. Rectangular ducts with weld pins spaced a maximum of 18 inches on center in both directions.
2. All corners made with joints, bending insulation around corners not allowed.
3. All joints and seams butted tight together.
4. Butt joints with 3-inch wide tape.
5. Corners finished with 3-inch wide tape.

D. Internal Duct Liner:
1. The coated surface shall face air stream.
2. Weld pins spaced maximum of 15-inch on center in both directions and within 2 inches of all corners and joints. Weld pins flush with liner surface.
3. Complete duct surface coated with adhesive and insulation pressed tightly thereto.
4. Edges at terminal points shall be provided with metal beading and heavily coated with adhesive.
5. All joints and corners shall be heavily coated with adhesive.
6. Damaged areas replaced or heavily coated with adhesive.

E. Duct Enclosure - Fire Rated:
1. Installation: Per manufacturer's instructions.
2. Joints:
   a. Attached boards shall be cemented and attached to one another. Mating surfaces shall be "buttered" with a 1/8-inch layer adhesive.
   b. Secure fiberglass type material with stainless steel banding (type 304).
3. Support: The duct enclosure may be hung from a conventional "trapeze" arrangement. Adequate support shall be provided at the bottom of vertical runs. On multi-story vertical runs, the Firetemp enclosure shall be supported at each story penetration with an angle iron collar attached to the Firetemp.
4. Expansion: Adequate clearance shall be provided at the end of all straight runs to allow for expansion of the metal duct inside the enclosure.

F. Plenums: Insulation on floors protected by wire mesh.

G. Blank Off Panels: Insulation, enclosed with sheet metal on all sides. All joints with vapor barrier mastic and taped.

H. Volume Dampers: Where volume dampers do not allow for continuous insulation, terminate insulation clear of handle sweep and finish edges to maintain vapor barrier and to prevent damage to the insulation.

3.4 DUCT, PIPE AND TERMINAL UNIT ACOUSTICAL WRAP

A. Installed in accordance with the manufacturer's instructions.

B. Applied locations for piping and duct systems:
1. All variable and constant volume terminal units with maximum air volumes over 2000 cfm. Wrap installed such that control devices are easily accessible without circumventing the acoustical value.
2. Where specified or indicated on drawings.

3.5 FIELD QUALITY CONTROL

A. Field Test: All systems shall be tested and approved prior to installation of insulation.

B. Existing Insulation:

1. Repair existing insulation damaged during construction.
2. Make neat connections where new and existing insulation meet.
3. Where existing piping, ductwork or equipment is removed, cover existing surfaces neatly to match existing.
4. Where existing insulation is damaged or missing, notify the architect prior to performing to work.

END OF SECTION

SECTION 23 08 00

COMMISSIONING OF HVAC AND PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 22 and 23 responsibilities in the commissioning process which are being directed by the Commissioning Authority (CxA). The commissioning requirements designated in this section pertain to building commissioning activities and documentation in support of Calgreen Commissioning Requirements.

B. The systems to be commissioned are listed in Division 01 "General Commissioning Requirements". Contractors MUST refer to Division 01 for this and other Commissioning information. Mechanical and Plumbing Systems Commissioning section does not replace, but instead complements, the contents of the Division 01 section and all parties shall be held to the information contained in both sections.

C. Commissioning (Cx) requires the participation of Division 22 and 23 to ensure that all systems are operating in a manner consistent with the Contract Documents through documented functional testing and startup procedures. The general commissioning requirements and coordination are detailed in Division 01. Division 22 and 23 shall be familiar with all parts of Division 01 and the Commissioning Plan issued by the Commissioning Authority (CA) and shall execute all Cx responsibilities assigned to them in the Contract Documents.

1.2 RELATED SECTIONS

A. Division 01 "General Commissioning Requirements".

B. Section 23 90 00

1.3 DEFINITIONS

A. A/E: Architect / Engineer.

B. BAS: Building Automation System

C. BIM: Building Information Management.

D. CAD: Computer Aided Design.

E. CM/GC: Construction Manager / General Contractor.

F. Cx: Commissioning.

G. CxA: Commissioning Authority.

H. CxC: CM/GC Commissioning Coordinator.

I. FPT: Functional Performance Test(ing).

J. HVAC: Heating, Ventilating, and Air Conditioning.s

K. I/O: Input / Output.

L. O&M: Operations and Maintenance.

M. P/T: Pete's Plug.

N. TAB: Testing and Balancing.

1.4 RESPONSIBILITIES

A. MECHANICAL, PLUMBING, CONTROLS, and TAB CONTRACTORS. The Cx responsibilities applicable to each of the mechanical, plumbing, controls and TAB contractors of Division 22 and 23 are as follows (all references apply to commissioned equipment only):

1. Include and itemize the cost of Cx, including functional testing, documentation, and all specified requirements in the contract price.
2. In each purchase order or subcontract written, include requirements for submittal data, Cx documentation, O&M data and operator training.
3. Attend a Cx scoping meeting and other meetings necessary to facilitate the Cx process.
4. Contractors shall provide the CxA with normal cut sheets and shop drawing submittals of commissioned equipment.
5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CxA for development of functional testing procedures.
6. This shall include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, fan and pump curves, preliminary balance reports, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CxA.
7. The CxA may request further documentation necessary for the commissioning process, and requests may be made prior to normal submittals.
8. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CxA for review and approval.

9. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
10. Provide assistance to the CxA in preparing the specific functional performance test procedures. Contractors shall review test procedures to ensure feasibility, safety, acceptability under warranty requirements, equipment protection, and provide necessary written alarm limits to be used during the tests.
11. During the startup and initial checkout process, execute the pre-functional checklists (provided by CxA) for all commissioned equipment and return to the CxA.
12. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CxA for inclusion in the Commissioning Report. This may be done parallel with the pre-functional tests.
13. Address current Architect / Engineer (A/E) punch list items before the commencement of functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
14. Provide skilled technicians to execute starting of equipment and to rehearse and execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and all resultant problem-solving.
15. Provide skilled technicians to perform functional performance testing under the direction of the CxA for specified equipment. Contractor shall rehearse the functional tests and correct system (or identified and informed the CxA of test procedure) discrepancies from design prior to the verification tests. Assist the CxA in interpreting the monitoring data, as necessary.
16. Provide written responses, in a timely manner, to all items noted in the Cx submittal reviews and Cx issues log that relate to Division 22 and 23.
17. Correct any deficiencies (differences between specified and observed performance) as interpreted by the CxA, Construction Manager / General Contractor (CM/GC) and A/E and retest the equipment. Note contractor may be responsible for the cost of retesting if there are excessive test failures; see Division 01.
18. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
19. During construction, maintain as-built red-line drawings for all drawings and final CAD as-built for contractor-generated coordination drawings. Provide to CxA as requested for functional test development and update after completion of commissioning (excluding deferred testing and seasonal testing).
20. Provide training of the Owner's operating staff using expert qualified personnel, as specified in Division 01.
21. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
22. Warranty Period

    a. Assist CxA in execution of select seasonal or deferred functional performance testing.
    b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. MECHANICAL CONTRACTOR. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed are:

1. Provide startup for all HVAC equipment.
2. Assist and cooperate with the TAB contractor and CxA by:

    a. Review Draft Functional Performance Tests and issue comments to CxA.
    b. Successfully rehearse Functional Performance Tests and provide a signed copy prior to CxA visit to witness test execution.
    c. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and Cx, as required.
    d. Including cost of sheaves and belts that may be required by TAB.
    e. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Provide approved plugs to seal holes.
    f. Providing temperature and pressure taps according to the Construction Documents for TAB and Cx testing. Note sample port (P/T or Pete's plug) requirements in hydronic details.
    g. Install a P/T plug at each water sensor which is an input point to the control system.
    h. List and clearly identify on the as-built drawings the locations of all air-flow stations.
    i. Prepare a preliminary schedule for Division 22 and 23 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CxA. Update the schedule as appropriate.
    j. Notify the CxC or CxA depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the CM/GC Commissioning Coordinator or CxA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CxA has the scheduling information needed to efficiently execute the commissioning process.
    k. Verify all air is bled from system and verify bleed by checking for air at 10% of manual vents no more than 3 days prior to functional testing.

C. CONTROLS CONTRACTOR. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed are:

1. As-Built Sequence of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, including time of day schedules, schedule frequency, and detailed point listings with ranges and initial setpoints.
2. Control Drawings Submittal

    a. The control drawings shall have a key to all abbreviations.
    b. The control drawings shall contain graphic schematic depictions of the systems and each component.

c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
d. Provide a full points list

3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls as-built drawings submittal.
4. Assist and cooperate with the TAB contractor in the following manner:

   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB contractor any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CxA prior to TAB.
   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
   d. Coordinate with the TAB contractor to acquire all balance related setpoint, for example the minimum duct pressure required at design flow and/or the pump system pressure differential required at design flow condition.

5. Assist and cooperate with the CxA in the following manner:

   a. Review Draft Functional Performance Tests and issue comments to CxA.
   b. Successfully rehearse Functional Performance Tests and provide a signed copy prior to CxA visit to witness test execution.
   c. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system. Assist the CxA in interpreting the monitoring data, as necessary.
   d. Execute all control system trend logs specified in Functional Tests. Trend data will be required in electronic format, specifically in a Microsoft Excel compatible format (ASCII text, comma delineated,.xls, etc.).
   e. Ensure that all of the trended points are sampled at 1 minute intervals, all points may be trended simultaneously and the data is stored for all points at minimum for a 1 year period.
   f. Provide the Commissioning Authority remote internet access to the Building Automation System during the Commissioning Period.

6. Provide a signed and dated certification to the CxA and CM/GC Commissioning Coordinator upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.

7. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

D. TAB CONTRACTOR. The duties of the TAB contractor, in addition to those listed are:

1. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CxA and CxC at least once a week.
2. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
3. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CxA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB, or ASHRAE Standard 111.
4. Demonstrate repeatability of 10% of final air and water measurements, upon request by CxA.
5. Provide the CxA with any requested data, gathered, but not shown on the draft reports.
6. Provide a final TAB report for the CxA with details, as in the draft.
7. Assist in resolving any balancing issues discovered during functional testing.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 23 shall provide all test equipment necessary to fulfill the testing requirements of this Division. Refer to Division 01.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS AND PROCEDURES

A. Refer to Division 01 “General Commissioning Requirements” for a summary of the Commissioning process and procedures.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. The HVAC mechanical and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this specification. Division 22 and 23 contractors have start-up responsibility and are required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning

procedures do not relieve or lessen this responsibility or shift that responsibility partially to the CxA or Owner.

B. Review and Complete Pre-functional Checklists in accordance with Division 01.

C. CM/GC Commissioning Coordinator (CxC) shall verify completion of all items, sign and return the checklist to the Commissioning Authority as an indication of final completion with all installation criteria as specified in the Project Contract Documents

D. A separate completed checklist shall be submitted for each system and item of equipment within the commissioning scope of work, as specified in Division 01.

E. The Pre-Functional Readiness Checklists do not represent all the contract documents for the associated equipment. Completion of the items on this checklist does not release the contractor from requirements specified elsewhere.

3.3 TAB REVIEW

A. Testing, Adjusting and Balancing (TAB): TAB shall be provided by the Contractor in accordance with the project specifications. The TAB contractor shall support commissioning by submitting the preliminary TAB data for CxA review and participating on the Commissioning TAB Field Review, in which the TAB Contractor demonstrates specified results to the CxA after completion of final TAB.

B. Equipment tested: All HVAC systems & associated equipment.

C. Demonstrate:

1. Determination of the final set points for pump speed and fan speed control per the project specifications. Demonstrate for all set points.
2. Airflow rates are balanced and adjusted per the project specifications.

    a. Demonstrate minimum outside airflow rates for all air handling equipment.
    b. Demonstrate a 10% sample for all other measurements.

3. Hydronic system flow rates are balanced and adjusted per the project specifications.

    a. Demonstrate for all boilers, chillers, cooling towers, and distribution pumps.
    b. Demonstrate a 10% sample for all other measurements.

4. Verify TAB of circulating domestic hot water system per the project specifications. Demonstrate a 10% sample.

3.4 FUNCTIONAL PERFORMANCE TESTING

A. The Functional Performance Test (FPT) Procedures shall be developed, performed, and demonstrated in accordance with Division 01.

B. Contractor is responsible for conducting test runs of all required Functional Performance Tests, and submitting results to the CxA prior to the Commissioning Authority witnessed Functional Testing. See Division 01 for additional details.

C. The initial FPTs shall be provided after review of the final and approved controls submittal. The final FPTs may be modifications of the initial FPTs, and FPTs may be added; modifications and additions to be made by the Commissioning Authority after equipment submittals have been accepted.

D. The Contractor's Commissioning Coordinator shall coordinate the subcontractors, with the Commissioning Authority's input, in developing, performing, and demonstrating the Working FPT.

E. Functional testing shall consist of the following four phases:

1. Component testing:

a. Component testing applies to all control input and output devices, including those provided by the equipment suppliers and those provided with the Building Automation System (BAS). Examples include but are not limited to: sensor assemblies, detectors, relays and switches, valves, dampers, and actuators
b. Component testing applies to thermometers, gauges:
c. Component testing consists of demonstrating field I/O calibration and operation including but not limited to:

1) Accuracy of sensors is within design temperature range as specified.
2) Alarmed points report correctly to operator work station.
3) Accuracy and settings of binary switches and alarms is as specified, within design temperature range
4) Actuators operate smoothly in a linear relationship with the signal they receive over the full range of operation
5) Fail safe operation of components and controllers is as specified for loss of control signal, electric power, and network communications
6) All components, values and alarms are correctly mapped to operator interface station
7) Air pressure reference points appropriately located and protected from transient effects of diffusers, wind, and other localized conditions.

2. Systems Testing; Operational Verification: After functional testing of the system components has been successfully completed, each sequence of operation and control system function shall be functionally tested, including those provided by the equipment suppliers and those provided with the Building Automation System (BAS). Each control

loop shall be tested to verify stable control with the specified and appropriate responses. Testing may include examination of trended data for any point, even where not explicitly called out in functional test script.

3. Systems Testing - Integrated System Verification: After operational testing has successfully demonstrated that each system functions in accordance with the project documents, functional testing shall occur to verify that the interaction between the systems is as required. Each interactive function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BAS.
4. Systems Testing - Real Time Performance Analysis (trend logging):

    a. After operational testing has been successfully completed real time performance testing may be performed to further corroborate correct operation and/or verify the operation of systems that eluded the initial test phase. Data shall be logged for the intervals and periods specified in the FPT procedures. Unless otherwise specified in the FPTs, test periods shall include occupied, unoccupied, weekday and weekend schedules.
    b. All points shall be trended, initiated at the end of construction, continuing over the entire commissioning period and left in place for future use or seasonal commissioning. All points shall be simultaneously trended per the interval specified by the CxA. Historical archiving shall be enabled so that data is continuous with no gaps and accessible in the future. The data shall be capable of being stored at a minimum of 1 year period.
    c. Internet or web-based remote access shall be provided to the commissioning agent for the commissioning period. Trends shall be displayed graphically and shall be user configurable at the graphical interface. Graphical displays shall be capable of containing multiple points on a single graph.
    d. Analysis of the data shall demonstrate that that the systems operate in accordance with the acceptance criteria specified in the FPT procedures. Verify that data demonstrates acceptable results before submitting for CxA review. If acceptable results are not demonstrated, perform testing and trouble shooting and corrective action to provide resolution. Provisions for retesting, as specified in Division 01 shall apply to trend log analysis.
    e. In addition to the initial test period, data logged during a peak heating period, a peak cooling period, and a transitional season period if so specified.

3.5 ISSUE CORRECTION

A. See Division 01 “General Commissioning Requirements”.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. See Division 01 “General Commissioning Requirements”.

3.7 TRAINING OF OWNER PERSONNEL

A. See Division 01 “General Commissioning Requirements”.

END OF SECTION 23 08 00

SECTION 23 09 00

INSTRUMENTATION AND CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Provide complete automatic control system.

B. Related Sections include:
1. Section 23 21 13 Pipe and Pipe Fittings HVAC.
2. Section 23 05 93 Testing, Adjusting and Balancing.
3. Section 23 08 00 Commissioning for HVAC.
4. Section 23 09 93 Sequence of Operation for HVAC Controls.

1.3 QUALITY ASSURANCE

A. Control work shall be provided by single company with specialists in the type of work required, so that only one control manufacturer is responsible for all control and automation work for project.

B. Provide coordination with other contractors or subcontractors for work required by other trades for accomplishment of control work.

C. Prior to substantial completion, controls contractor must demonstrate to Owner that system is operating per the Specifications and final adjustments have been made as approved.

D. System, including all components and appurtenances, shall be configured and installed to yield a Mean Time Between Failure (MTBF) of at least 1,000 hours.

1.4 SUBMITTALS

A. System Drawings: The submittals shall be prepared on AutoCad format and shall include the following:
1. Equipment installation, block diagrams, and wiring diagrams.
2. DDC panel physical layout and schematics.
3. Sensor and control wiring and installation drawings which identify each component and show all interconnected or interlocked components.
4. Material and equipment descriptive material such as catalog cuts, diagrams, performance curves, and other data to demonstrate conformance with specifications.
5. Details of connections to power sources, including grounding.
6. Details of surge protection device installations.
7. Instrumentation and control diagrams.

8. Complete a written description of control sequences.
9. List of connected data points, including DDC panels to which they are connected, and input device (sensor, etc.).
10. Valve and damper schedules indicating flows, pressure drops, CV's, and actuator type.

B. Equipment Data: The submittals shall include complete data for all materials, including field and system equipment.

C. Software Data: The submittals shall consist of complete descriptions of system, command, and applications software as specified. Include description of control sequences which are software based using detailed logic flow diagrams. Diagrams shall indicate logic used to achieve control sequence of calculation specified, and shall show relationship between control sequence and application software packages specified.

D. Testing Submittals: Provide test plan and test procedures for approval. Explain in detail, step-by-step, actions and expected results to demonstrate compliance with the requirements of this specification and methods for simulating necessary conditions of operation to demonstrate performance of the system. Test plan and test procedures shall demonstrate capability of system to monitor and control equipment and to accomplish control and monitoring specified.

E. Operation and Maintenance Manuals: Provide three complete sets of manuals bound in loose-leaf binders within 30 days after completing acceptance tests. Identify each manuals contents on cover. Manuals shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and of nearest service representatives for each item of equipment and each system. Place tab sheets at beginning of each chapter or section and at beginning of each appendix. Final copies delivered after completion of the acceptance tests shall include all modifications made during installation, checkout, and acceptance. Operation and Maintenance Manuals to include hardware manual, software manual, operations manual, and maintenance manual.
1. Hardware Manual: Furnish a hardware manual describing all equipment provided, including:
    a. General description and specifications.
    b. Installation and checkout procedures.
    c. Equipment electrical schematics and layout drawings.
    d. System schematics and I-O wiring lists.
    e. Alignment and calibration procedures.
2. Software Manual: The software manual shall describe all furnished software. The manual shall be oriented to programmers and shall describe calling requirements, data exchange requirements, data file requirements, and other information necessary to enable proper integration, loading, testing, and program execution. Provide one software manual per Operator's Terminal.
3. Operator's Manual: The operator's manual shall provide all procedures and instructions for operation of the system, including:
    a. DDC panels and peripherals.
    b. System start-up and shutdown procedures.
    c. Use of system, command, and applications software.
    d. Alarm presentation.
    e. Recovery and restart procedures.
    f. Report generation.
    g. System schematic graphics.
    h. Provide one Operator's Manual per Operator's Terminal.
4. Maintenance Manual: The maintenance manual shall provide descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

5. Acceptance Test Forms: Maintenance manual shall include copies of signed-off acceptance test forms.

1.5 ACCEPTANCE TESTING AND TRAINING

A. Site Testing:
1. General: Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform testing. Owner or Owner's representative will witness and sign off on acceptance testing.
2. Acceptance Test: Contractor shall demonstrate compliance of completed control system with contract documents. Using approved test plan, all physical and functional requirements of project shall be demonstrated.

B. Training:
1. General: Contractor shall conduct training courses for designated personnel in operation and maintenance of system. Training shall be oriented to specific system being installed under this contract. Training manuals shall be provided for each trainee, with two additional copies provided for archival at project site. Manuals shall include detailed description of the subject matter for each lesson. Copies of audiovisuals shall be delivered to Owner. Training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunch time, Monday through Friday, during normal first shift in effect at training facility. Notification of any planned training shall be given to the Owner's representative at least 15 days prior to the training.
2. Operator's Training I: First course shall be taught at supplier's facility for period of two consecutive training days. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations with guidance and describe general hardware architecture and functionality of system.
3. Operator's Training II: Second course shall be taught at project site for a period of one training day after completion of contractor's field testing. Course shall include instruction on specific hardware configuration of installed system and specific instructions for operating the installed system. Upon completion, each student should be able to start system, operate the system, recover the system after failure, and describe the specific hardware architecture and operation of system.
4. Operator's Training III: Third course shall be taught at project site for period of one training day no later than six months after completion of the acceptance test. Course will be structured to address specific topics that students need to discuss and to answer questions concerning operation of system. Upon completion, students should be fully proficient in system operation and have no unanswered questions regarding operation of installed system.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/INSTALLERS

A. Acceptable Manufacturers/Installers:
1. Alerton by Environmental Control.

B. Other Manufacturers: Submit Substitution Request.

2.2 SYSTEM DESCRIPTION

A. General:

1. Provide a complete control system, consisting primarily of electronic direct digital control devices.
2. System shall consist of modular and distributed microprocessor based control and monitoring units connected together by communications trunks. System shall be capable of global data sharing and communication between controllers.
3. System architecture shall be distributed and not rely on central processing unit (CPU) for sharing point data between controllers, or for control functions requiring data from other controllers.
4. System shall have multipurpose controller(s) consisting of CPU, system program, memory, power supply and input/output drivers which communicated with terminal equipment controllers through a communications network.
5. Provide operator's interface.
6. Provide all equipment, installation, wiring and accessories as required but not necessarily specified to accomplish operations as described.

B. Environmental Conditions: The DDC panels and all other field equipment shall be rated for continuous operation under ambient environmental conditions of 35°F to 120°F dry bulb and 10 percent to 95 percent relative humidity, noncondensing. Instrumentation and control elements shall be rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered for the installation. Install all control devices in an enclosure suitable for the installed environment.

C. System Accuracy and Display:
1. DDC system to control space temperature with a range of 50°F to 85°F ±1°F for conditioned space (display to nearest 0.5°F); 15°F to 130°F ±1°F for unconditioned space (display to nearest 0.5°F). Return air humidity controlled to 20% RH to 35% RH ±3% RH.
2. DDC system to control duct temperature with a range of 40°F to 140°F ±1°F (display to nearest 0.5°F).
3. Water temperature with a range of 30°F to 100°F ±1°F (display to nearest 0.5°F); the range of 100°F to 300°F ±2°F (display to nearest 0.5°F); and water temperatures for the purpose of performing BTU calculations using differential temperatures to ±0.5°F using matched sensors (display to nearest 0.5°F).
4. Pressure with a range for the specific application ±5 percent of range.

2.3 MATERIALS AND EQUIPMENT

A. Controls and Power Wiring:
1. General: Electric equipment and wiring shall be in accordance with Division 26. Manual or automatic control and protective or signal devices required for operation specified, and any control wiring required for controls and devices, shall be provided hereunder.
2. Wiring:
   a. Field and Subfield Panels: Voltage in panels shall not exceed 120 volts. Where devices are wired to higher voltages, mount in suitable individual enclosures or group in separate control panel. Coordinate electrical power supply with Division 26.
   b. Motor Control Centers: Responsibility for correct voltage of holding coils and starter wiring in pre-wired motor control centers interfacing with automatic controls is included hereunder.
   c. Wiring for DDC systems communications buses shall be two conductor minimum 18 gauge foil-shielded, stranded twisted pair cable rated at 300 VDC or more than 80°C.

3. Communications Links Surge Protection: Protect all communications equipment against surges induced on any communications link. All cables and conductors which serve as communications links shall have surge protection circuits installed that meet the requirements of REA PE-60d.
4. Communications Links Overvoltage Protection: Protect all communications equipment against overvoltage on any communications link conductors. All cables and conductors which serve as communications links shall have overvoltage protection for voltages up to 480 VAC rms, 60 Hz installed. Instrument fuses or fusible resistors are acceptable for this application.
5. Power Line Surge Protection: Protect all equipment connected to AC circuits from power line surges. Fuses shall not be used for surge protection.

B. Control Panels:
1. Wall mounted control panels shall be provided as required to contain all relays, terminal strips, power supplies and other equipment in building control system.
2. Panels shall be U.L. listed, minimum NEMA 1, minimum 14 gauge steel with stiffeners, continuous hinge doors, locking handles, single point latch.

2.4 CONTROL DEVICES

A. Temperature Instruments:
1. Room Temperature Sensors: Platinum RTD type with accuracy of ±0.4°F at 70°F; operating range 30-120°F; linear to DDC system; single point sensing element in wall-mounted ventilated enclosure with insulating backplate if mounted on exterior wall.
a. Sensor shall have digital readout display.
b. Sensor shall have user adjustment based on DDC programmed offset.

2.5 DDC FIELD PANELS

A. Multipurpose Controllers:
1. Multipurpose controllers shall be stand alone microprocessor based panels, enclosed in sturdy metal enclosure with two standard RS232 interface ports, network communications module, power supply, and battery back-up.
2. Panels will be used to connect field sensors and control devices. Each panel shall be fully supervised to detect failures. Construct panel so that all functions are implemented on replaceable circuit boards to permit field maintenance. Panels shall be completely field programmable through portable terminal. Each DDC panel is to have minimum 8-hour battery backup system.
3. Each DDC panel shall be linked with data trunk cable to other controllers and Operator's Terminals to distribute information. Field panels shall continuously exchange data through trunk cable without requiring output to input wiring between panels. The system shall be arranged so that all operations are maintained without the central computer being connected to the system.
4. Upon failure of the DDC field panel, including transmission failure, the panel shall automatically force the controls to remain in the last command status.
5. Provide a real time clock with calendar maintaining seconds, minutes, hours, and days of the week, accurate to ±10 seconds per day.
6. Provide sufficient memory to perform all specified and shown DDC field panel functions and operations, including all spares. Each DDC panel to have 10 percent minimum spare memory board spacing.
7. Each DDC field panel shall contain hardware to support power fail automatic restart.
8. Provide locking type mounting cabinets with common keying.
9. DDC field panel shall have built-in diagnostics to display to operator interface terminal any sensor transmitting signal out of its design range.

10. All control logic shall be done with software resident in each local DDC panel. Auxiliary relays may be used only when required for load contact rating.
11. Panels shall be U.L. listed.

B. Terminal Equipment Controller:
1. Terminal equipment controllers shall be provided for each piece of equipment as specified and shall include all point inputs and outputs as necessary to perform specified control sequences.
2. Each controller performing space temperature control shall be provided with a matching room temperature sensor, which shall include terminal jack to monitor all hardware and software associated with controller.
3. Each room sensor shall include setpoint adjustment dial, temperature indicator and override switch. Override switch shall override night setback mode to normal (day) mode when activated by occupant. Adjustment dial and override switch may be locked out, overridden, or limited through software from central work station or portable terminal.
4. Each controller shall be independent of other network communications. Controller shall receive real time data from central work station or multipurpose controller.
5. Controller shall utilize proportional, integral, and derivative (PID) algorithms which shall be field adjustable.
6. Data base and sequence of operation programs shall be stored in non-volatile EEPROM and EPROM.
7. Controllers shall be networked through communications link to the Multipurpose controller.
8. Controllers shall be powered from 24 VAC source. Provide dedicated power source. Coordinate with Division 26.

2.6 CONNECTION TO EXISTING NETWORK

A. General: Communication between all peer-to-peer DDC control panels shall be via TCP/IP over the existing Ethernet system.

B. Provide all software and system integration to seamlessly integrate to the existing server for common system graphics, alarming, paging out of alarms via existing paging system.

2.7 BACNET COMPATIBILITY

A. DDC System and components shall be BACnet Data Communications Protocol compliant.

B. System shall be fully integrated and installed as a complete package of BACnet compliant controls and instrumentation

C. System shall be capable of seamless BACnet integration with all existing BACnet compliant devices as well as future BACnet compliant devices.

D. No portals or third party devices shall be required for integration with existing or future equipment.

E. All devices utilized in the BACnet interface shall be BACnet Testing Laboratories (BTL) listed and labeled.

2.8 OPERATOR INTERFACE SYSTEM

A. Web Based Access: Provide a web-based controls interface with at least 3 user login accounts and password each with the capability of different access privileges that performs all data access, operator's commands, alarm notification, requests for reports, file generation, diagnostics, and modifications. Controls shall also be accessible in mechanical room by direct connection from a laptop to a data port. The contractor shall provide a temporary computer located on site in the mechanical room until the commissioning, testing and balancing has been completed. The Contractor shall provide a temporary computer located onside in the mechanical room, with all software and capabilities necessary to support commissioning, testing and balancing and other activities required for project completion.

B. Graphics: Provide a complete graphics package with the following features:
   1. Provide separate schematic diagram depicting each system. Diagrams to show all major components such as fans, dampers, heating and cooling coils, humidifiers, pumps, heat exchangers, chillers, boilers, towers, ductwork, piping, etc. arranged to convey to viewer system configuration and flow of each system.
   2. Provide plot plan, riser plan and selected floor plans of all buildings with the location of each mechanical room and major equipment location indicated.
   3. Provide symbols superimposed on each schematic to indicate each control device including control valves, damper motors, temperature sensors, pressure sensors, etc. Provide real time dynamic displays of the temperature, humidity, pressure, flow rate, run status, alarm status etc. adjacent to each control symbol. Arrange CPU to update each displayed analog and digital value minimum of every 15 seconds.
   4. Provide indication of all setpoints, with each setpoint value located adjacent to each sensed value.
   5. Provide means to allow the user to easily change or add graphics via computer assisted drawing function utilizing freehand mouse.
   6. Provide means to allow user to transfer repeated system schematics and symbols between graphics without redrawing them. Provide symbol library arranged to store all commonly used symbols.
   7. Provide a "telescoping" or "zoom" program to allow use to move from plot plan to mechanical room plan, to system graphic to control device display by simply clocking the mouse.
   8. Provide dual function windowing program to allow user to view a split screen and toggle between simultaneous operations.

C. Trend Data Collection and Historical Data:
   1. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-intervals, time-synchronized intervals, change of value, or by-event all of which shall be user-definable. Trend data shall be collected stored on hard disk for future diagnostics and reporting. Automatic Trend collection may be scheduled of zones, events, and reports. Additionally, trend data may be archived to network drives or removable disk media for future retrieval.
   2. Trend data reports shall be provided to allow the user to view all trended point data. Display data in both tabular and graphical format. Reports may be customized to include individual points or predefined groups of selected points. Provide additional functionality to allow predefined groups of up to 250 trended points to be easily transferred on-line to Microsoft Excel.

2.9 APPLICATION PROGRAMS

A. General: Provide user-programmable DDC system programs with library of base-level predefined functions with user specified parameters.

B. Time of Day Scheduling:
   1. A minimum of 6 schedules shall be provided for equipment operation.
   2. Seven unique days per schedule shall be provided.
   3. Program individual time cycle capability for each piece of equipment.

C. Control Priorities:
   1. The system shall provide an effective order of control priorities such that each succeeding level of optimization does not interfere with a more critical function.
   2. This shall allow such features as alarm actions and manual commands from the operator to override lower level functions (such as duty cycling or scheduling).
   3. Events, initiated outside the DDC system causing equipment shutdown shall automatically reset when events causing the shutdown is cleared, such as power failure or fire alarm. (When Fire Alarm system is cleared and reset, air handlers, etc. shall sequentially restart). For alarms within the control system, such as freeze protection, mechanical equipment such as air handlers, shall restart after the alarm condition is manually reset.

D. Alarms: System shall provide following alarm processing capabilities:
   1. Any connected status or analog point may be designated as alarm input point.
   2. Start/stop points with status feedback as well as associated analog alarms shall have a user-programmable inhibit time assigned to each point to prevent nuisance alarms from occurring during startup of HVAC equipment.
   3. Each alarmable point shall have change-of-state priority assignment assignable at 3 levels. One each for its level of criticality -- low for such things as maintenance alarms, high for critical HVAC equipment alarms and emergency for life safety alarms.
   4. User may designate which conditions of alarm shall cause alarms to be initiated for display. The user may also designate alarm message for alarm condition and for return to normal condition as desired. Each message may be up to 32 characters in length and up to 32 messages are available in each digital management system.
   5. This feature shall provide for orderly display of alarms based on criticality, i.e., if two or more alarms occur simultaneously, alarm with highest level of priority shall be displayed first.
   6. User may designate which conditions of alarm shall cause alarms to be initiated for display. User may also designate alarm message for alarm condition and for return to normal condition as desired. Each message may be up to 80 characters in length.
   7. Provide automatic phone dialing feature with the capability to report a general alarm recorded message.

E. Security: System shall support multi-level password access with the following minimum access levels:
   1. Read-only level, without capability of changing any part of software.
   2. Adjustment level, allowing operator to adjust setpoints and schedules, force outputs on/off, but not to modify programming.
   3. Full programming access.
   4. System shall support additional levels of programming access.

F. Power Failure: In the event of the loss of normal power, there shall be an orderly shutdown of all controllers to prevent the loss of database or operating system software. Nonvolatile memory shall be incorporated for all critical controller configuration data, and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.
   1. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions.

2. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
3. Should a controller memory be lost for any reason the operator workstation shall automatically reload the program without any intervention by the system operators.

G. Providing load shedding software package.

H. Preventive maintenance software package.

2.10 INPUT/OUTPUT (I/O) FUNCTIONS

A. Analog Inputs (AI): The AI function shall monitor each analog input, perform A-to-D conversion, and hold the digital value in a buffer for interrogation. Provide signal conditioning for each analog input. Individually calibrate all analog inputs for zero and span, in hardware or in software. Minimum 12 bit A to D resolution.

B. Analog Outputs (AO): The AO function shall accept digital data, perform D-to-A conversion, and output a signal compatible with the operator. Individually calibrate all analog outputs for zero and span. Provide short circuit protection. Minimum 8 bit D to A resolution.

C. Digital Inputs (DI): The DI function shall accept on/off, open/close, or other change of state (two-state data) indications. Provide isolation and protection against input voltage up to 180 Vac peak.

D. Digital Outputs (DO): The DO function shall provide contact closures for momentary and maintained operation of output devices. Closures shall have a minimum duration of 0.1 second.

2.11 UPS PRODUCT SPECIFICATIONS

A. General: Provide an uninterruptable power supply (UPS) for each DDC field panel. The UPS shall be fed by 120V AC emergency power circuits. The UPS shall be floor or wall mountable.

B. UPS: Provide MGE Pulsar UPS, or pre-bid approved equal. Products shall carry UL 1778 listing. Base sizing on peak current requirements of connected load, plus 15 percent factor of safety. Provide manufacturer's standard three-year comprehensive warranty, including batteries.

PART 3 - EXECUTION

3.1 INSTALLATION

A. CRT, Keyboard, Computer, and Printers: Locate as shown or submit proposed location where not shown.

B. Mounting Panels: Locate panels where shown on Drawings or near item of equipment to be controlled, but not on equipment itself.

C. DDC Field Panels: Provide number of panels required to accommodate all DI, DO, AI, and AO points and all hardware and software to accomplish specified control sequenced. Locate all panels in mechanical or electrical rooms. Submit proposed locations for approval prior to preparing control drawings.

D. Electrical:
   1. Provide control wiring for all control devices and control panels.
   2. Run all control wiring in conduit.
   3. Provide power wiring for all control devices and control panels. Utilized designated circuits in electrical power panels. Refer to Electrical Drawings. If no circuits are designated for DDC Controls, submit detailed request for use of spare circuits at no additional cost.
   4. All power wiring to be installed in conduit.
   5. Grounding: Instrumentation and communication grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
   6. Control voltage shall be limited to maximum of 120 volts.
   7. Where relay coil is connected to load side of motor starter to energize with motor operation, external control circuit shall be properly fused with fuse block located in respective starter enclosure.
   8. Where relays are used to control single phase motors directly, provide contacts rated for not less than horsepower rating of largest motor switched by relay.

E. Identification: Provide engraved nameplates identifying all switches, lights and starters, and each control device where control function is not readily apparent.

F. Room Thermostats and Room Sensors: Mount at height of 4 feet for wall mounted sensor and thermostats with adjustment on face. Mount at height of 5 feet for all wall mounted thermostats and sensors which do not have adjustment on face. Provide insulating back on thermostats mounted on exterior walls. Provide one thermostat for each zone of temperature control. Submit proposed locations for approval prior to preparing control drawings, where not shown or alternate location is proposed.

G. Carbon Dioxide Sensor:
   1. Mount sensor at 5 feet above finished floor or as indicated on the plans.
   2. Provide sensor quantity as indicated on plans or as required by sensor coverage rating (max. 20-foot radius).
   3. Alarm above 850 PPM.
   4. Refer to sequence of operations for more information on sensor use.

END OF SECTION

SECTION 23 31 01

HVAC DUCTS AND CASING-LOW PRESSURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Low pressure ductwork and fittings.

B. Related Sections include:
1. Section 23 05 48 Vibration and Seismic Controls for HVAC Piping Equipment.
2. Section 23 07 00 Insulation for HVAC.
3. Section 23 33 00 Air Duct Accessories.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the manual of Duct and Sheet Metal Construction of the Sheet Metal and Air Conditioning Contractors National Association and these Specifications.

B. Regulatory Requirements:
1. Entire ductwork system, including materials and installation, installed in accordance with NFPA 90A.
2. Ductwork and components shall be listed as U.L. 181, Class I air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.

1.4 SUBMITTALS

A. Submit the following:
1. Provide catalog data on each product specified hereunder.
2. Schedule of duct construction standards.
3. Provide shop drawings showing materials and construction details for single wall housing plenum.
4. Provide shop drawings showing construction details, support and seismic restraint of ductwork distribution systems.

PART 2 - PRODUCTS

2.1 SUPPORTS, ANCHORAGE AND RESTRAINTS

A. General:

1. When supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for ductwork are not shown on the Drawings, the contractor shall be responsible for their design.
2. Seismic restraints and anchorages shall resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
3. Seismic restraints shall follow the provisions described in Section 23 05 48, Vibration and Seismic Control for HVAC Piping and Equipment.
4. Seismic restraints shall not introduce stresses in the ductwork caused by thermal expansion or contraction.
5. Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Suspended Ductwork: Seismic restraints shall be in accordance with the latest edition of the SMACNA "Seismic Restraint Manual - Guidelines for Mechanical Systems" for the seismic hazard level corresponding to the seismic zone in which the project is constructed.

C. Engineered Support Systems: The following support systems shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction:
1. Supports and seismic restraints for suspended ductwork and equipment.
2. Support frames for ductwork and equipment which provide support from below.
3. Equipment and ductwork support frame anchorage to supporting slab or structure.

2.2 SHEETMETAL DUCTWORK

A. Fabricate from galvanized steel, unless noted otherwise.

B. Minimum gauge, duct construction, joint reinforcing, fittings, hangers and supports shall be in accordance with SMACNA "HVAC Duct Construction Standards", Third Edition, 2005.

C. Duct Classification: Ducts shall be considered low pressure when design velocities are 2000 fpm or less and maximum static pressure is 2 inches W.G. positive or negative.
1. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1/2-inch W.G. positive or negative.
   a. Supply ductwork downstream from terminal units.
   b. Supply, return or exhaust ductwork serving fans scheduled to operate at less than 1/2-inch W.G.
   c. Supply, return, or exhaust branch ductwork which serves one or two inlets/outlets.
2. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1-inch W.G. positive or negative.
   a. Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1 inch W.G. On supply fans pressure drops for louvers, coils, clean filters, and sound traps may be deleted from scheduled fan static.
   b. Supply, return, or exhaust ductwork serving multiple duct branches where contractor can demonstrate that pressures will not exceed 1 inch W.G. positive or negative.
3. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 2 inches W.G., positive or negative.
   a. Supply, return, or exhaust ductwork serving fans scheduled to operate at pressures greater than 1 inch W.G. positive or negative.

D. Longitudinal seams on rectangular duct shall be Pittsburgh or Button punch snap lock. Snap lock seams for round duct may be used only on ducts classified for 1/2 inch W.G. Longitudinal seams for round ducts using lap and rivet, spot weld, or fillet weld may be used only on ducts classified for statics 1 inch W.G. or less.

E. Joining and reinforcing systems manufactured by Ductmate, Roloc, or TDC are acceptable. Ductmate 35 is equivalent to SMACNA “J”, and Ductmate 25 is equivalent to SMACNA “F”.

F. Use of adjustable round elbows not permitted.

2.3 FIBERGLASS DUCTWORK:

A. Acceptable Manufacturers:
1. Schuller “Superduct™,” as fabricated by E.J. Bartels.
2. Other Manufacturers: Submit Substitution Request.

B. Material:
1. Fibrous Glass Ducts: Rigid glass fiber duct board finished with a factory-applied thermosetting acrylic polymer coating to the airstream side resistant to potential dust incursion into the material substrate, containing an immobilized EPA-approved anti-microbial agent to further inhibit potential microbial growth as indicated by ASTM G-21 and G-22 test data and resistant to fiber shed and damage during duct cleaning operations. The fibrous glass duct must meet the requirements of NFPA 90A and 90B and with a factory applied Underwriters Laboratory UL181, Class 1 Air Duct Listing Label and faced with a Foil, Scrim, Kraft (FSK) facing (scrim reinforced foil on round duct). The 1" (25 mm) thick material must have the following thermal and acoustical properties: Thermal Resistance (R-Value) of 4.3 (0.76) at 75°F (24°C) mean temperature; NRC of 0.80 (0.75) for Type 800) as tested on “Type A” mounting in accordance with ASTM C 423-90. The 1.5" (38 mm) thick material must have the following thermal and acoustical properties: Thermal Resistance (R-Value) of 6.3 (1.11) at 75°F (24°C) mean temperature; NRC of 0.95 as tested on “Type A” mounting in accordance to ASTM C 423-90.
   a. Rectangular: Schuller Superduct™ Air Duct Board Type 475/800, 1" (25 mm) for pressures up to 4" w.c. (996 Pa) positive, and 2" w.c. (498 Pa) negative with proper reinforcement; velocities up to 5000 fpm (25.4 m/s).
   b. Round: Schuller SuperRound®, 1" (25 mm), for pressures up to 8" w.c. (1992 Pa) positive and 2" w.c. (498 Pa) negative; velocities up to 5000 fpm (25.4 m/s).
   c. Turning Vanes: Schuller SuperVane® Acoustical Air Turning Vane.
   d. Fabrication cuts and/or installation damage to the internal airstream coating shall be treated with Schuller SuperSeal® to maintain the integrity of the UL product listing.
   e. Closure shall be made with materials listed under UL 181A. Where extended manufacturer’s warranty is required, closure shall be Fortifiber® Therm-Lock® UL 181-H closure system.
2. Sealant: Non-hardening, water resistant, fire resistant, used alone or with tape.
3. Deca-Duct not permissible.

C. Fabrication:
1. Fabricate in accordance with manufacturer’s instructions in shop, field fabrication not allowed.
2. Seal joints with minimum 2-inch wide heat sensitive tape as recommended by the manufacturer to comply with UL 181 requirements. Use of other types of tapes not permitted.

3. Fabricate splitter damper sections and branch takeoffs of sheet metal and insulate to adjoining thickness of fiberglass or fabricate of glass fiber duct with sheet metal sleeves, reinforcing as approved.
4. Fabricate and install ductwork in accordance with SMACNA “Fibrous Glass Duct Construction Standards” for low pressure systems of 1-l/2 inches W.G. or less; ducts to 36 inches maximum dimension require no reinforcing; reinforce ducts over 36 inches per SMACNA requirements or heavy density (4 pcf) installed in accordance with manufacturers recommendations.

2.4 SINGLE WALL HOUSING PLENUMS

A. Fabricate from galvanized steel, unless otherwise noted.

B. Minimum gauge not less than 18 gauge except panels 10'-1" or longer 16 gauge.

C. Housing panels constructed in accordance with the latest edition of SMACNA “HVAC Duct Construction Standards”.

D. Minimum pressure classification for single wall housing panels is 2 inches W.G. positive or negative.

E. Maximum allowable panel width 24 inches with standing interlocking seams.

F. Openings in panels for air inlets/outlets, or access doors reinforced per SMACNA standards.

G. Provide intermediate reinforcing and/or bracing when spans are 8 feet or longer.

H. Line all interior surfaces of single wall plenums with minimum of 2-inch thick acoustical lining.

I. Access Doors: Construct of 20-gauge galvanized steel, double wall construction. Install in opening in plenum panel reinforced with 10-gauge channel. Doors mounted on three hinges and shall seat against neoprene gaskets. Doors in plenums at humidifiers shall have 12-inch x 12-inch double glass inserts from observation. Doors 24-inch x 60-inch height unless otherwise indicated.

2.5 FLEXIBLE DUCTS

A. Acceptable Manufacturers:
1. Thermaflex M-KE, Gen Flex IMP-25S.
2. Other Manufacturers: Submit Substitution Request.

B. Description: Flexible air duct with CPE or metal film liner permanently bonded to coated spring steel wire helix with 1-inch thick fiberglass insulation blanket covered with fiberglass reinforced metal film vapor barrier jacket. Duct rated for 6-inch W.G. positive and 1-inch W.G. negative.

2.6 ACOUSTICAL LINED PLENUMS

A. Panels: Double wall insulated panel consisting of 20-gauge galvanized steel perforated interior panel, 4-inch thick fiberglass insulation, and 18-gauge outer panel. Panels located downstream of final filters shall have solid inside panel or sheet mylar liner between inside perforated panel and insulation.

B. Panels of tongue and groove construction with adjacent panels held rigidly in position by self-interlocking joint effective inside or out. As alternate panels may be joined with H-channels.

C. Housing construction shall be capable of withstanding pressures up to 4-inches WG positive on supply ductwork and 4-inches WG negative on return and exhaust ductwork. Deflection at design pressure shall not exceed 1/200 of span.

D. For spans 12-feet or greater, provide additional structural reinforcement.

2.7 DUCTWORK, GREASE HOOD EXHAUST

A. Materials: [Steel, minimum 16 gauge] [Stainless steel, minimum 18 gauge].

B. Fabrication: Make all joints and seams with a continuous grease tight weld on the external surface of the duct system.

C. Fittings: Elbows shall be the radius type with centerline radius equal to or greater than 1-1/2 times the depth of the duct in the plan of the turn.

D. Construct and install ductwork so that grease cannot accumulate.

E. Access Doors: 16 gauge minimum steel with gaskets and latches easily operable without the use of a tool.

2.8 EXPOSED OR VISIBLE DUCTWORK IN FINISHED SPACES

A. Round:
1. Material: Round or flat oval, machine formed, spiral lock-seam galvanized sheet metal ductwork of thicknesses as listed for sheet metal duct. Paintable surface.
2. Fittings: Machine formed, shop fabricated, with welded seams, designed for easiest air flow, similar to United Sheetmetal numbers listed.
   a. Mitered Elbow with Turning Vanes: Type EV-90-2.
   b. Radius Elbows: Type E090-5. Similar for less than 90 degree elbows.
   c. Tees: Type Con-T-1.
   d. Reducing Fittings: May be used unless noted otherwise.

B. Rectangular: Same as for sheet metal ductwork but paintable surface. All reinforcing shall be inside. Use special care to prevent imperfections in the metal surface.

PART 3 - EXECUTION

3.1 APPLIED LOCATIONS

A. Supply ductwork on downstream side of terminal box. Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00.

B. Supply Ductwork from Spin-In Fittings to Supply Outlet Collar Connection: Flexible duct, maximum 4'-0" length.

C. Return Air Trunk Ductwork from End Run to Unit Connection: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00.

D. Exhaust Ductwork: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00.

E. Ductwork between Transfer Grilles: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00.

F. Ductwork Below Grade: Underslab ductwork, fiberglass.

G. Exposed or Visible Ductwork in Finished Spaces: Sheet metal as specified for application, lined where indicated on the Drawings or as specified in Section 23 07 00.

H. Acoustical lined plenums on inlet and outlet of rooftop units. Plenum size shall be sufficient for duct connections as shown on plans, minimum plenum size shall be same as unit opening.

3.2 INSTALLATION

A. Ductwork:
1. Seal traverse joints with an approved mastic during joining procedure or tape after joining to provide airtight duct system.
2. Low pressure ductwork hanger and support systems in accordance with SMACNA "HVAC Duct Construction Standards". Wire supports are not allowed.
3. Provide supplementary steel for support of ductwork in shafts and between building structural members.
4. Fabricate changes in direction to permit easy air flow, using full 1.5D radius bends or fixed turning vanes in square elbows. Radius elbows less than 1.5D radius shall have splitter vanes.
5. Change in duct size or shape necessitated by interference made using rectangular equivalents of equal velocity.
6. Where pipe, structural member, or other obstruction passes through a duct, provide streamlined sheet metal collar around member and increase duct size to maintain net free area. Fit collar and caulk to make air tight.

B. Sound Attenuation (Internal Insulation):
1. Provide sound attenuation duct where shown and as specified under Section 23 07 00.
2. Duct dimensions shown are net inside attenuating material.

C. Dampers: Install where shown and where necessary to complete final balancing of system. Install regulators as specified in Section 23 33 00 for each specific project condition. Leave all dampers locked wide open in preparation for balancing.

D. Extractors: Install behind supply grilles and registers where shown.

E. Flexible Connectors: Make connections to fans and other rotating equipment with flexible connectors with 2-inch minimum clearance between casing and ductwork. Not required on internally spring isolated units.

F. Spin-in Fittings:
1. Install at branch takeoffs to outlets using round or flex duct.
2. Connect to flexible duct with draw band strap and minimum of two wraps of duct tape.
3. Leave all dampers locked wide open.

G. Flexible Ducts:
1. Make connections at ends using draw band strap and a minimum of 2 wraps of duct tape.
2. Suspend center spans from structure above using wire as required by code. Connect to manufacturer's eyelet on jacket or use 1-inch wide galvanized steel strap with single loop at top and smooth edges.
3. Suspending duct by laying it on the ceiling is prohibited.

4. Avoid crimping flex duct. All changes in direction shall be made using 2D radius. Duct connections to grilles, registers and diffusers using less than 2D radius bends are not acceptable. Where space is constricted, use sheet metal elbows or Thermaflex Flex Boots (or equal).

H. Ductwork, Grease Hood Exhaust:
1. Slope minimum of 1/4 inch per foot of run toward the hood. Where horizontal ducts exceed 75 feet in length, slope minimum of 1 inch per foot of run.
2. Install access doors at every change in direction and maximum of 10 feet on center.
3. Provide access doors and allow penetrations for sprinklers as required by Fire Protection section of these specifications.
4. Install ductwork in a rated shaft as specified under other divisions of work.

I. Ductwork, Exposed or Visible in Finished Areas:
1. Use extreme care in handling and installing.
2. Replace all dented or damaged sections.
3. Install ductwork straight and true, parallel to building lines.
4. Make all connections with pop rivets using couplings where applicable. Grind all raw edges smooth and apply paintable sealant to cover imperfections.
5. Remove all excess sealant to provide a finished joint.
6. Provide floor, wall, and ceiling plates as specified in Section 23 05 00.
7. Finish, clean and prime all ductwork and hangers for painting.

J. Single Wall Housing Plenums:
1. Install housing plenums in accordance with SMACNA HVAC Duct Construction Standards, latest edition.
2. All joints and seams sealed with high pressure duct sealer or gaskets and fastened with bolts, screws, or pop rivets.
3. Pipe, duct, conduit, and control penetrations sealed to prevent air leakage using close off sheets and strips.
4. Securely anchor housing panels to floor or roof curbs.
5. Block outside air or return air dampers open to prevent damage during construction until automatic control system is operational and adjusted.
6. Provide access doors where indicated on drawings and where required to provide access for cleaning and maintenance. Access doors installed to open against air pressure.
7. Slope plenum and connected ductwork to drain towards the exterior louver or building exterior opening.
8. For single wall plenums installed behind exterior louvers or wall openings, slope plenum floor and connected ductwork at 1/4-in/ft to drain towards the exterior louver or opening.
9. For single wall plenums installed below roof ventilators or roof openings, slope floor of plenum at 1/4-in/ft to drain connection. Pipe drain connection to floor drain.

3.3 FIELD QUALITY CONTROL

A. Coordination with Balance Agency:
1. Provide services of a sheet metal person familiar with the system ductwork to provide assistance to the balancing agency during the initial phases of air balancing in locating all sheet metal dampers.
2. Install missing dampers required to complete final balancing.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Medium and low pressure duct accessories, sealants and tapes, flexible connectors, fire dampers, smoke dampers, combination smoke and fire dampers, access doors, spin-in, extractors, automatic dampers, drain pans, eliminators, back draft dampers.

B. Related Sections include:
1. Section 23 31 01 HVAC Ducts and Casing-Low Pressure.
2. Section 23 31 02 HVAC Ducts and Casing-Medium Pressure.
3. Section 23 09 00 Instrumentation and Controls for HVAC.

1.3 QUALITY ASSURANCE

A. Work performed by qualified, experienced mechanics in accordance with the manual of Duct and Sheet Metal Construction of the National Association of Sheet Metal and Air Conditioning Contractors and these Specifications.

B. Install entire ductwork system, including materials and installation, in accordance with NFPA 90A.

C. Flexible connectors, flexible equipment connections, tapes and sealants listed as UL 181, Class I air duct. Flame spread rating not to exceed 25 and smoke developed rating not to exceed 50.

1.4 SUBMITTALS

A. Submit the following: Product data for Duct Accessories.
1. Medium Pressure Duct Accessories:
    a. Acoustical Turning Vanes
    b. Access Doors
    c. Bell Mouth Fittings
2. Low Pressure Duct Accessories:
    a. Constant Airflow Regulators
    b. Access Doors
    c. Backdraft Dampers
    d. Water Eliminators
    e. Security Grates
    f. Dryer Vent
    g. Roof Jack

h. Automatic Dampers

B. Operation and Maintenance Data: Automatic dampers, fire dampers, smoke dampers. Combination smoke and fire dampers, air flow station.

PART 2 - PRODUCTS

2.1 MEDIUM PRESSURE DUCT ACCESSORIES

A. Acceptable Manufacturers:
1. As indicated.
2. Other Manufacturers: Submit Substitution Request.

B. Flexible Connector:
1. Peabody Noise Control/Kinetics Model KNM-100B, Polymer Adhesive.
2. Description: One pound per square foot density, barium sulphate load vinyl material with fiberglass reinforcing.

C. Turning Vane Assemblies:
1. Sheet Metal Vanes: Multiple radius hollow vane air foil type with 4-1/2 inch inside radius, galvanized steel construction.
2. Runners: Embossed type.

D. Acoustical Turning Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill. AirSan Acoustiturn or as approved.

E. Access Doors:
1. Manufacturers: United Sheetmetal APR or ASR, Metco, Semco, Cesco, Ruskin, Nailor-Hart or approved equal.
2. Round, oval or rectangular to match duct, single wall to open against positive duct pressure, fastened with spring clips, pressure seal gasket, fastened with chain. Double wall access doors similar except provide insulated frame and insulated door.

F. Bell Mouth Fittings: Round or flat oval, radius of 0.20 D minimum.

2.2 LOW PRESSURE DUCT ACCESSORIES

A. Acceptable Manufacturers:
1. As indicated.
2. Other Manufacturers: Submit Substitution Request.

B. Damper Regulators:
1. Ventlok model numbers used, similar products by Young, Durodyne or approved equal are acceptable.
2. Dial Regulator: Concealed or exposed duct in unfinished spaces, blade lengths 18-inch and less, 3/8-inch, Ventlok 635 or 638 for insulated duct. For blade lengths, 19 inches and above, similar except 1/2-inch shafts.
3. Dial Regulator: Exposed duct finished space, 3/8-inch, Ventlok 640.
4. Dial Regulator: Concealed, not accessible, blade lengths 18-inch and less, 3/8-inch Ventlok 666 regulator with 680 mitered gear assembly where right angle turn is necessary. Blade lengths 19 inches and above, similar except 1/2-inch shafts.

5. End Bearings: For ducts rated to 1 inch WG, open end, Ventlok 607. For ducts rated above 1 inch WG, closed end, Ventlok 609. Exposed ductwork, finished spaces, Ventlock 609. Spring end bearings not allowed.

C. Constant Airflow Regulator:
   1. Constant volume pressure regulator, round or rectangular, as conditions dictate, UL listed for flame and smoke generation. Factory assembled and calibrated assembly, no field adjustment necessary. Regulators shall maintain constant airflow +/- 10% of scheduled airflow rates within operating the pressure range of the system. Units shall come with a flange connection. Provide 5-year warranty. Based on: CAR by American Aldes or approved equal.

D. Volume Damper Fabrication:
   1. Single blade dampers reinforced or crimped for rigidity, with pivot rod extending through duct. Dampers over 12 inches high use multiple opposed blade damper. Single blade damper no larger than 12 inches x 48 inches. Multiple blade damper factory fabricated, Ruskin MD-35 or equal.
   2. Minimum gauge and duct construction in accordance with SMACNA “HVAC Duct Construction Standards”, latest edition.
   3. Splitter and butterfly dampers fabricated of 18 gauge galvanized steel.
   4. Dampers of length suitable to close branch ducts without damper flutter.
   5. Damper blade must be aligned with handle and index pointer.

E. Flexible Equipment Connections: 30 oz. Ventfabrics Ventglas or Duro Dyne neoprene coated fire retardant glass fabric or approved equal.

F. Extractors (EX): Gang operated blades, steel construction, blades at 1-inch centers, slide operator set 15 degrees into main trunk duct, Titus AG-45 with No. 1 operator, similar Carnes, Anemostat, Barber-Coleman, Nailor-Hart or approved equal.

G. Spin-in Fittings:
   1. Sheet Metal Duct: Straight pattern sheet metal spin-in fitting with scoops designed for connection to sheet metal ductwork, volume damper, and locking quadrant. Construction with spot welds or rivets. “Button-punch” fabrication prohibited.
   2. Fiberglass Duct: Straight pattern sheet metal spin-in fitting with scoops designed for connection to fiberglass ductwork volume damper, and locking quadrant. Construction shall be with spot welds or rivets. “Button-punch” fabrication prohibited.

H. Duct Sealer:
   1. Based On: McGill Airseal Zero.
   2. Description: Suitable for indoor/outdoor use, rated to 10-inch WG, Maximum Flame Spread/Smoke Developed Rating of 25/50, maximum VOC of 30 g/L less water. SCAQMD Rule 1158 compliant.

I. Duct Tape for Sheet Metal: ARNO C520 duct tape similar United, Duro Dyne, Nashua, Polymer Adhesive.

J. Tape and Adhesive/Activator System for Sheet Metal: Hardcast, Polymer Adhesive.

K. Turning Vane Assemblies:
   1. Sheet Metal Vanes: Multiple radius hollow vane air foil type 2-inch (small vane) or 4-1/2-inch (large vane) inside radius, galvanized steel construction.
   2. Runners: Push-on type.

3. Acoustical Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill. AirSan Acoustiturn or as approved.

L. Access Doors:
1. Manufacturer: Air Balance, Ruskin, Metco, Durodyne, Cesco, Nailor-Hart or approved equal.
2. Doors complete with steel frame, steel door with backing plate, cam latches (two on units 14-inch x 14-inch and larger), hinge and gasketing. Doors on insulated or lined ducts shall be insulated.
3. Grease Duct Access Door: Construct of metal thickness equal to metal duct, doors air and grease tight with hinge and hand operable latches. Ductmate.
4. Size:

Duct Width or Duct Diameter	Net Access Door Opening
Up to 8"	6" x 6"
9" to 12"	8" x 8"
13" to 20"	12" x 12"
21" to 30"	16" x 14"
31" to 42"	18" x 14"
Over 42"	Two 16" x 14"

M. Backdraft Dampers:
1. Manufacturer: Air Balance, Ruskin, Cesco, Advanced Air, Nailor-Hart or approved equal.
2. Description: Gravity operated, vinyl edged, metal bladed backdraft dampers.

N. Drip Pans: Provide Type 304 stainless steel drip pans for cooling coils and exhaust heat recovery coils on built-up units as indicated.

O. Louver Blank-off Panels: At air intake or exhaust louvers which are only partially active area, blank off inactive area with sheet metal closure panels caulked airtight, secured to louver frame and insulated with 2" rigid fiberglass insulation per Section 23 07 00 Insulation for HVAC.

P. Water Eliminators: Provide 20-gauge stainless steel, 3-break type, removable water eliminators on downstream face of cooling coils where indicated. Eliminators securely fastened in stainless steel sheet metal channel frame and braced to prevent vibration. Each bank of eliminators shall consist of 3 breaks made at angle of 45 degrees with respect to air flow, each 2-1/2" long and spaced 2 inches on centers across coil face. Eliminator plates and frame shall have same face dimensions as cooling coils based on maximum fpm face velocity and 0.20 inches w.g. pressure drop.

Q. Security Grates:
1. Constructed from welded 1/4" steel plates with 1/4"x3" wide mounting flange welded to sides with 5/16" diameter mounting holes at 8" centers all around. Frame O.D. to equal duct size.
2. 1/2" diameter steel security bars spaced vertically at minimum of 3" and maximum of 6" centers welded all around at top bottom. Horizontal cross bars welded to vertical bars at maximum of 1" centers on ducts over 12" deep.
3. Manufacturer: Kees, or approved equal.

R. Dryer Vent: Aluminum wall cap with hinged backdraft and bird screen. Broan 641, or equal.

S. Roof Jack: Enamel finish steel with back draft damper and bird screen. Broan 636, or equal.

T. Automatic Dampers:

1. Description: Multi-blade air foil type, except where either dimension is less than 10 inches a single blade may be used. Maximum blade length to be 48 inches. Provide parallel blades for positive or modulating mixing service and opposed blades for throttling service. Blades to be interlocking, minimum 16 gauge galvanized steel.
2. Dampers shall have compression type edge seals and side seating stops. Damper blades shall be reinforced, have continuous full length axle shafts, axle to axle linkage and/or operating "jackshafts" as required to provide coordinated tracking of all blades. Dampers over 25 square feet in area to be in two or more sections, with interconnected blades. Dampers shall have a maximum air leakage of 3 cfm per square foot at 1 inch wg pressure. Provide all automatic dampers except those specified to be provided with units. Tested in accordance with AMCA Standard No. 500. Based on Ruskin CD-60.
3. Damper Operators: Refer to Section 23 09 00.
4. Manufacturers: Ruskin, Greenheck, Air Balance, Cesco, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all devices as shown on the Contract Drawings and per manufacturer's recommendations.

B. Medium Pressure Duct Accessory installation specified under Section 23 33 02.

C. Low Pressure Duct Accessory installation specified under Section 23 33 01.

D. Fire Dampers:
1. Install dampers in accordance with NFPA 90A and manufacturer's written recommendations.
2. Size and locate dampers as shown on Drawings.
3. Install dynamic fire dampers in correct position with regards to direction of air.
4. Where dampers are not accessible for servicing by removing an outlet, provide access doors for servicing. Doors shall be compatible with the duct in which they are installed.

E. Ceiling Fire Dampers:
1. Install dampers in accordance with NFPA 90A and manufacturer's written recommendations.
2. Size and locate dampers as shown on Drawings.

F. Smoke Dampers and Combination Fire and Smoke Dampers:
1. Install dampers in accordance with NFPA 90A and manufacturer's written recommendations.
2. Size and locate dampers as shown on Drawings.
3. Where dampers are not accessible for servicing by removing an outlet, provide access doors for servicing. Doors shall be compatible with the duct in which they are installed.

G. Access Doors: Install where indicated and at all duct mounted coils, humidifiers, automatic control dampers, smoke dampers, fire dampers, air flow stations, to provide access for cleaning and maintenance.

H. Kitchen Grease Duct Access Doors: Install every 10 feet and at each change in direction of kitchen exhaust duct per code.

I. Back Draft Dampers: Install where indicated and at the discharge (or inlet) of exhaust fans where automatic dampers are not indicated.

J. Automatic Dampers: Install where indicated and are not specified with equipment or in Section 23 09 00 Instrumentation and Controls for HVAC. Coordinate damper operators with Section 23 09 00.

K. Drip Pans: Install under each cooling coil and exhaust heat recovery coil as indicated. Provide drain connection from each drip pan and pipe to nearest floor drain through trap. Drip pans over 6 feet in length require drain connections from both ends. Pitch drip pans in direction of air flow and to drain.

L. Louver Blank-off Panels: Install blank-off panels on unused portions of louvers.

M. Water Eliminators: Install water eliminators as indicated on drawings.

END OF SECTION

SECTION 23 34 00

HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Centrifugal fans, vane axial fans, in-line fans, roof exhaust fans, propeller fans, plug fans, roof vents, ceiling exhaust fans, small cabinet fans.

1.3 SUBMITTALS

A. Submit the following:
   1. Shop Drawings: Showing dimensions, details of construction.
   2. Product Data: Showing performance of fans.
   3. Operation and maintenance data.
   4. Submit certified sound power ratings for each fan.

PART 2 - PRODUCTS

2.1 CEILING EXHAUST FANS

A. Acceptable Manufacturers:
   1. Broan, Greenheck, Panasonic, Cook
   2. Other Manufacturers: Submit Substitution Request.

B. General Description: Centrifugal direct drive cabinet fan, AMCA rated.

C. Fan: Double width, double inlet forward curved aluminum blade wheel, integral backdraft damper. Provide duct mounted automatic motorized damper where indicated or required by code.

D. Casing: Fabricated acoustically insulated steel casing, steel scroll with inlet cone and steel base, factory standard finish.

E. Motor: Integrally mounted, 1050 RPM nominal, lubricated sleeve bearing, internal disconnect plug. Refer to Section 23 05 00 for energy efficient motor requirements.

F. Vibration Isolation: Factory mount motor on double deflection neoprene mounts.

G. Inlet and Outlet: Provide plaque inlet grille. Provide discharge with backdraft damper. Arrange for access to fan and motor through grille.

H. Accessories: Provide **[flat roof cap] [hooded wall cap] [pitched roof cap] [elbow discharge with grille] [wall louvered discharge]**, sized to match fan discharge, built in bird screen and damper, aluminum construction.

2.2 INLINE CENTRIFUGAL FANS

A. Acceptable Manufacturers:
   1. Greenheck, Cook, Cook, Twin Cities
   2. Other Manufacturers: Submit Substitution Request.

B. General Description: Inline centrifugal, belt driven, cabinet fan, AMCA rated, backward inclined wheel, heavy gauge steel housing adequately braced with all edges sealed, externally mounted 1800 rpm motor, hinged access doors. Refer to Section 23 05 00 for energy efficient motor requirements.

C. Smoke Control Fans: Provide UL listing as “Power Ventilators for Smoke Control Systems” where used as a smoke control fan.

D. Drive: Multiple belt with fixed sheave and OSHA approved metal guard. Size drive for 150 percent of motor horsepower. For fans used as part of a life safety system, provide 1.5 times the number of belts required, with a minimum of 2.

E. Vibration Isolation: Provide vibration isolation as indicated on drawings and in accordance with Section 23 05 48.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide flexible connections on all inlet and discharge duct connection. Flexible connection for vane axial fans to be barium loaded vinyl.

3.2 CEILING EXHAUST FANS

A. Install fan in ceiling with inlet grille tight to surface.

B. Make connection from fan outlet to ductwork.

3.3 INLINE CENTRIFUGAL FAN

A. Mount in ductwork using Vibration Isolation as specified in 23 05 48, and as indicated on drawings.

B. Connect ductwork using flexible connections.

C. Arrange for unobstructed access to access door.

END OF SECTION

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes: Ceiling diffusers, sidewall grilles.

B. Related Sections include:
1. Section 23 33 00 Duct Accessories.

1.3 SUBMITTALS

A. Submit the following:
1. Shop Drawings: Showing dimensions and details of construction.
2. Product Data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Where only Titus figure numbers are listed, equivalent products by Carnes, Price, Krueger, Tuttle & Bailey, Anemostat, Nailor are acceptable.

B. All such products shall be of one manufacturer.

C. Other Manufacturers: Submit substitution Request.

2.2 PERFORMANCE

A. Unit sizing is based on air being introduced at 20°F temperature differential and being diffused at the 5-foot level to a velocity not greater than 50 FPM and a temperature differential not greater than 1.5°F. Units are also selected so as not to exceed the NC-30 curve.

2.3 DIFFUSERS AND GRILLES

A. Ceiling Supply Diffuser (C-1): Perforated face modular diffuser with adjustable modular core, steel panel, square or rectangular neck size as indicated, discharge pattern as indicated, lay-in tee bar ceiling, or surface mounted as required (coordinate with architectural reflected ceiling plan), white baked enamel finish, Titus PMC.

B. Ceiling Return/Exhaust Grille (C-2): Perforated face modular ceiling grille, steel panel, with duct adapters for round or rectangular as indicated, lay-in tee bar ceiling, or surface mounted as required (coordinate with architectural reflected ceiling plan), white baked enamel finish, Titus PAR.

C. Wall Return/Exhaust Grille (H-4): Aluminum 45 degree fixed single deflection, horizontal blades 3/4-inch spacing 1-1/4-inch border, gasketed around face flange, white baked enamel finish, Titus Model 3F manufacturer.

D. Wall Return/Exhaust Grille (H-8): Heavy duty bar grille, steel 38 degree fixed single deflection, horizontal 14 gauge blades, 1/2-inch spacing, 1-1/4-inch 16 gauge border, steel support bars spaced on 6-inch center. Provide intermediate mullions as required for large grilles. White baked acrylic finish, Titus 33RL.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all diffusers tight to their respective mounting surfaces.

B. Installed plumb and true with room dimensions and accurately centered on projections as shown on the Architectural reflected ceiling plans.

C. Install extractors behind all duct mounted sidewall supply grilles, and where shown. Turning vanes allowable if condition is the last outlet on a branch.

D. Set pattern control for directions of throw as shown on Drawings prior to air balancer arriving on Project.

E. Paint ductwork behind all outlets flat black.

END OF SECTION

SECTION 23 81 00

DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.2 SUMMARY

A. This Section includes:
1. Packaged thru wall air conditioning units and heat pumps.

B. Related Sections include:
1. Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment.
2. Section 23 09 00 Instrumentation and Controls for HVAC.

1.3 SUBMITTALS

A. Submit the following:
1. Shop drawings showing details of construction, dimensions, arrangement of components, isolation, filters, etc.
2. Product data showing performance data, standard items and accessories, operating weight.
3. Operating and maintenance data.

PART 2 - PRODUCTS

2.1 PACKAGED THRU WALL HEAT PUMP

A. Acceptable Manufacturers:
1. Owner Furnished

B. Description: Thru wall packaged air conditioning unit or heat pump unit. Capacity as scheduled on drawings, factory wiring, controls, and refrigerant charge. Components include wall sleeve, unit chassis, compressor, coils, evaporator fan, condenser fan, indoor panel, electric heat and controls.

C. Wall Sleeve: One-piece design, closure panel at indoor and outdoor sections. Outdoor grille to be standard type. See Architectural drawings and specifications for painting, coordinate with Architect.

D. Unit Chassis: Slide out design separate from sleeve.

E. Refrigerant: 422B or R410A.

F. Compressor: Hermetic or rotary type compressor, rubber shock mounted for quiet operation and vibration isolation.

G. Evaporator and Condenser Coils: Aluminum tubing with aluminum fins.

H. Fans:
1. Indoor Fan: Centrifugal type, direct drive motor.
2.

I. Indoor Panel: Non-flammable, high impact polymer.

J. Controls:
1. Refer to Section 23 09 00, Instrumentation and Controls for HVAC.

K. Include condensate removal system without drain connection, thru spray on outdoor coil.

L. Filters: Factory installed, disposable type.

M. Electrical: Furnish magnetic contactors. Arrange unit for single point electrical connection through 3-prong plug.

PART 3 - EXECUTION

3.1 PACKAGED THRU WALL AIR-CONDITIONING UNIT OR HEAT PUMP

A. Installation:
1. Install in location shown on Drawings. Level unit and secure to structure.
2. Install so that unit can be removed while wall sleeve remains in place.

B. Start-Up:
1. General: Comply with manufacturer's instructions.
2. Install filters before operating unit.

END OF SECTION

SECTION 26 01 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The requirements of the General Conditions and Division 1, General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Related Work in Other Sections, but not limited to the following:

1. Motors, motor controls and low voltage control wiring that are an integral part of equipment assemblies and heating and ventilation controls.

2. Painting of exposed electrical work.

3. Plumbing controls and low voltage wiring.

4. Fire alarm system and devices.

5. Data network and distribution.

6. Intercom system and equipment.

7. Intrusion alarm system and equipment.

B. Work Included in Contract

1. Coordinate with PG&E Service Planning and provide and install primary power service conduits, primary box, primary/secondary transformer pad and secondary service bus duct per PG&E engineered service drawing and “Green Book” requirements.

2. Provide and install new 120/240V, 1 phase, 3 wire electrical distribution system as detailed on drawings.

3. Relocate and reconnectg interior lighting and controls.

4. Provide electrical connections to new HVAC and Plumbing units.

5. Grounding and bonding per NEC.

6. Provide complete telephone/data system per District standards as shown on drawings and specified under Division 27.

7. Provide new clock/speakers and wiring as shown on drawings and specified under Division 27.

8. Provide new intrusion alarm devices where as shown on drawings and specified under Division 27.

9. Provide wiring and hookup of all electrical equipment specified under other specification sections, such as technology systems, mechanical and plumbing equipment.

10. Modify existing automatic addressable fire alarm system in existing building to provide a complete new voice evacuation automatic addressable fire alarm system in new buildings and connect to existing system.

1.3 CODES AND STANDARDS

A. In addition to Codes and Standards - Division 1, the following shall apply to this Division:

National Electrical Code with California amendments
California Admin. Code, Titles 17, 19, 24, Part 3.
U.L. Electrical Construction Materials List
Codes, rules and regulations as specified hereinafter
Local city and county agencies

1.4 SUBMITTALS

A. Submittals shall be made in conformance with the General Conditions. The list shall include, for each item, the manufacturer, manufacturer's catalog number, type of class, the rating, capacity, size, etc. Submittals shall include:

1. Conduit & Fittings

2. Boxes & Covers

3. Fuses

4. Wire & Cable

5. Wiring Devices

6. Switchboards

7. Panelboards

8. Switchboards

9. Disconnect Switches

10. Lighting

11. Paging/Intercom/Clock System

12. Telephone/Data Networking System

13. Intrusion Alarm System

14. Fire Alarm System

B. Shop Drawings: Submit for approval, detailed construction drawings for each item of fabricated equipment required for the electrical installation. All drawings shall be to scale, fully dimensioned, and provide sufficient detail to clearly indicate the arrangement of the equipment and its component parts. Construction of the equipment shown shall be revised to comply with the drawings and specifications as required by the Architect after review of the shop drawings, and the drawings submitted when requested by the Architect. Shop drawings shall be submitted for the following:

1. Lighting Controls

2. Paging/Intercom/Clock System

3. Telephone/Data Networking System

4. Intrusion Alarm System

5. Fire Alarm System

C. Substitution: Provide substitutions as outlined.

1.5 SUPERVISION OF ELECTRICAL WORK

A. Contractor shall personally, or through an authorized and competent representative, constantly supervise the work from beginning to completion and final acceptance. So far as possible, keep same foreman and workmen throughout the project duration. Work shall be subject to inspection and

approval by Architect. Promptly furnish related information when so requested by Architect.

1.6 EQUIPMENT AND SYSTEMS IDENTIFICATION

A. Name Plates: Provide permanent identification of circuit breakers in switchboards, panels, transformers, disconnects for mechanical and plumbing roof-top equipment and other cabinet enclosed apparatus. Use black bakelite plates, not less than ½" X 3", with engraved white letters, secured with adhesive. Provide voltage along with panel name. Provide red with white letters on FACP, FATC, etc.

B. Stencil Work: Identify all motors and operating apparatus in electrical equipment rooms or semi-concealed spaces, with black or white lacquer lettering, not less than ½" high, placed where readily visible upon inspection.

C. Directories: Provide for power circuits, typewritten, neatly arranged in numerical order, and permanently fixed inside or adjacent to appropriate panel.

D. Provide lamecoid label on all receptacle and switch covers indicating complete circuit number.

E. Provide service description etched on cover of all underground pull boxes.

F. Provide lamecoid label on all receptacle and switch covers indicating complete circuit number.

G. Provide lamecoid label on all blank cover plates indicating circuit number or low voltage system (i.e. future data, intrusion, etc.).

H. Provide lamecoid label on all fire alarm device covers indicating complete device number.

1.7 OPERATING INSTRUCTIONS ON-SITE

A. At time of occupancy, arrange for manufacturer's representatives to instruct building operating and maintenance personnel in use of any equipment requiring operating and maintenance. Arrange for all personnel to be instructed at one time. Pay all costs for such service (minimum of 4 hours).

1.8 ADJACENT WORK

A. Coordinate work and complete with others in furnishing and placing this work.

B. Work to approved shop drawings for work by others and to field measurements as necessary to properly fit the work.

C. Project adjacent work as necessary; adjacent construction or exposed surfaces or surfaces damaged by use of materials or operations under this Section shall be repaired or replaced as directed by Architect.

1.9 DRAWINGS

A. The electrical drawings, which constitute an integral part of this contract, shall serve as the working drawings. They indicate diagrammatically the general layout of the complete electrical system, including the arrangement of feeders, circuits, panelboards, service equipment, and other work. Field verifications of scale dimensions taken from the drawings are directed since actual field locations, distances and elevations will be governed by actual field conditions. Review architectural, structural, mechanical and plumbing drawings and adjust work to conform to all conditions indicated thereon. Discrepancies shown on different plans or between plans and actual field conditions, or between plans and specifications, shall promptly be brought to the attention of the Architect for a decision.

1.10 COORDINATION AND COOPERATION

A. Drawings and specifications are both supplementary and complementary. Taken together, they are intended to define complete working installations of the systems represented, in accordance with approved practice in the trade, and in conformity with all applicable requirements of local jurisdictional offices and officers and codes and enforcing bodies.

B. It shall be presumed that any bid offered under this Division of the Specifications is based on a careful examination of the job site, and of the plans and specifications; that the person(s) or firm(s) awarded a contract hereunder is/are experienced and qualified in the type of work represented; that every effort has been made to prepare complete, accurate and correct plans and specifications; and that reasonable diligence will be exercised in planning and scheduling the work to anticipate conflicts and/or detect errors or omissions. All such shall be immediately reported, and proper resolution agreed on between concerned parties before the work affected is performed. If due to lack of diligence, or to incompetence, failure to anticipate such problems shall not create a valid claim for extra costs or charges.

C. Requirements of other trades, of utility companies, and of fire departments, protective services, communication systems, or other facilities of a utility nature, shall be determined prior to installation of systems, equipment, devices or materials affected by or dependent on such requirements.

D. Unapproved deviations or changes based on a presumption of error or code violation, or work not suitable for its intended function, may not be accepted.

E. Nothing herein shall act to prevent or discourage the contractor from suggesting or discussing possible changes in the work where such might be beneficial to the contractor or the owner, or might facilitate the work of this or other trades.

F. Any work resulting in a claim for a change in the contract price must be approved and fully documented.

1.11 VISIT TO SITE

A. Visit the project site, take requisite measurements, and verify exact location of buildings, utilities, and other facilities, and obtain such other information as is necessary for an intelligent bid. No allowance will subsequently be made by the Architect or Owner for any error or omission on the part of the bidder in this connection.

1.12 RECORD DRAWINGS

A. Record of Job Progress: Keep an accurate dimensional record of the "as-built" locations and of all work; all as required. This record shall be kept up-to-date on blueline prints as the job progresses and shall be available for inspection at all times. It shall be reviewed by inspector prior to each monthly application for payment.

B. Record of Installation: Refer to Supplementary General Conditions.

C. Include on "as-built" drawings:

1. Routing of all buried or concealed electrical feeders and conduits.

D. Upon completion of the work, a completed set of as-built electronic files (ACAD) and PDF shall be delivered to the Architect.

1.13 GUARANTEE

A. All work shall be guaranteed for a minimum period of one year from either the official date of completion or from the date of acceptance by the Owner, whichever is the later date. The guarantee period for certain items shall be longer, as indicated in the specification for those items.

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

1.14 COMMISSIONING

A. Electrical systems including lighting and lighting controls, occupancy sensors, daylight controls, switching systems, exterior lighting controls and uninterruptible power supplies will be commissioned per the requirements specified in Commissioning Requirements."

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Electrical identification.
2. Concrete equipment bases.
3. Electrical demolition.
4. Cutting and patching for electrical construction.

1.2 SUBMITTALS

A. Product Data: For utility company electricity-metering components.

B. Shop Drawings: Dimensioned plans and sections or elevation layouts and single-line diagram of electricity-metering component assemblies specific to this Project.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.

C. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs. Strength rating to suit structural loading.

D. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.

1. Materials: Same as channels and angles, except metal items may be stainless steel.

E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

H. Expansion Anchors: Carbon-steel wedge or sleeve type.

I. Toggle Bolts: All-steel springhead type.

J. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

A. Identification Device Colors: Use those prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.

C. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

E. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:

1. Not less than 6 inches wide by 4 mils thick.

2. Embedded continuous metallic strip or core.

3. Printed legend that indicates type of underground line.

F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.

G. Warning and Caution Signs: Preprinted; comply with 29 CFR 1910.145, Chapter XVII. Colors, legend, and size appropriate to each application.

1. Interior Units: Aluminum, baked-enamel-finish, punched or drilled for mechanical fasteners.

2. Exterior Units: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate with 0.0396-inch, galvanized-steel backing. 1/4-inch grommets in corners for mounting.

H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

B. Concrete: 3000-psi, 28-day compressive strength.

2.4 CONCRETE BOXES

A. Concrete Boxes: Pre-cast reinforced, size and type as shown; Christy, Brooks or approved equal. All underground boxes shall be provided with traffic grade, spring loaded, bolt-down, steel cover.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, slotted channel system components.

B. Dry Locations: Steel materials.

C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb minimum design load for each support element.

3.3 SUPPORT INSTALLATION

A. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

B. Size supports for multiple raceway or cable runs so capacity can be increased by a 25 percent minimum in the future.

C. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.

D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

E. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:

1. Wood: Wood screws or screw-type nails.

2. Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.

3. Masonry: Toggle bolts on hollow block and expansion bolts on solid block. Seal around sleeves with mortar, both sides of wall.

4. New Concrete: Concrete inserts with machine screws and bolts.

5. Existing Concrete: Expansion bolts.

6. Structural Steel: Spring-tension clamps.

   a. Comply with AWS D1.1 for field welding.

7. Light Steel Framing: Sheet metal screws.

8. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.

9. Light Steel: Sheet-metal screws.

10. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

F. Install warning, caution, and instruction signs where required to comply with 29 CFR 1910.145, Chapter XVII, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Indoors install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

G. Install, where applicable, engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

H. Provide service description etched on cover of all underground pull boxes.

3.5 FIRESTOPPING

A. Apply firestopping to cable and raceway sleeves and other penetrations of fire-rated floor and wall assemblies to restore original undisturbed fire-resistance ratings of assemblies. Firestopping installation is specified in Division 7 Section "Through-Penetration Firestop Systems."

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

3.7 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

END OF SECTION

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SECTION 26 05 19

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Manufacturers:

1. Alcan Aluminum Corporation; Alcan Cable Div.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THW, THHN-THWN or XHHW complying with NEMA WC 5 or 7.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AMP Incorporated/Tyco International.

2. Hubbell/Anderson.

3. O-Z/Gedney; EGS Electrical Group LLC.

4. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway .

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

I. Fire Alarm Circuits: Type THHN-THWN, in raceway.

J. Class 1 Control Circuits: Type THHN-THWN, in raceway.

K. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed feeders parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26.

F. Seal around cables penetrating fire-rated elements according to Section "Through-Penetration Firestop Systems."

G. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods."

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.3 FIELD QUALITY CONTROL

A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

1.2 SUBMITTALS

A. Product Data: For ground rods.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Boggs, Inc.
2. Copperweld Corp.
3. Dossert Corp.
4. Erico Inc.; Electrical Products Group.
5. Galvan Industries, Inc.
6. Harger Lightning Protection, Inc.
7. Hastings Fiber Glass Products, Inc.
8. Heary Brothers Lightning Protection Co.
9. ILSCO.
10. Kearney/Cooper Power Systems.
11. Korns, C. C. Co.; Division of Robroy Industries.

12. Lightning Master Corp.
13. Lyncole XIT Grounding.
14. O-Z/Gedney Co.; a business of the EGS Electrical Group.
15. Robbins Lightning, Inc.
16. Salisbury, W. H. & Co.
17. Superior Grounding Systems, Inc.
18. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."

B. Equipment Grounding Conductors: Insulated with green-colored insulation.

C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare, Solid-Copper Conductors: ASTM B 3.

G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.

H. Bare, Tinned-Copper Conductors: ASTM B 33.

I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.

M. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Exothermic-welded type, in kit form, selected per manufacturer's written instructions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: 3/4 inches in diameter by 120 inches long.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the indicated height above the floor.

E. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

F. Equipment Grounding Conductors: Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

1. Install insulated equipment grounding conductors in feeders.

2. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

4. Air-Duct Equipment Circuits: Install an insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and

more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

5. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install an insulated equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

6. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location and per Division 27.

   a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a grounding bus per Division 27.

   b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

7. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing an insulated equipment grounding conductor with supply branch-circuit conductors.

G. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.

H. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

I. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

J. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a

dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

K. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

L. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

M. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

N. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

O. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.2 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

3. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of

weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:

a. Equipment Rated 500 kVA and Less: 10 ohms.

b. Equipment Rated 500 to 1000 kVA: 5 ohms.

c. Equipment Rated More Than 1000 kVA: 3 ohms.

d. Substations and Pad-Mounted Switching Equipment: 5 ohms.

e. Manhole Grounds: 10 ohms.

END OF SECTION

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SECTION 26 05 29

SEISMIC CONTROLS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes seismic restraints and other earthquake-damage-reduction measures for electrical components. It applies to and complements optional seismic-restraint requirements in the various electrical component Sections of these Specifications.

1.2 DEFINITIONS

A. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.

B. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independently of other structural elements during an earthquake.

1.3 SUBMITTALS

A. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic-restraint component used. Include documentation of evaluation and approval of components by agencies acceptable to authorities having jurisdiction.

B. Shop Drawings: For components, physical arrangements, and installation details not defined by Drawings. Indicate materials and show calculations, design analysis, details, and layouts, signed and sealed by a professional engineer.

C. Pre-approval and Evaluation Documentation: By an agency approved by authorities having jurisdiction, showing maximum ratings of restraints.

D. Qualification data.

E. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in California Building Code, unless requirements in this Section are more stringent.

B. Testing Agency Qualifications: An independent testing and inspection agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the inspection indicated.

1.5 PROJECT CONDITIONS

A. Project Seismic Zone and Zone Factor as Defined in CBC.

1.6 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structure, architectural features, and mechanical, fire-protection, electrical, and other building systems.

B. Coordinate concrete bases with building structural system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Amber/Booth Company, Inc.
2. B-Line Systems, Inc.
3. Erico, Inc.
4. GS Metals Corp.
5. Loos & Company, Inc.
6. Mason Industries, Inc,
7. Powerstrut.
8. Thomas & Betts Corp.
9. Unistrut Corporation.

2.2 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components shall be at least twice the maximum seismic forces for which they are required to be designed.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.4 SEISMIC-BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 570, GR 33.

2. Materials for Fittings and Accessories: ASTM A 575, ASTM A 576, or ASTM A 36.

3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.

4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Hanger Rod Stiffeners: Slotted steel channels, installed vertically, with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.

B. Install structural attachments as follows:

1. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to spread structural loads and reduce stresses.

2. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.

3. Attachments to Existing Concrete: Use expansion anchors.

4. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.

5. Attachments to Solid Concrete Masonry Unit Walls: Use expansion anchors.

6. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.

7. Attachments to Wood Structural Members: Install bolts through members.

8. Attachments to Steel: Bolt to clamps on flanges of beams or on upper truss chords of bar joists.

C. Install electrical equipment anchorage as follows:

1. Anchor panelboards, motor-control centers, motor controls, switchboards, transformers, fused power-circuit devices, control, and distribution units as follows:

a. Anchor equipment rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.

b. Size concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.

c. Bushings for Floor-Mounted Equipment Anchors: Install to allow for resilient media between anchor bolt or stud and mounting hole in concrete.

d. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.

e. Torque bolts and nuts on studs to values recommended by equipment manufacturer.

D. Install seismic bracing as follows:

1. Install bracing according to spacings and strengths indicated by approved analysis.

2. Expansion and Contraction: Install to allow for thermal movement of braced components.

3. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

E. Accommodation of Differential Seismic Motion: Make flexible connections in raceways, cables, wireway, cable trays, and busway where they cross expansion- and seismic-control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspection agency to inspect seismic-control installation for compliance with indicated requirements.

B. Testing Agency: Engage a qualified testing and inspection agency to inspect seismic-control installation for compliance with indicated requirements.

C. Reinspection: Correct deficiencies and verify by reinspection that work complies with requirements.

D. Provide written report of tests and inspections.

END OF SECTION

SECTION 26 13 00

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.

8. O-Z Gedney; Unit of General Signal.

9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. EMT and Fittings: ANSI C80.3.

1. Fittings: Compression type.

F. FMC: Aluminum.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.

2. Anamet Electrical, Inc.; Anaconda Metal Hose.

3. Arnco Corp.

4. Cantex Inc.

5. Certainteed Corp.; Pipe & Plastics Group.

6. Condux International.

7. ElecSYS, Inc.

8. Electri-Flex Co.

9. Lamson & Sessions; Carlon Electrical Products.

10. Manhattan/CDT/Cole-Flex.

11. RACO; Division of Hubbell, Inc.

12. Spiralduct, Inc./AFC Cable Systems, Inc.

13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

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

2.4 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.

1. Manufacturers:

a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).

b. Thomas & Betts Corporation.

c. Walker Systems, Inc.; Wiremold Company (The).

d. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.

1. Manufacturers:

a. Butler Manufacturing Co.; Walker Division.

b. Enduro Composite Systems.

c. Hubbell, Inc.; Wiring Device Division.

d. Lamson & Sessions; Carlon Electrical Products.

e. Panduit Corp.

f. Walker Systems, Inc.; Wiremold Company (The).

g. Wiremold Company (The); Electrical Sales Division.

C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.

2. Emerson/General Signal; Appleton Electric Company.

3. Erickson Electrical Equipment Co.

4. Hoffman.

5. Hubbell, Inc.; Killark Electric Manufacturing Co.

6. O-Z/Gedney; Unit of General Signal.

7. RACO; Division of Hubbell, Inc.

8. Robroy Industries, Inc.; Enclosure Division.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

H. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

I. Concrete Boxes: Pre-cast reinforced, size and type as shown; Christy, Brooks or approved equal. All underground boxes shall be provided with traffic grade, spring loaded, bolt-down, steel cover.

2.6 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components provide manufacturer's standard prime-coat finish ready for field painting.

2.7 FIRESTOPPING FOR LOW VOLTAGE SLEEVES

A. Firestop Pillows: STI SpecSeal® Brand re-enterable, non-curing, mineral fiber core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal® Series SSB Pillows.

B. Fire Rated Cable Pathways: STI EZ-PATH™ Brand device modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:

1. Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway.

2. Specified Technologies Inc. (STI) Mini EZ-PATH™ Fire Rated Pathway.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.
7. **Underground duct bank conduit spacers.**
8. **Backfill materials per civil site requirements.**

B. Indoors:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
3. For Outdoor Use – conduit hub, NEMA 4 for conduit connection/terminating to cabinet/panel/boxes.

4. All connectors to be steel. Die cast connectors are not acceptable.

E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.

3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.

2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors on all raceways 2" and larger.

K. Tighten set screws of threadless fittings with suitable tools.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.

2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where otherwise required by NFPA 70.

P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration,

noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

S. Set floor boxes level and flush with finished floor surface.

T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 22 00

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Cartridge fuses rated 600 V and less for use in switches controllers and motor-control centers.

1.2 SUBMITTALS

A. Product Data: For each fuse type indicated.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA FU 1.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Cooper Bussman, Inc.

2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.

3. Ferraz Shawmut, Inc.

4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Service Entrance: Class L, fast acting or J, fast acting.

B. Motor Branch Circuits: Class RK5, time delay.

3.2 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION

SECTION 26 24 10

SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes service and distribution switchboards rated 600 V and less.

1.2 SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC 2013, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 2, "Deadfront Distribution Switchboards."

C. Comply with CEC.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 MANUFACTURED UNITS

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.

2. General Electric Co.; Electrical Distribution & Protection Div.

3. Siemens Energy & Automation, Inc.

4. Square D.

B. Front-Connected, Front-Accessible Switchboard: Fixed, individually mounted main device, panel-mounted branches, and sections rear aligned.

C. Nominal System Voltage: As shown on plans.

D. Main-Bus Continuous rating: As shown on plans.

E. Enclosure: Steel, NEMA 250, Type 1 or 3R as required.

F. Enclosure Finish: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

G. Barriers: Between adjacent switchboard sections.

H. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard.

I. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

J. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

K. Pull Box on Top of Switchboard (if required by utility):

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.

2. Set back from front to clear circuit-breaker removal mechanism.

3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.

4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.

5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

L. Buses and Connections: Three phase, four wire, unless otherwise indicated. Hard-drawn copper of 98 percent conductivity with feeder circuit-breaker line connections.

1. Ground Bus: 1/4-by-2-inch- minimum-size, hard-drawn copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors.

2. Contact Surfaces of Buses: Silver plated.

3. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from one end.

M. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.3 TRANSIENT VOLTAGE SUPPRESSION DEVICES

A. IEEE C62.41, integrally mounted, plug-in-style, solid-state, parallel-connected, sine-wave tracking suppression and filtering modules.

B. Minimum single-impulse current rating shall be as follows:

1. Line to Neutral: 100,000 A.

2. Line to Ground: 100,000 A.

3. Neutral to Ground: 50,000 A.

C. Protection modes shall be as follows:

1. Line to neutral.

2. Line to ground.

3. Neutral to ground.

D. EMI/RFI Noise Attenuation Using 50-ohm Insertion Loss Test: 55 dB at 100 kHz.

E. Maximum UL 1449 clamping levels shall not exceed 400 V, line to neutral and line to ground on 120/208 V systems and 800 V, line to neutral and line to ground on 277/480 V systems.

F. Accessories:

1. Form-C contacts, one normally open and one normally closed, for remote monitoring of system operation. Contacts to reverse position on failure of any surge diversion module.

2. Audible alarm activated on failure of any surge diversion module.

3. Six-digit transient-counter set to total transient surges that deviate from the sine-wave envelope by more than 125 V.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 3, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic trip-unit circuit breakers shall have RMS sensing, field-replaceable rating plug, and the following field-adjustable settings:

a. Instantaneous trip.

b. Long- and short-time pickup levels.

c. Long- and short-time time adjustments.

d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

6. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.

C. Enclosed, Insulated-Case Circuit Breaker: Fully rated, encased-power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.

2. Two-step, stored-energy closing.

3. Microprocessor-based trip units with interchangeable rating plug, LED trip indicators, and the following field-adjustable settings:

a. Instantaneous trip.

b. Long- and short-time pickup levels.

c. Long- and short-time time adjustments with I^2t response.

d. Ground-fault pickup level, time delay, and I^2t response.

4. Remote trip indication and control.

5. Communication Capability: Integral communication module with functions and features compatible with power monitoring and control system specified in Division 16 Section "Electrical Power Monitoring and Control"

6. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

7. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

8. Control Voltage: 125 -V, ac.

D. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

E. Fuses are specified in Division 26 Section "Fuses."

2.5 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1, IEEE C57.13, and the following:

1. Potential Transformers: Secondary voltage rating of 120 V and NEMA accuracy class of 0.3 with burdens of W, X, and Y.

2. Current Transformers: Ratios shall be as indicated with accuracy class and burden suitable for connected relays, meters, and instruments.

3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kV.

4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondaries to ground overcurrent relays to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

a. Phase Currents, Each Phase: Plus or minus 1 percent.

b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.

c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.

d. Megawatts: Plus or minus 2 percent.

e. Megavars: Plus or minus 2 percent.

f. Power Factor: Plus or minus 2 percent.

g. Frequency: Plus or minus 0.5 percent.

h. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from 5 to 60 minutes.

i. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent. Accumulated values unaffected by power outages up to 72 hours.

2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

2.6 CONTROL POWER

A. Control Circuits: 120 V, supplied through secondary disconnecting devices from control-power transformer.

B. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

C. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Furnish portable test set to test functions of solid-state trip devices without removal from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.

B. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.

2.8 IDENTIFICATION

A. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1 and NECA 40.

B. Install and anchor switchboards level on concrete bases, 4-inch nominal thickness. Concrete base is specified in Division 16 Section "Basic Electrical Materials and Methods," and concrete materials and installation requirements are specified in Division 3.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

D. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

E. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

F. Install spare-fuse cabinet.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods."

B. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

SECTION 26 24 20

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

   a. Enclosure types and details for types other than NEMA 250, Type 1.

   b. Bus configuration, current, and voltage ratings.

   c. Short-circuit current rating of panelboards and overcurrent protective devices.

   d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

3. Field quality-control test reports.

4. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. Eaton Corporation; Cutler-Hammer Products.

b. General Electric Co.; Electrical Distribution & Protection Div.

c. Siemens Energy & Automation, Inc.

d. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.

b. Kitchen Areas: NEMA 250, Type 4.

c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

B. Phase and Ground Buses: Hard-drawn copper, 98 percent conductivity.

C. Conductor Connectors: Suitable for use with conductor material.

1. Ground Lugs and Bus Configured Terminators: Compression type.

D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices. Provide 20% space in all panelboards

F. Panelboard Short-Circuit Rating:

1. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units. No tie-handle allowed for multi-pole breakers.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

a. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components for all NEMA 3R panelboards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."

C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.

D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

E. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

H. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

I. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

J. Ground equipment according to Division 26 Section "Grounding and Bonding."

K. Connect wiring according to Division 26 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters.
2. Single- and double-pole snap switches and dimmer switches.
3. Device wall plates.
4. Floor service outlets, poke-through assemblies and multioutlet assemblies.

1.2 SUBMITTALS

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

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Wiring Devices:
    a. Bryant Electric, Inc./Hubbell Subsidiary.
    b. Eagle Electric Manufacturing Co., Inc.
    c. Hubbell Incorporated; Wiring Device-Kellems.

d. Leviton Mfg. Company Inc.

e. Pass & Seymour/Legrand; Wiring Devices Div.

2. Multioutlet Assemblies:

a. Hubbell Incorporated; Wiring Device-Kellems.

b. Wiremold Company (The).

3. Poke-Through, Floor Service Outlets and Telephone/Power Poles:

a. Hubbell Incorporated; Wiring Device-Kellems.

b. Pass & Seymour/Legrand; Wiring Devices Div.

c. Square D/Groupe Schneider NA.

d. Thomas & Betts Corporation.

e. Wiremold Company (The).

2.2 RECEPTACLES

A. Straight-Blade and Locking Receptacles: Heavy-Duty grade.

B. Straight-Blade Receptacles: Hospital grade.

C. GFCI Receptacles: Straight blade, non-feed-through type, Hospital or Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch deep outlet box without an adapter.

2.3 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches: Heavy-Duty grade, quiet type.

C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: 20 A, 120/277-V ac.

2. Receptacle: NEMA WD 6, Configuration 5-20R.

2.4 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: 0.035-inch thick, satin-finished stainless steel.

3. Material for Unfinished Spaces: Galvanized steel.

4. Material for Wet Locations: Cast aluminum with spring-loaded, lockable, lift cover, and listed and labeled for use in "wet locations."

2.5 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: See telecommunication specifications for requirements.

F. Wiremold RFB4-4DB series complete with brackets, devices, corresponding covers and hardware.

2.6 POKE-THROUGH ASSEMBLIES

A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Flush type with two simplex receptacles and space for two RJ-45 jacks.

2. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.

3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.

4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.

5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 6 voice and data communication cables.

2.7 MULTIOUTLET ASSEMBLIES

A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

B. Raceway Material: PVC.

C. Wire: No. 12 AWG.

2.8 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Install wall dimmers to achieve indicated rating after derating for ganging.

C. Install unshared neutral conductors on line and load side of dimmers.

D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

E. Remove wall plates and protect devices and assemblies during painting.

F. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Basic Electrical Materials and Methods."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

2. Submit same for approval.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.

2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers.
4. Enclosures.

1.2 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.

2. General Electric Co.; Electrical Distribution & Control Division.

3. Siemens Energy & Automation, Inc.

4. Square D/Group Schneider.

B. Fusible Switch, 600 A and Smaller: NEMA KS 1, Type GD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 600 A and Smaller: NEMA KS 1, Type GD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.

3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open (required for all disconnects located downstream of Variable frequency Drives)

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.

2. General Electric Co.; Electrical Distribution & Control Division.

3. Siemens Energy & Automation, Inc.

4. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.

4. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.

2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.

3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.

2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.

3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 Section "Basic Electrical Materials and Methods," and concrete materials and installation requirements are specified in Division 3.

C. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

D. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

E. Comply with mounting and anchoring requirements specified in Division 26 Section "Seismic Controls for Electrical Work."

F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

G. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

3.2 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.

2. Verify switch and relay type and labeling verification.

3. Verify rating of installed fuses.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION

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SECTION 27 05 26

TELECOMMUNICATIONS GROUNDING PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, sections included under Divisions 1, 26, and 27 are included as part of this section as though bound herein.

B. Section 27 01 00 General Requirements

C. Section 27 15 00 – Horizontal Cabling

1.2 SUMMARY

A. This Section specifies the minimum materials and performance standards for grounding and bonding installed specifically for telecommunication systems in Hayward Unified School District new construction and remodels.

1. Sections include:
   a. Grounding electrodes and conductors.
   b. Grounding electrodes.
   c. Equipment grounding conductors.
   d. Bonding.

1.3 REFERENCES

A. American National Standards Institute (ANSI) Publication C2-97 – National Electrical Safety Code; ANSI/IEEE Std. 1100-1999 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems; ANSI/NFPA 780 – Lightning Protection Code Electronic Industries Association and Telecommunication Industries Association (EIA/TIA) Publications:

1. EIA/TIA 568B – Commercial Building Telecommunications Wiring Standard.
2. EIA/TIA 569 – Commercial Building Standard for Telecommunications Pathways.
3. EIA/TIA 607 – Grounding and Bonding for Communications.

B. Institute of Electrical and Electronic Engineers (IEEE) Publication 142 – Recommended Practice for Grounding of Industrial and Commercial Power Systems.

C. National Fire Protection Association (NFPA) Publication:

1. 70 – National Electrical Code (NEC).
2. 780 – Lightning Protection Code.

D. Underwriters Laboratories, Inc. (U.L.) Publication:

1. 83 - Thermoplastic Insulated Wires.
2. 467 - Grounding and Bonding Equipment.
3. 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

1.4 REGULATORY REQUIREMENTS

A. The Contractor shall conform to requirements of the National Electrical Code Article 250, California Electrical Code, and requirements for EIA/TIA 607.

B. The Contractor shall furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the SDUSD as suitable for purpose specified and shown.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding system resistance shall be 5 ohms or less unless otherwise indicated.

B. A telecommunications ground in the form of telecommunication main ground busbar (TMGB) shall be installed in the Main Distribution Frame (MDF) cabinet. It will be directly attached and effectively bonded to the closest point in the building's electrical service grounding electrode system.

C. In the event the building's service grounding electrode system is not in close proximity of the TMGB, install a driven ground rod for the telecommunication grounding system.

D. Each Building Distribution Frame (BDF) shall be effectively bonded with the TMGB in the MDF. Each BDF ground shall be a separate grounding conductor between the BDF and the MDF.

1.6 SUBMITTALS:

A. The following information shall be submitted for review and approval in accordance with Section 26 01 00, "General Electrical Requirements".

1. Catalog Cut:

a. Ground Rod.
b. Ground Connectors
c. Telecommunications Main Grounding Busbar.

2. Ground resistance from each major piece of equipment to the ground electrode. Equipment shall include, but not be limited to the following:

   a. Main Distribution Frame (MDF).
   b. Building Distribution Frame (BDF).

1.7 WARRANTY

A. Warranty shall comply with the provisions of Section 26 01 00, "General Electrical Requirements".

PART 2 - PRODUCTS

2.1 Telecommunication Main Grounding Bus Bar (TMGB):

A. Provide 2” wide x 3/16” thick copper ground bus, (length as necessary to accommodate all MDF/BDFIDF ground connections).

2.2 GROUND RODS:

A. Provide copper clad steel with adequate diameter to permit driving it full length of the rod in the earth but not less than ¾-inch. Length shall be 10-feet unless otherwise indicated.

2.3 GROUNDING AND BONDING CONDUCTORS

A. Grounding and bonding conductors shall be sized in accordance with Table for equipment grounding conductors, NEC. 250, ANSI/TIA/EIA – 607.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Make mechanical and electrical contact at all MDFs and BDFs. Permanently and effectively ground all equipment as required by all applicable codes, regulations and standards.

B. Drive ground rods full length in a depression at least six (6)-inches below finished grade.

   1. Provide minimum No. 4/0 AWG, insulated, stranded copper grounding conductor between TMGB in MDF and electrical system ground

   2. Provide minimum No. 6 AWG, insulated, stranded copper grounding conductor between individual BDFs and the MDF TMGB.

3.2 TESTS:

A. All testing shall be performed by the technology contractor and shall be witnessed by the Architect and/or the District's designated representative.

B. As an exception to requirements that may be stated elsewhere in the contract, the Consultant shall be given five (5) working days notice prior to each test.

C. The testing equipment and devices used in performing the required tests shall have a calibration sticker affixed to the device stating the date when calibrated, date due for re-calibration, and the signature of the individual who did the calibration. In addition to the sticker, a certificate shall also contain the brand name and the serial number of the device.

D. Ground Rod Test: Test ground rods for ground resistance value before any wire is connected. A portable testing megger shall be used to test each ground or group of grounds. The auxiliary or reference ground rods shall be ¾-inch copper clad steel, not less than 4-feet in length and driven 3-1/2 feet deep, and shall be installed in a straight line from the ground being tested. Number 14 AWG stranded wire leads with at least 600 volt rubber insulation shall be connected to binding post on the instrument.

1. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground electrode under test. Provide one (1) copy of the megger manufacturer's directions for use of the ground megger indicating the methods to be used.

E. Test Report (Submit four (4) copies in writing):

1. Grounding electrodes and systems (identifying electrodes and systems, each test).

END OF SECTION

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SECTION 27 01 00

GENERAL TECHNOLOGY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General Requirements

B. Scope: Data, Telephone/Voice

C. Industry Guidelines and Standards

D. Submittals

1.2 GENERAL REQUIREMENTS

A. Manufacturer: The term “manufacturer” shall be defined as the company, or group of companies, that actually produces the products meeting the requirements of Section 2 of this document. The manufacturer shall have a minimum of seven (7) years experience in manufacturing products of this type and shall be ISO 9001 Certified.

B. Contractor: The term “contractor” shall be defined as the company, or group of companies, that actually installs the product. The contractor selected to provide the installation of this system shall be certified by the manufacturer in all aspects of design, installation and testing of the products described herein.
   1. The contractor shall hold a valid State of California C-7 Or C-10 Contractor’s license, shall have completed at least ten (10) projects of equal scope, shall have been in business of furnishing and installing systems of this scope and magnitude for at lest three (3) years and capable of being bonded to assure the Owner’s Project Manager of performance and satisfactory service during the guarantee period.
   2. The contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work.
   3. All work shall be performed under the supervision of a company accredited by the manufacturer and such accreditation must be presented.
   4. The contractor shall be a manufacturer’s authorized distributor and warrantee station for the equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The contractor shall maintain a spare set of all major parts for the system at all times.
   5. The contractor selected for this Project must adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this Project.

6. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of optical and Category 6A metallic premise distribution systems and have personnel who are adequately trained in the use of such tools and equipment.
7. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the installing contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.
8. All communication system supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.

C. Responsible Person for Contractor: Submit name of the individual authorized to receive construction change documents, and who is responsible for informing others in Contractor's employ or subcontractors of changes in the Work.

1.3 SCOPE OF WORK

A. DATA: The work shall include, but not be limited to the following objectives:
1. Remove data drops and cable and install new data drops and new cable and connect to existing IDFs. Contractor shall coordinate closely with District for required time to complete connection.
2. Only virgin materials shall be used in the construction of cabling.
3. Replace existing fiber optic cable where shown on drawings and terminate all strands of fiber at each rack or wall mounted fiber enclosure. All cables shall be installed with service loops at ground boxes and MDF/IDF locations only. Fiber will be terminated using LC type connectors. Also furnish two (2) meter duplex fiber patch cord for every two terminations. Patch cord is to match fiber type that is installed, i.e. Multi-Mode. Patch cord is to be LC to LC as required by equipment. Note that all fiber optic cable is to be pulled in existing conduits.
4. Installation of a new Category 6A UTP in rooms as required by the drawings or the scope of work. Category 6A terminations will be EIA/TIA standard 568B wiring configuration into RJ45 workstation data jacks (all jacks shall be blue in color for data and all cables shall be blue in color for data). All cables shall be installed with service loops at ground boxes and MDF/IDF locations only.
5. Furnish and install for each IDF a data cabinet, fiber patch panels, copper patch panels, UPS, and wire management hardware as required by the quantities shown drawings or the scope of work.
6. Mount and install Switches as required by the drawings or the scope of work. Contractor shall notify the District in writing two weeks prior to the expected installation date of switches. Equipment shall be installed within Data Cabinets (provided by the contractor). Data Cabinets will be dual access and fully en

closed (See Materials List)

7. Testing of cables and connections to insure a complete and operable end-to-end data connection using EIA/TIA TSB-67 testing guidelines at level II accuracy for Category 6A, and EIA/TIA 455a for fiber.
8. All terminations into patch panel for connection to Switches using contractor supplied patch cords/station cables. For each data cable installed, the contractor shall supply one (1) 3' Category 6A patch cord for the patch panel location. In addition, the contractor shall supply 50% of 7' station cords and 50% of 10' station cords of the total number of data jacks installed. Station cords shall be delivered as directed by computer services in boxes clearly labeled with School name, quantity and size of station cords. Contractor to install patch cords from patch-panel to switches.
9. Set up a complete wire management system at each IDF, this includes wire management organizer(s). Contractor shall provide one horizontal wire manager for each new Category 6A patch panel and one horizontal wire manager for each switch installed.
10. Warranty:
    a. Contractor shall warrant the installation and that all approved cabling components meet or exceed the requirements of TIA/EIA-568A, TIA/EIA-568A-A5, and ISO/IEC 11801.
    b. Contractor will provide a minimum of a fifteen (15) year written warranty from the manufacturer(s) for both UTP basic link and fiber optic cable systems. This may require the contractor to certify their installers to the manufacturer's guidelines before the project begins.
    c. The permanent link cabling system shall be warranted for a period of at least 25 years.
    d. The contractor will provide a two (2) year written warranty covering workmanship and materials in compliance with District specifications. All repairs shall be made at no cost to District during the warranty period.
    e. Contractor will provide to the District warranty information covering parts and materials used by the contractor.
    f. Upon hookup of system and system start-up by District, if system troubles should indicate problems with the cables or terminations, it shall be the responsibility of the cable installation contractor to repair any such problems free of charge to the District. The contractor shall start this repair work within a 48 hour period of time from initial notification by District.

B. TELEPHONE/VOICE: The work shall include but not be limited to the following objectives:

1. Only virgin materials shall be used in the construction of cabling.
2. Backbone feeder cables shall be Category 6A, size and number of pairs as indicated in drawings and Scope of Work documents. All pairs are to be terminated on 66m, 50 blocks and 89B standoffs.
3. All 66 blocks shall be mounted on blue-boards located in or near data cabinets.
4. Each 66-block shall have a minimum of a mushroom block and mushrooms installed per drawing details.
5. Installation of new Category 6A UTP in rooms as indicated on the drawings.

Category 6A terminations will be EIA/TIA standard 568B wiring configuration into RJ45 workstation jacks (all telephone wire and jacks shall be blue in color). All cables shall be installed with service loops at ground boxes and MDF/IDF/CIDF locations only.

6. Testing of cables and connections to insure a complete and operable end-to-end data connection using EIA/TIA TSB-67 testing guidelines at level II accuracy for Category 6A.

C. INDUSTRY GUIDELINES AND STANDARDS

1. When Contract Documents differ from governing codes, furnish and install larger size or higher standards called for without extra charge. Notify the District Representative of any discrepancies prior to commencement of construction. Obtain written clarification prior to proceeding with work.
2. Fiber optic cable, electrical cable, wire and connectors shall be installed as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended functions.
3. The National Fire Code (NFPA), National Electrical Code (NEC), California Electrical Code (CEC), California Building Code and Local Codes will be followed.
4. Applicable Standards
   a) National Electrical Code (NEC), most recent edition.

   b) ANSI/TIA/EIA-568-B -- Commercial Building Telecommunications Cabling Standard ANSI/TIA/EIA-568-A-1 -- Propagation Delay and Delay Skew Specifications for 100 ohm 4-pair Cable.
   c) ANSI/TIA/EIA-568-A-2 - Commercial Building Standards Updates
   d) ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces.
   e) ANSI/TIA/EIA-606 -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
   f) ANSI/TIA/EIA-607 -- Commercial Building Grounding and Bonding Requirements for Telecommunications.
   g) ANSI/TIA/EIA TSB-67 -- Transmission Performance Specifications for Field-testing of Unshielded Twisted-Pair Cabling Systems.
   h) ANSI/TIA/EIA TSB-75 -- Additional Horizontal Cabling Practices for Open Offices.
   i) BICSI -- Telecommunications Distribution Methods Manual.
   j) BICSI -- Cabling Installation Manual.
   k) IEEE 802.3 "Carrier Sense Multiple Access with Collision Detection".
   l) IEEE 802.3ab "Gigabit Ethernet transmission over unshielded twisted pair (UTP)"
   m) IEEE 802.z "1000Base-SX transmission over multi-mode fiber and 1000Base-LX transmission over single-mode fiber
   n) ISO/IEC DIS 11801, January 6, 1994.

o) UL Cable Certification Program.
p) ANSI X3T9.5 Requirements for UTP at 100 Mbps.
q) EIA/TIA Technical Specification Bulletin 36. Technical Systems Bulletin additional Cable Specifications for Unshielded Twisted-Pair Cables.
r) EIA/TIA Technical Specification Bulletin 40. Technical Systems Bulletin additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware.
s) TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
t) EIA/TIA-455-61 FOTP-61 Measurement of Fiber or Cable Attenuation Using an OTDR.
u) ANSI/EIA/TIA-455-A-1991 Standard Test Procedures for Fiber Optic Fibers, Cables and Transducers, Sensors, Connecting and Terminating Devices, and other Fiber Optic Components
v) ANSI/ICEA S-83-596-1994, Fiber Optic Premises Distribution Cable.
w) ANSI/ICEA S-87-640-2000, Fiber Optic Outside Plant Communications Cable.
x) ANSI/TIA/EIA-526-7-1998, Optical Power Loss Measurements of Installed Single-mode Fiber Cable Plant-OFSTP-7.
y) ANSI/TIA/EIA-526-14-A-1998, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant-OFSTP-14A.
z) ANSI/TIA/EIA-598-A-1995, Optical Fiber Cable Color Coding.
aa) ANSI/TIA/EIA-604-3-1997, FOCIS 3 Fiber Optic Connector Intermateability Standard.

1.4 SUBMITTALS

A. Pre-construction material submittals
   1. Whenever in the Contract Documents any materials, products, processes or articles are indicated or specified by the name brand of the manufacturer, or by patent or proprietary names, such specifications shall be deemed to be a measure of quality and utility or a standard, and shall be deemed to be followed by the words, “or equal”. It is the intent of this article to comply with Public Contract Code Section 3400.

B. Proposed Product Substitutions
   1. All proposed product substitutions shall be requested as per Section Product Substitution Procedures.

1.5 LOW VOLTAGE ENCLOSURES AND PATHWAYS

A. Single channel surface raceway will be Wiremold 2300 or 2900 series or larger depending on fill ratio. All fittings made for an intended purpose of installation by the manufacturer shall be included as part of this material. Fill shall not exceed 40% and raceways shall be screw in type. Adhesive only raceways are not acceptable.

B. Multi channel surface raceway will be Wiremold 5400, 5500 series depending on fill ratio. All fittings made for an intended purpose of installation by the manufacturer shall be included as part of this material. Fill shall not exceed 40% and raceways shall be screw in type. Adhesive only raceways are not acceptable.

C. Mounting hardware and anchors recommended by the Manufacturer of any material that shall be mounted to the building or structure.
   1. Sheetrock/drywall/wall board: Easy Anchor, toggle bolt, other spread type anchor with load distribution, or approved equal.
   2. Concrete/cinder block/solid masonry: expanding compression type lag, expanding compression type bolt, expanding compression type all tread with nuts, or approved equal.
   3. Tile/Stucco/hollow masonry: toggle bolts or approved equal.
   4. Wood: lags, wood screws, or approved equal.
   5. Metal: clamp, or approved equal.

D. Surface Mount Boxes will be Wiremold 2944 Extra Deep Device Box.

E. Cover plates will be Panduit with four ports (minimum). Blanks will be used to cover any unused ports.

F. Wall mounted phone plates will be Hubbell multi-jack faceplate (p/n BR630DWP) and jacks.

G. Wiremold 5500 faceplates shall be 5507FRJ, Color to match existing or new installed raceway.

H. Wall mounted cabinets shall be either a Hubbell (RE4X with Sound Dampening Kit REKS) or the Chatsworth Cube-iT Plus cabinets 24”Hx24”Wx24”D (p/n 11840-224) or 36”Hx24”Wx24”D (p/n 11840-236) with solid door and vents, computer white in color. (NOTE: Size and type of cabinet will be specified by the District depending on need). Extra package of Phillips mounting screws to be provided with cabinet.

I. Floor mounted cabinets will be Chatsworth Enhanced Steel frame cabinets (p/n 16141-701)

J. Wall mount racks shall be Chatsworth stacker swing-gate rack, minimum of 24” deep, 24” tall (p/n 13602-725), or 36” tall (p/n 13604-725), or approved equal.

K. Floor mount racks shall be Chatsworth 19”W x 7’H standard equipment rack (p/n 55053-503) with Quantity 4 Panduit vertical wire managers (p/n WMPVHC46) and appropriate ladder racking with mounting hardware for structural support.

L. Definitions:
   1. A rack is defined as a sideless, bottomless, topless open-rammed support

structure for equipment. A rack may be mounted to a wall, ceiling, or to a floor depending on type, size, and District requirements.

2. A cabinet is defined as an enclosed equipment support structure with opening front and rear. A cabinet may be mounted to a wall, or to a floor depending on type, size, and District requirements.
3. All cabinets and swing able racks must be able to open fully with no cable tension, or obstructions.

M. Nomenclature:
1. CIDF cabinets are classroom cabinets /racks specified for mounting within classrooms or offices. Typically a Chatsworth (24Hx24Wx24D) or a Hubbell RE4X (42Hx24.2Wx10D)
2. IDF cabinets are cabinets/racks specified for intermediate distribution frames, typically at the head of a wing and feed one or more classrooms. Typically a Chatsworth (36Hx24Wx24D or 48Hx24Wx24D).
3. MDF cabinets are cabinets/racks specified for main distribution frames. Typically 84" high.
4. All equipment shall be mounted with Phillips screws, unless otherwise specified.

PART 2 - PRODUCTS

2.1 DATA

A. 4-pair 24 AWG Category 6A cable (Data) shall test at 10Gbps. Data cable shall be blue in color. Approved manufacturers are Berktek and General Cable.

B. All Category 6A jacks shall in Panduit and blue in color for data (p/n CJ688TGOR).

C. Category 6A patch panels shall be Panduit Modular Patch Panel (p/n CPP48FMWBLY) loaded with 48 Category 6A RJ45 jacks. Jacks shall be Panduit CJ688TGOR.

D. Wire management will be Panduit Horizontal Cable Management System (p/n NCMH2).

E. New Multi-Mode fiber optic cable shall be OM4, tight buffered, 8.3/125 microns. Approved manufacturer's are OCC and Berk-Tek. No composite cable shall be used.

F. Fiber Optic connectors will be Panduit (or equivalent) LC connectors.

G. Fiber enclosures shall be mounted at the top of the cabinet/rack.

H. The fiber enclosures for the MDF shall be rack mountable with applicable number of LC duplex port connector outlets for termination of all fiber runs (12 strands per

IDF). The fiber enclosure for the MDF shall be sized such that the initial installation does not exceed 60% of its capacity. The MDF fiber enclosures shall be Panduit 72 port 19" rack mount (p/n FRME4), loaded with the appropriate number of 6 strand fiber adapter panels (p/n FAP3WEIDSC).

I. The fiber enclosures for the IDF shall be rack mountable with applicable number of LC duplex port connector outlets for termination of all fiber runs (6 strands per CIDF and 12 strands to MDF). The fiber enclosure for the IDF shall be sized such that the initial installation does not exceed 60% of its capacity. The IDF fiber enclosures shall be either the Panduit 72 port unit listed above, or the Panduit 54 port, 19" rack mounted unit (p/n FRME3) loaded with the appropriate number of 6 strand fiber adapter panels (FAP3WEIDSC).

J. Fiber patch cords shall be 1 meter, 2 meter, or 3 meters long, as required and shall be LC to LC connectors or LC to LC as required.

2.2 TELEPHONE/VOICE

A. Voice cable shall be blue in color. Approved manufacturers are Berk-Tek and General Cable.

B. All Category 6A jacks will be Panduit and blue in color for voice (P/n CJ688TGBU).

C. OSP gel/icky pick blocking kits for 25 pair and larger pair count cables shall be 3M Scotchcast 4416 duct sealing kit or approved equal.

2.1 Category 6A 66-blocks shall be Siemon or equal and include Siemon's "Lasting Hinge Cover" (P/n MN4LH-2) for labeling purposes.

PART 3 - EXECUTION

3.1 GENERAL REQUIRMENTS

A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the contractor shall notify the Owner's Representative before making any changes. It shall be the responsibility of the manufacturer-authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.

B. Furnish all conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

C. Splices of conductors in underground pull boxes are not permitted.

D. The labor employed by the contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the Owner's Rep

resentative to engage in the installation and service of this system.

E. The contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc. The contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., caused by the performance of this work.

F. The system must meet all local and other prevailing codes.

G. All cabling installations shall be performed by qualified technicians.

H. All cabling shall be splice free.

I. In order to ensure the least amount of cable untwisting, it is required that all cables shall be stripped using a special tool.

J. The use of lubricants (i.e. Blue 77) to facilitate the installation of cables in conduits is highly discouraged. If such a lubricant must be used, the contractor shall verify the acceptability of the lubricant to be used with the cable manufacturer, prior to using such a lubricant. Lubricants that harden after installation are not allowed.

K. Under no circumstance are “channel locks” or other pliers to be used.

L. Plenum rated cable may be run exposed above ceilings, provided the cabling is supported independent of other utilities such as conduits, pipes, and the ceiling support systems. The cable shall not be laid directly on the ciling panels. The use of cable ties shall be done in accordance with the cable manufacturer’s requirements. The cable jacket composition must meet local and all other prevailing fire and safety codes.

M. All firewalls penetrated by structured cabling shall be sealed by use of a non-permanent fire blanket or other method in compliance with the current edition of national Fire Protection Association (NFPA) and the National Electric Code (NEC) or other prevailing code. The contractor must not use concrete or other non-removable substance for fire stopping on cable trays, wire ways or conduits.

N. Site Cleaning. Throughout the progress of the plant construction, the contractor shall keep the working area free from debris of all types and remove from the premises all rubbish resulting from any work done by Contractor. On a daily basis and at the completion of its work the Contractor shall, to the extent possible, leave the premises in a clean and finished condition.

O. Conduits. All backbone cabling will run through dedicated conduits. All new conduits will be supplied with a pull string. Contractor shall supply pull string and pull rope for the installation of all cables in existing conduits. For all conduits left with

available capacity, Contractor shall replace pull strings with ¼-inch pull rope during the course of his work. Contractor must seal all conduits with an approved sealing compound.

P. Cabling and Termination Identifications. All new cabling shall be of the type specified herein. Any conflicts between cabling types specified and code or design requirements shall be submitted to Owner's Representative for review and final disposition. All cabling shall be neatly laced, dressed and adequately supported. Cabling must be concealed to the fullest extent possible. In addition, a numbering and marking scheme must be used to identify all cable and cabling terminations. All cables, regardless of length, shall be marked and/or numbered at both ends. Marking codes and methodologies shall correspond to the instructions in this specification.

Q. Seismic Requirements. Contractor will install all equipment racks, equipment cabinet enclosures, cable runways, etc. according to the local, state and/or federal code. Contractor will notify Owner's Representative of such requirements and shall provide such bracing as required.

R. Safety Requirements. Contractor will utilize appropriate personnel and display warning signs, signals, flags and/or barricades at the work site to ensure adherence to safety regulations and as prudence requires.

S. Owner or Owner's Representative may view work or testing in progress.

3.2 CABLE ROUTING

A. The cables will be routed to their respective Main Distribution Frame (MDF), Intermediate Distribution Frame (IDF), or to service drop utilizing the shortest path possible.

B. Cable shall not be exposed at any point in the cable path. Contractor is to use appropriate pathway for the situation (i.e. inside wall, conduit, or non metallic surface raceway). EXCEPTION: In MDF ROOM ONLY cables may be exposed and routed in contractor supplied D-rings every 4 feet.

C. Cables shall be protected and sleeved with a conduit in locations where cables need to pass through walls, floors, or hard ceilings. Contractor shall install threaded IMC or rigid conduit with large fender washers, lock rings, and screw on protective bushings on both ends. The fire rating of the wall must be maintained during and after installation.

D. At solid wall location such as plaster, brick, concrete, cinder block, tile, reinforced concrete, Contractor will provide and install surface mounted non-metallic raceways or equivalent. The use of different series raceways is required at locations where cable fill capacities are exceeded.

E. Terminations on block walls will be accomplished with District approved surface mount boxes.

F. Cables will be run vertically inside the wall and into the ceiling space. Terminations on stud walls will be accomplished with cut-in type electrical boxes with a 1" conduit (flex or EMT) extended from the box within the wall to ceiling access space.

G. Service loops:

1. Fiber:
   a. Shall be a minimum of 10' at all MDF and IDF locations.

   b. Shall be a minimum of 6' at all ground box locations that allow for the minimum bend radius specified by the manufacturer.

2. Category 6A (Data and Voice) and CATV/Broadband
   a. Shall be a minimum of 6' at all MDF and IDF locations.
   b. Shall be a minimum of 6' at all ground box locations that allow for the minimum bend radius specified by the manufacturer.

3. Category 6A Voice Feeder Cables
   a. Shall be routed around the perimeter of the backboard in which it is terminated on.
   b. All ground boxes shall have a minimum of 6' service loop.

H. Cables shall be run in corridors wherever possible in order to avoid furniture and work areas so that access to the cables in unencumbered.

I. The cables are to be as accessible as possible, placed above all other items in the ceiling, including ducts and supports.

J. Do not use pulling means, including fish tape, cable or rope, which can damage the Wiremold raceway.

K. Use pulling compound or lubricant that will not deteriorate cable or conduit.

L. Pulling compound shall be a water base pulling lubricant that will not deteriorate cable or conduit.

M. Cables shall not be pulled across sharp edges. If sharp edges are present a small sleeve, insuliner or grommet shall be installed to protect the cable.

N. Cables shall be pulled free of sharp bends or kinks.

O. Cables shall not be forced or jammed between metal parts, assemblies, etc.

P. Cables shall not be pulled across access doors and pull box covers. Access to all

equipment and systems shall be maintained.

Q. Manufacturer's specifications for pulling stress and minimum bend radius shall not be exceeded on any cable.

R. Do not use staples or drive rings.

3.3 CABLE INSTALLATION PARAMETERS

A. Contractor is required to adhere to the following parameters in this section whether or not existing equipment has been placed by Contractor and/or others.

B. Contractor will notify District of any of the following requirements that cannot be met prior to bid.

C. Data UTP specifications.
   1. Data terminations shall be T568B configuration unless otherwise specified
   2. Category 6A modular patch panels shall be installed in accordance with manufacturer's design and installation guidelines.
   3. Data UTP Testing
      a. All data UTP cable shall be tested after installation according to the procedures and acceptability criteria described in EIA/TIA Standards for Category 6A cable and connecting hardware. Test at level 11 compliance.
      b. Data UTP cable shall meet or exceed requirements for 1 Gbps data transmission.
      c. Network certification of all four (4) pair will meet testing criteria for a minimum of 1000BASE-TX
      d. Printed test results (both printed copy and data file copy) shall be provided as documentation of the quality of installation procedures and as a baseline for future troubleshooting.
      e. All UTP testing equipment shall have current calibration certification.

D. Fiber Cable Specification
   1. Fiber cable will be multi-mode 50 micron rated at OM4. The number of strands will be specified by the District. Contractor will provide a specification sheet for the cable they will be using on each job.
   2. Fiber Optics Connectors
      a. All connectors shall be glass-in-ceramic LC to LC connectors.
   3. Fiber Optics Cable Installation and Testing
      a. All spare optical ports and connectors shall have a dust cap in place to protect from the environment.
      b. Contractor shall provide and install blanks in unused spaces of the fiber enclosure.
      c. If fiber is supplied to Contractor by the District it shall be tested before installation, while still on the shipping reel, using and optical time domain reflectometer (OTDR).
      d. The test results shall be compared to the manufacturers test results. A

discrepancy of more than 1 dB on any fiber in either window indicates possible shipping damage and the fiber shall be returned to the supplier.

e. The test results shall be maintained in a file for future reference.
f. All fiber shall be tested after installation according to the procedures and acceptability criteria described in EIA/TIA 455A (Aug 1991) and all applicable addenda after installation and an 1310/1550 nm power meter and stabilized light source for single mode fiber. OTDR testing is to be performed in any location where the fiber is not continuous, i.e. coupled LC connectors (soft splice), fusion splice and mechanical splice.
g. The results of these tests (printed OTDR result power meter attenuation results) shall be provided by the installer as documentation of the quality of installation and as a baseline for future troubleshooting, both printed copy and data file copy.
h. The results shall be compared to the pre-installation test results for significant changes.
i. All optical test equipment shall have current, traceable calibration certification.
k. The multi-mode cable shall comply with the following maximum individual fiber loss (cabled): Attenuation 1310 nm, 2.00 dB end to end (basic link) 1550 nm, 1.00 dB end to end (basic link).
l. Aerial fiber cable mounting hardware shall be matched to the all supporting (ADSS) fiber cable exactly and be installed in accordance with mounting hardware and cabling manufacturers specifications.

E A maximum fill capacity of 40% will be deemed acceptable for conduits and 75% of raceway and surface mold. Contractor shall inform Consultant in writing if this requirement cannot be met. If the Contractor fails to inform the Consultant any labor involved in rerouting cables in such conduit or raceways shall be the soul responsibility of the Contractor.

F. Cable shall be identified with a machine-printed tag identifying the system type in all access points (i.e. junction boxes, ground boxes, MDF, IDF's, etc.) and as they enter or exit the conduit pathway.

G. Contractor will assess whether or not the ceiling space is a plenum air return which shall dictate the use of the listed plenum type or PVC type cable required in the materials specification section. Any cable installations that shall be pulled through underground conduit will require Outside Plant (OSP) cable.

H. All cabling shall be installed with proper stress relief and tied down.

I. Manufacturer's specification for pulling stress and minimum bend radius shall not be exceeded on any fiber optic, data, voice, CATV, CCTV, IP Network Cameras, PA or any other cable.

J. Power feeds of greater than 220 volts shall not be run parallel to the UTP cables. Parallel runs of greater than 20 feet require a minimum separation distance of 3

feet, or 18 inches if cables are contained in a metallic conduit, which is grounded.

K. Multiple conduit runs of 110 volts power distribution shall not be run parallel to the UTP cables. Parallel runs of greater than 20 feet require a minimum separation distance of 18 inches.

L. All power feeds crossing the path of the UTP cables at right angles shall be a minimum of 6 inches in distance from the UTP cables.

M. There shall be an 18 inch separation between the cables and the fluorescent light fixtures. Contractor shall notify District representative in the event this requirement can not be met.

N. All cable/cabling shall be kept 30 inches away from any heat source; i.e., HVAC ducting, steam valves, etc.

O. Thin Ethernet or Fiber Optic cable/cables shall be identified with a tag as to the system and date, every 30 feet when installed in open trays or suspension systems in ceilings.

P. Station Cable (UTP) or STP runs are not to exceed 295 feet for data and 1000 feet for voice.

Q. Cable splicing at any point of a UTP or STP station cable or any cable installed by the contractor is unacceptable without specific district approval.

R. No cabling is allowed to rest on any ceiling tile or suspension system unless specifically authorized by District. Strapping or mounted to any existing wires (e.g., lighting, ceiling grid, etc.) is not permitted.

S. Cables shall be securely supported to building structure (i.e. stud, beam, or other framing member) within 12 inches of any conduit or raceway entrance.

T. Contractor will place all station cables in the ceiling area on Contractor supplied and installed wire hangers or in floor spaces and raceways.

U. Insulation shall be removed to expose shielding and conductors/fibers to the exact length required by manufacturer for proper termination of plugs, pins and fiber terminations.
   1. Wires and shielding shall not be nicked or damaged in any way upon termination of pins and closure of plug assembly.
   2. Pins and plugs, upon termination, shall not be damaged in any way.

3.4 LABELING AND IDENTIFICATION

A. All cable plant labeling and administration documentation shall conform to ANSI/TIA/EIA 606 Administration Standard.

B. The cables within the rack or cabinets shall be numbered for identification.

C. Equipment used for labeling shall be: Brother “P-Touch” model PT-1750. Label media shall be black typeface on white tape. Tape material shall be ½” wide.

D. Components shall be marked where they are administrated (label at all punch down points, panels, blocks, outlets, etc.).

E. Industry standard color fields should be used where applicable as described in the Standards.

F. All pathways labeled (conduit, trays, etc.).

G. Data UTP Labeling
   1. Wiring termination locations shall be labeled to corresponding pairs at the MDF, IDF, CIDF and at each workstation end.
   2. Cables shall be labeled no more than 3” back from each end of the termination point with a cable label that matches the faceplate labeling.
   3. Contractor will provide tags, straps and adhesive labels. These tags, straps and adhesive labels shall be of high quality that will endure over time.
   4. Hand written labels are not acceptable.
   5. Each drop shall have a unique label throughout the site. This would allow a cable management system to track each cable pair.
   6. Labeling Scheme:

H. Workstation Labeling: The faceplate or surface block shall be labeled with the Room # of the IDF where the cable sources from, the Room # the cable terminates in, and the sequential workstation number (ex. B10(IDF)-B2(RJ45 jack)-09(Workstation number). Each room shall have a sequential workstation number starting with the number 01 (ex. B10-B2-01 through B10-B2-10 and B10-B3-01 through B10-B3-10). The labeling itself shall be in a white background with black lettering.

I. Closet Labeling: Patch panel shall be labeled with the Room # the cable terminates in (RJ45 jack) and sequential workstation number only. The labeling itself shall be in a black background with white lettering.

J. Data Fiber Optics Labeling
   1. Fiber termination locations shall be labeled to corresponding fiber strands pairs at the MDF, IDF, and CIDF.
   2. The labeling scheme will be provided by the District and will be specific up to and including instructions for the placement of labeling, tags, straps, and adhesive labels.
   3. Contractor is expected to provide tags, straps and adhesive labels. These tags, straps and adhesive labels shall be of high quality that will endure over time.
   4. Hand written labels are not acceptable.

5. Labeling Scheme:
   i) Each drop shall have a unique label throughout the site. This would allow a cable management system to track each cable.
   ii) Cables shall be labeled approximately 12 inches back from the point where the cable enters the fiber enclosure with a cable label that identifies the origin and destination of the cable.
   iii) Closet labeling; each connection shall be labeled denoting each strands color, origin and destination with name of room or wing.
   iv) The type (single-mode or multi-mode) of fiber optic cable used shall be clearly labeled on the fiber patch panel per drawn details.
   v) Color-coding shall conform to EIA/TIA specifications.

3.5 TESTING OF THE CABLING PLANT

A. Contractor is responsible for supplying all of the required test equipment used to conduct acceptance tests.

B. District reserves the right to be present during any or all of testing.

C. All cabling not tested strictly in accordance with these procedures shall be re-tested at no additional cost to the District.

D. 100% of the installed cabling must be tested. All tests must pass acceptance.

E. Test equipment shall be fully charged prior to each day's testing.

F. Test reports must be submitted in hardcopy or electronic format. Hand-written test reports are not acceptable.

G. Hardcopy reports are to be submitted in labeled 3 ring binders with an attached affidavit verifying passing execution of all tests. For large installations electronic reports with hardcopy summaries are preferred. Hardcopy summary reports shall contain the following information on each row of the report: circuit ID, test specification used, length, date of test, and pass/fail result.

H. Electronic reports are to be submitted on CD format. If proprietary software is used, CD shall contain any necessary software required to view test results. If the results are delivered in a standard format like Excel, Access, CSV files, etc. then software to read these files are not provided. Electronic reports must be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate must reference traceable circuit numbers that match the electronic record.

I. Test reports shall include the following information for each cabling element tested:
   1. Wire map results that indicate the cabling has no shorts, opens, miswires, split, reversed, or crossed pairs, and end to end connectivity is achieved.

2. For Category 6A cabling: Attenuation, NEXT, PSNEXT, Return Loss, ELFEXT, and PSELFEXT data that indicate the worst case result, the frequency at which it occurs, the limit at that point, and the margin. These tests shall be performed in a swept frequency manner from 1 MHz to highest relevant frequency, using a swept frequency interval that is consistent with TIA and ISO requirements. Information shall be provided for all pairs or pair combinations and in both directions when required by the appropriate standards. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
3. Length (in meters), propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
4. Cable manufacturer, cable model number/type, and NVP
5. Tester manufacturer, model, serial number, hardware version, and software version
6. Circuit ID number and project name
7. Auto-test specification used
8. Overall pass/fail indication
9. Date of test
10. Test reports shall be submitted within 7 business days of completion of testing.

3.6 TEST EQUIPMENT

A. Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years experience in producing field test equipment. Manufacturers must be ISO 9001 certified.

B. All test tools of a given type shall be from the same manufacturer, and have ompatible electronic results output.

C. Test adapter cables must be approved by the manufacturer of the test equipment. Adapters from other sources are not acceptable.

D. Baseline accuracy of the test equipment must exceed TIA Level III, as indicated by independent laboratory testing.

E. Test equipment must be capable of certifying Category 6A and 6 links.

F. Test equipment must have a dynamic range of at least 100 dB to minimize measurement uncertainty.

G. Test equipment must be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.

H. Test equipment must include S-Band time domain diagnostics for NEXT and return loss (TDNXT and TDRL) for accurate and efficient troubleshooting.

I. Test equipment must be capable of running individual NEXT, return loss, etc measurements in addition to auto-tests. Individual tests increase productivity when diagnosing faults.

J. Test equipment must include a library of cable types, sorted by major manufacturer.

K. Test equipment must store at least 1000 Category 6A or 6 auto-tests in internal memory.

L. Test equipment must be able to internally group auto-tests and cables in project folders for good records management.

M. Test equipment must include DSP technology for support of advanced measurements.

N. Test equipment must make swept frequency measurements in compliance with TIA standards.

O. The measurement reference plane of the test equipment shall start immediately at the output of the test equipment interface connector. There shall not be a time domain dead zone of any distance that excludes any part of the link from the measurement.

3.7 MDF/IDF/CIDF INSTALLATION PARAMETERS

A. UTP cabling shall conform to a 6 foot separation requirement from main power panels, Switch gear and/or starter motors adjacent to the IDF and termination locations.

B. All data, voice and communications racks and cabinets shall be anchored in accordance with manufacturer specifications and drawn details, to walls and floors and grounded to building ground grid (not to water pipes, etc.). Individual or new ground points are acceptable.

C. All floor mounted racks and cabinets shall have ladder racking from top of rack or cabinet to nearest wall as directed by consultant.

D. Wall mounted racks and cabinets.
   1. Backboards shall be made of fire retardant or treated materials. Outside backboards shall be mounted squarely cut, with sanded edges, void free and painted. Backboards made from particle or pressed board materials are not acceptable. Backboards shall be a minimum size of ¾" thick x 36" wide x the height of the rack or cabinet. Backboard shall be painted with white fire-retardant paint.
   2. Inside backboards shall be mounted squarely cut, with sanded edges and void

free. Inside backboard shall match the inside dimensions of the installed cabinet. Inside backboard shall be a minimum thickness of ¾".

3. All new racks and cabinets shall be securely mounted to wall studs in accordance with manufacturer specifications and drawn details.

E. All new and existing racks and cabinets shall have a dedicated 110V/AC double duplex outlet installed per specification section, California Electrical Codes, and drawing details.

3.8 DOCUMENTATION AND DRAWINGS

A. As a pre-requisite for the acceptance of the work, the Contractor shall provide all of the following information. The Contractor shall prepare and provide 2 copies of a complete Cable Book as documentation. This cable book shall consist of the following:
   1. Title of Project
   2. Index page detailing the following sections
   3. Site plans (as-built drawings)
   4. Drawings shall be professionally drafted (to scale, within a border similar to design drawings) and reproducible. Hand written drawings are not acceptable.
   5. The drawings shall depict, at a minimum, the following conditions:
      a. The exact MDF/IDF/CIDF locations
      b. Size and routing of backbone cable from each IDF to the MDF.
      c. Station locations and their exact labeling ID(s) which shall match the physical label at the device.
      d. New pathways, conduit, ground boxes, junction boxes, raceway, power poles and floor monuments.
      e. Any other new conditions.
   6. Contractor shall provide 3 sets of as-built drawings, one of which shall be reproducible.
   7. In addition to the hard copy requirements, the as-builts, one of which shall be generated on Visio, and supplied to District. Media shall be recordable CD.
   8. The Contractor shall submit as-built drawings and media no later than 30 days after the installation date.
   9. Price list and contact information for emergency service work.

B. Fiber backbone test results
   1. In sequential order by IDF number

C. Data station cable test results
   1. In sequential order by IDF and then drop number.

D. Voice feeder test results.
   1. In sequential order by IDF number.
   2. Station/Feeder connectivity spread sheet (8-1/2" x 11" hard copy and electronic file, Microsoft Excel format).

E. Voice station cable test results.
   1. In sequential order by IDF number.
   2. Station/Feeder connectivity spread sheet (8-1/2" x 11"hard copy and electronic file, Microsoft Excel format).

F. Warranty certificates and documentation.

3.9 WARRANTY AND SUPPORT SERVICE

A. The warranty shall commence from the date of final written acceptance by the Owner.

B. All conditions for obtaining the manufacturer's Performance Warranty shall be the sole responsibility of the contractor.

C. The contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the owner after the end of the guarantee period.

D. A typewritten notice shall be posted at the equipment rack that shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.

E. Extended Product Warranty and Application Assurance:
   1. The 25 Year Extended Product Warranty shall ensure against product defects, that all approved cabling components exceed the specifications of TIA/EIA 568A and ISO/IEC IS 11801, exceed the attenuation and NEXT requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for cabling links/channels, that the installation will exceed the loss and bandwidth requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for fiber links/channels, for a twenty (20) year period. The warranty shall apply to all passive SCS components. The 20 Year Extended Product Warranty shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s) for a twenty (20) year period.
   2. The 25 Year Application Assurance shall cover the failure of the wiring system to support the application which it was designed to support, as well as additional application(s) introduced in the future, up to 1000 Mbps parallel transmission schemes, by recognized standards or user forums that use the TIA/EIA-568A or ISO/IEC IS 11801 component and link/channel specifications for cabling, for a twenty (20) year period.
   3. Upon successful completion of the installation and subsequent inspection, the Owner's Project Manager shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

F. One-Year Maintenance Service shall be provided as follows:
   1. Emergency Response: Contractor must respond by utilizing remote diagnostics

capabilities (as applicable) within thirty minutes of notification. If necessary, Contractor must dispatch at least one certified technician for arrival on-site within two hours of notification.

2. Non-Emergency Response: Contractor shall respond by utilizing remote diagnostics capabilities and or cause dispatch of at least one certified technician for arrival on-site within one business day of notification.
3. Definition of "Emergency": For maintenance purposes, "emergency" shall be defined as one or more of the following conditions:
   a. Defects of any riser pairs and/or components involving at least ten percent (10%) of any riser cable's capacity.
   b. Defects of station cable pairs and/or components involving at least ten percent (10%) of any department or group of voice and/or data stations.
   c. Defects significantly impairing any single attendant console.
   d. Defects of any fiber optic cable and/or components involving at least ten percent (10%) of any departments or groups fiber-based systems and/or stations.
   e. Any pre-defined failure as submitted by Owner and agreed to by Contractor.

G. Contractor shall provide extra service upon request on a 24 hour-a-day, 365 day-a-Year basis. Pricing for such service shall be described in the "Cable Book" Documentation.

3.10 FINAL ACCEPTANCE

A. The Owner or Owner's representative may visit the site during the installation of the system to ensure that correct installation practices are being followed.

B. The Owner or Owner's representative will conduct a final job review once the contractor has finished the job. The review will take place within one week after the contractor notifies the owner.

C. Two copies of all certification data and drawings for all identifications shall be provided to the Owner before the Owner's review.

D. The Owner or Owner's representative will review the installation and certification data prior to the system acceptance.

E. The Owner or Owner's representative may test some of the systems features to ensure that the certification data is correct. If a substantial discrepancy is found, the Owner reserves the right to have an independent consultant perform a certification of the entire system. If such a procedure is undertaken, the cost of the testing will be billed back to the contractor.

F. In the event that repairs or adjustments are necessary, the contractor shall make these repairs at his own expense. All repairs shall be completed within 10 days from the time they are discovered.

END OF SECTION

SECTION 27 76 00

PUBLIC ADDRESS and CLOCK SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Refer to the General Conditions and all other Section of Division.

1.2 DESCRIPTION OF WORK

A. Disconnect existing speakers and provide and install new and connect to existing campus system.:

B. Related work included in other Sections:

1. Section 26 01 00, General Electrical Requirements, applies all work in this Section.

2. Basic Construction Materials and Methods: Section 26 05 00.

3. Complete installation and wiring of each device. The systems shall include conduit, outlet boxes, wiring devices, signaling facilities, programming, staff training and other items as specified.

4. Provide all incidental work and materials involved in installation of the signal equipment including carpentry or structural work for support of junction boxes, conduits, control panels, outlets, etc.

1.3 SUPERVISION AND QUALITY OF WORK

A. The Contractor shall supervise the work of this section, personally, or through an authorized and competent representative.

B. All material and equipment shall be installed in a neat manner. Any material or equipment not installed in the manner described shall upon the order of the Architect, Engineer or District be removed and replaced in satisfactory manner. No additional expense shall be allowed to repair work required.

C. The Contractor shall carefully study and compare all drawings, specifications and other instructions and shall at once report, prior to bid, to the Engineer via the Architect any error, inconsistency or omission that may be discovered.

1.4 CONTRACTOR

A. The contractor shall furnish all equipment, accessories and material required for the installation of a comprehensive communication system in strict compliance with these specifications and applicable contract drawings. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this specification.

1.5 SUBMITTALS AND SUBSTITUTIONS

A. Within thirty-five (35) calendar days after the date of award of the contract, the contractor shall submit to the Architect for review, eight (8) copies of a complete submission. The submission shall consist of five (5) major sections, with each section separated with insertable index tabs. The first section shall be the "index", which shall include the project title and address, name of the firm submitting the proposal and the name of the Architect. Each page in the submission shall be numbered chronologically and shall be summarized in the index. The second section shall include a copy of the authorized distributor's valid C-10 California State Contractors License, letters of factory authorization and guaranteed service, list of projects of equal scope and list of proposed instrumentation to be used by the contractor. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications. The fifth section shall contain a wiring destination schedule for each circuit leaving each piece of equipment.

B. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state the manufacturer guarantees service performance for the life of the equipment, and that there will always be an authorized distributor assigned to service the area in which the system has been installed.

1.6 QUALIFICATIONS

A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.

B. As further qualification for bidding and participating in the work under this specification the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of California. The manufacturer's representative shall have completed at least fifty (50) projects of equal scope, giving satisfactory performance and have been in the business of furnishing and installing sound systems of this type for at least twenty (20) years. The manufacturer's representative shall be capable of being

bonded to assure the owner of performance and satisfactory service during the guarantee period.

1.7 EQUIPMENT WARRANTY

A. The contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of two (2) years after final acceptance of the project by the owner.

1.8 SERVICE FACILITIES

A. The contractor shall make available, and maintain a satisfactory service department capable of furnishing equipment inspection and service. The contractor shall be prepared to offer a service contract for the maintenance of the system beyond the warranty period.

1.9 TRAINING

A. The contractor shall instruct personnel designated by the owner in the proper use, basic care, and maintenance of the equipment. Such training shall be provided as an integral component of the system.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The manufacturer shall be a United States manufacturer, who has been regularly engaged in the manufacture of communication systems for at least thirty (30) years. The equipment described herein, and furnished per these specifications shall be the product of one manufacturer. All reference to model numbers and other detailed descriptive data is intended to establish standards of design, performance and quality, as required.

B. The communications system shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as E.T.L., D.S. & G., or UL and be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, including NEC Section 800-51 (i), under direction of a qualified and factory approved distributor, to the approval of the owner.

C. The system is to be designed and configured for maximum ease of service and repair. All major components of the system shall be designed as a standard component of one type of card cage. All internal connections of the system shall be with factory keyed plugs designed for fault-free connection. The printed circuit

card of the card cage shall be silk screened to indicate the location of each connection.

D. Manufactures: Subject to compliance with requirements specifications, provide the following system:

1. Match existing one site.

E. The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.

F. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

2.2 SYSTEM PARAMETERS

A. Intercom/Paging System Speakers

1. Interior Speakers shall be match existing on campus:

a. Surface Wall Speakers: MB8TSQ/SL Metal Box Speakers

b. Surface Wall Speakers:WBS8T725 Wood Baffle Speakers

2.3 TERMINAL BLOCKS

A. All conductors in all-terminal cabinets, equipment rack, etc., shall be terminated on Siemens 66M1-50 punch blocks or approved equal.

2.4 WIRING CABLES

A. Each Speaker to console: West Penn 357.

B. All cables and wires shall be Copper and shall be installed in raceways per C.E.C. Code. All conductors and wires shall be new when delivered to the job site in unbroken packages, with the manufacturer's name and voltage class that shall be plainly indicated on cables and wires.

C. All cables and wires shall be National, General Electric, General Cable, West Penn or approved equal. All conductors installed in underground conduit shall be type "THWN" or UL listed for wet location or direct burial.

PART 3 – EXECUTION

3.1 DIVISION OF WORK

A. While all work included under this specification is the complete responsibility of the contractor, the division of actual work listed following shall occur.

B. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work shall be furnished and installed completely by the electrical contractor. The manufacturer's authorized representative shall perform the balance of the system, including installation of speakers and equipment, making all connections, etc. The entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

3.2 INSTALLATION

A. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.

B. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material ("cat-track") shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.

C. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall be a unique number, located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.

D. Shielding: Cable shielding shall be connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.

E. Provide complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.

3.3 GROUNDING

A. The Contractor shall provide all necessary grounding for the entire system in accordance with and required by the National Electric Code, and the State of California "Safety Orders".

3.4 TEST AND ADJUSTING

A. The Contractor shall furnish all required test instruments and equipment. Each piece of equipment and the entire systems shall be adjusted and readjusted to insure proper function of all equipment, elimination of noise, and vibration and left improper operating condition.

3.5 ACCEPTANCE

A. Before the work shall be accepted, the Electrical Contractor shall demonstrate to the District and the Engineer that the entire installation is complete and in proper operating condition and the Contract has been properly and fully executed.

B. Upon acceptance of the work, the Contractor shall deliver to the District a written guarantee to the effect that all parts of the work, including all individual items of equipment and materials and the systems as a whole, shall be free from defects for a period of one year. Upon proper notice, the Contractor shall make good, at their expense any defect that develops or becomes apparent during this period.

END OF SECTION

SECTION 27 96 00

INTRUSION ALARM SYSTEM

1.1 RELATED DOCUMENTS

A. Refer to the General Conditions and all other Section of Division.

1.2 DESCRIPTION OF WORK

A. Replace existing head-in equipment with new per drawings and Attachment B.

B. Provide new motion sensors, backboxes, conduit and wire as shown on contract drawings and connect to new system.

C. Visit site prior to bid and verify and provide all required zone expanders and any other required equipment for a completely operational system.

D. Related work included in other Sections:

1. Section 26 01 00, General Electrical Requirements, applies all work in this Section.

2. Basic Construction Materials and Methods: Section 26 05 00.

3. Grounding: Section 26 05 26.

4. Complete installation and wiring of each device. The systems shall include conduit, outlet boxes, wiring devices, signaling facilities, programming, staff training and other items as specified.

5. Provide all incidental work and materials involved in installation of the signal equipment including carpentry or structural work for support of junction boxes, conduits, control panels, outlets, etc.

1.3 SUPERVISION AND QUALITY OF WORK

A. The Contractor shall supervise the work of this section, personally, or through an authorized and competent representative.

B. All material and equipment shall be installed in a neat manner. Any material or equipment not installed in the manner described shall upon the order of the Architect, Engineer or District be removed and replaced in satisfactory manner. No additional expense shall be allowed to repair work required.

C. The Contractor shall carefully study and compare all drawings, specifications and other instructions and shall at once report, prior to bid, to the Engineer via the Architect any error, inconsistency or omission that may be discovered.

1.4 CONTRACTOR

A. The contractor shall furnish all equipment, accessories and material required for the installation of a comprehensive communication system in strict compliance with these specifications and applicable contract drawings. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this specification.

1.7 EQUIPMENT WARRANTY

A. The contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of one (1) year after final acceptance of the project by the owner.

PART 2 - PRODUCTS

2.1 WIRING

A. Keypads – 2 twisted pair – size per manufacturer's requirements.

B. Motion Sensors/Door Contacts – Inside buildings – Per Attachement B.

2. 2 MOTION SENSORS

A. Per Attachment B.

2. 3 KEYPADS

A. Per Attachment B.

PART 3 – EXECUTION

3.1 GENERAL

A. While all work included under this specification is the complete responsibility of the contractor, the division of actual work listed following shall occur.

B. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work shall be furnished and installed completely by the electrical contractor. The

manufacturer's authorized representative shall perform the balance of the system, including installation of speakers and equipment, making all connections, etc. The entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

C. No T-tapping will be allowed.

D. No splices shall be allowed.

E. Connect all phone cables between the control panel and the phone board.

F. Program panel per requirements of school. Contact maintenance department for any other special programming that may be necessary.

3.2 INSTALLATION

A. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material ("cat-track") shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.

B. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall be a unique number, located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.

3.3 GROUNDING

A. The Contractor shall provide all necessary grounding for the entire system in accordance with and required by the National Electric Code, and the State of California "Safety Orders".

3.4 TEST AND ADJUSTING

A. The Contractor shall furnish all required test instruments and equipment. Each piece of equipment and the entire systems shall be adjusted and readjusted to insure proper function of all equipment, elimination of noise, and vibration and left improper operating condition.

3.5 ACCEPTANCE

A. Before the work shall be accepted, the Electrical Contractor shall demonstrate to the District and the Engineer that the entire installation is complete and in proper operating condition and the Contract has been properly and fully executed.

B. Upon acceptance of the work, the Contractor shall deliver to the District a written guarantee to the effect that all parts of the work, including all individual items of equipment and materials and the systems as a whole, shall be free from defects for a period of one year. Upon proper notice, the Contractor shall make good, at their expense any defect that develops or becomes apparent during this period.

END OF SECTION

SECTION 28 31 00

NETWORKED FIRE ALARM SYSTEM

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Attachment A – OUSD Fire Alarm Standards.

1.2 DESCRIPTION

A. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

B. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.

C. The system shall be able to support additional, alternate Fire Command Centers, which shall be capable of simultaneous monitoring of all system events. Alternate Fire Command Centers shall also support an approved method of transferring the control functions to an alternate Fire Command Center when necessary. All Fire Command Centers shall be individually capable of assuming Audio Command functions such as Emergency Paging, audio zone control functions, and Firefighter's Telephone communication functions.

D. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.

E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof). It's acceptable for peripheral devices to be manufactured outside of the U.S. by a division of the U.S. based parent company.

F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.3 SCOPE:

A. Provide and install new voice evacuation system in new portable buildings and connect to existing Simplex 4100 ES fire alarm control panel. Provide required card upgrades to update existing panel to provide voice evacuation to new portables. Existing system in existing buildings is a horn/strobe system which shall remain.

B. See Attachment A for Oakland Unified School District Standards. All standards shall be adhered to for this project.

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on Class B Signaling Line Circuits (SLC).
2. Device Circuits (IDC) shall be wired Class B as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class B as part of an addressable device connected by the SLC Circuit.
4. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
6. Speaker circuits may be controlled by NAC outputs built into the amplifiers, which shall function as addressable points on the Digital Audio Loop.
7. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone which ever is greater.
8. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
9. NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.
10. Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.
11. Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per smoke zone.
12. Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.

13. Audio amplifiers and tone generating equipment shall be electrically supervised for abnormal conditions. Digital amplifiers shall provide built-in speaker circuits, field configurable as four Class B (Style Y) circuits.
14. Digital amplifiers shall be capable of storing up to two minutes of digitally recorded audio messages and tones. The digital amplifiers shall also be capable of supervising the connection to the associated digital message generator, and upon loss of that connection shall be capable of one of the following system responses:

    a. The digital amplifier shall automatically broadcast the stored audio message.
    b. The digital amplifier shall switch to a mode where a local bus input on the digital amplifier will accept an input to initiate a broadcast of the stored message. This bus input shall be connected to a NAC on a local FACP for the purpose of providing an alternate means of initiating an emergency message during a communication fault condition.
    c. Speaker circuits shall be either 25 VRMS or 70VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.
    d. Two-way emergency telephone (Fire Fighter Telephone) communication shall be supported between the Audio Command Center and up to seven (7) remote Fire Fighter's Telephone locations simultaneously on a telephone riser.
    e. Means shall be provided to connect FFT voice communications to the speaker circuits in order to allow voice paging over the speaker circuit from a telephone handset.
    f. The digital audio message generator shall be of reliable, non-moving parts, and support the digital storage of up to 32 minutes of tones and emergency messages, shall support programming options to string audio segments together to create up to 1000 messages, or to loop messages and parts of messages to repeat for pre-determined cycles or indefinitely.

1.4 GUARANTEE:

A. The fire alarm control panel, voice panels and any head-end equipment shall have a manufacturer’s warranty of a minimum of 3 years.

1.5 SUBMITTALS

A. Submittals: Furnish catalog data, shop drawings, one-line diagrams, and scaled plan drawings. Building plans shall be *1/8”=1’0”,* and site plans shall be no smaller than 1”=40’. Minimum text height shall be 3/32” high. Contractor shall also submit name of firm he proposes to do work under this Section, ad

dresses, phone numbers, and name of firm's contact, for approval. Such firms shall be factory authorized representatives of the equipment specified, who shall furnish all equipment, make all connections to same, and place the systems in operation. Such firms shall have offices and service departments within a 100 mile radius of project and shall have been in business of this type for at least five years. Copies of WKM design drawings are not acceptable for submittal drawings. Two submittal reviews will be made by the Architect's representative. Subsequent reviews will be charged to the Contractor. A rejection of a submittal or review of a partially presented submittal constitutes one submittal review.

1.6 POST CONTRACT MAINTENANCE:

A. Complete maintenance and repair service for the fire detection system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, required tests, and list pricing for any replacement products included on the bill of materials, along with the list pricing for products not on the bill of materials; if test and inspection rates are different than full service rates the bid/proposal shall include pricing for all levels for a minimum period of five (5) years Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

D. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

E. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.

F. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the

cost of initiating devices or notification appliances connected to the addressable monitor/control modules.

G. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.7 APPLICABLE STANDARDS AND SPECIFICATIONS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

B. National Fire Protection Association (NFPA) - USA:

No. 12	Extinguishing Systems (low and high)
No. 12A	Halon 1301 Extinguishing Systems
No. 13	Sprinkler Systems
No. 15	Water Spray Systems
No. 16	Foam / Water Deluge and Spray Systems
No. 17	Dry Chemical Extinguishing Systems
No. 17A	Wet Chemical Extinguishing Systems
No. 2001	Clean Agent Extinguishing Systems
No. 70	National Electric Code
No. 90A	Air Conditioning Systems
No. 92A	Smoke Control Systems
No. 92B	Smoke Management Systems in Malls, Atria, Large Areas
No. 72	National Fire Alarm Code

C. Underwriters Laboratories Inc. (UL) - USA:

No. 268	Smoke Detectors for Fire Protective Signaling Systems
No. 864	Control Units for Fire Protective Signaling Systems
No. 2572	Mass Notification Systems
No. 217	Smoke Detectors, Single and Multiple Station
No. 228	Door Closers - Holders for Fire Protective Signaling Systems
No. 268A	Smoke Detectors for Duct Applications
No. 521	Heat Detectors for Fire Protective Signaling Systems
No. 464	Audible Signaling Appliances
No. 38	Manually Actuated Signaling Boxes
No. 1481	Power Supplies for Fire Protective Signaling Systems
No. 346	Waterflow Indicators for Fire Protective Signaling Systems
No. 1076	Control Units for Burglar Alarm Proprietary Protective Signaling Systems
No. 1971	Visual Notification Appliances

No. 2017	Standard for General-Purpose Signaling Devices and Systems
No.60950	Safety of Information Technology Equipment

D. Local and State Building Codes.

E. All requirements of the Authority Having Jurisdiction (AHJ).

1.8 APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL	Underwriters Laboratories, Inc
FM	Factory Mutual
CSFM	California State Fire Marshal

B. The system shall be certified for seismic applications in accordance with the California Building Code (CBC). The basis for qualification of seismic approval shall be via shake table testing.

PART 2 - PRODUCTS

2.1 MAIN FIRE ALARM CONTROL PANEL:

A. Existing FACP is a Simplex 4100 ES. Make revisions required per plans and provide devices and connectivity per Attachment A.

B. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:

1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.
3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.

2.2 System Capacity and General Operation

A. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels / nodes per network.

B. The control panel shall be capable of expansion via up to 10 SLC loops. Each module shall support up to 318 analog/addressable devices for a maximum system capacity of 3180 points. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a keypad for the control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either company.

C. All programming or editing of the existing program in the system shall be achieved without interrupting the alarm monitoring functions of the fire alarm control panel.

D. The FACP shall be able to provide the following software and hardware features:

1. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.
2. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.
3. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
4. Action: If programmed for Action and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on Alarm level.
5. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.

6. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
7. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the sensitivity testing requirements of NFPA 72.
8. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.
9. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop. A single change to one CPU database shall not require a database download to other CPUs.
10. History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.
11. Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.
12. The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
13. Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
14. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions
15. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
16. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.

17. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
18. Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
19. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.
20. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.
21. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector with up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result ofall cooperating detectors chamber readings.
22. ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.
23. NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.
24. Mass Notification Override:The system shall be UL 2572 listed for Mass Notification and shall be capable, based on the Risk Analysis, of being programmed so that Mass Notification/Emergency Communications events take precedence over fire alarm events.
25. Security Monitor Points: The system shall provide means to monitor any point as a type security.
26. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an

advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.

27. Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.
28. Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.
29. 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.
30. 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.
31. 100 trouble equations per device: The system shall provide support for up to 100 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.
32. Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.
33. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.
34. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector. The timer function shall delay an alarm signal for a user-

specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

35. Secure/Access Operation: The system shall have the capability of configuring input modules to monitor status of door contact or other security type sensors. These input modules shall be able to be commanded from the normally 'Secure' state to an 'Access' state. While in the secure state, the module will transmit alarm conditions to the controller, which shall be annunciated on the LCD and LED displays. The modules shall be placed into the Access state either through the LCD display or through predefined operator keys. While in the Access state, all alarms from the module will be shunted. Placing the module into the access state shall cause a discrete LED associated with input point to flash, but no other trouble or disable condition will be annunciated. Change from Secure to Access and reverse shall be transmitted to the central monitoring station on a per zone basis. Systems that cause or indicate a trouble or disable condition are unacceptable.

E. Network Communication

1. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels/nodes per network.

F. Central Processing Unit

1. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
2. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
3. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
4. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.

5. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
6. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.

G. Display

1. The system display shall provide a 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide eleven Light-Emitting-Diodes (LEDs) that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, CONTROLS ACTIVE, and CPU FAILURE.
2. The system display shall provide a keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

H. Loop (Signaling Line Circuit) Control Module:
1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Ionization, Photoelectric, or Thermal) and 159monitor or control modules.
2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. Each Loop shall be capable of operating as a NFPA Style 4 (Class B) circuit. Fault isolation modules shall be installed between each addressable SLC device per the manufacturers installation instructions. Systems which cannot provide full loop loading in Style 7 configurations are not acceptable.
4. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

I. Digital Voice Command Center

1. The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.
2. Function: The Voice Command Center equipment shall perform the following functions:

    a. Operate as a supervised multi-channel emergency voice communication system.
    b. Operate as a two-way emergency telephone system control center.
    c. Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
    d. Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
    e. Provide all-call Emergency Paging activities through activation of a single control switch.
    f. As required, provide vectored paging control to specific audio zones via dedicated control switches.
    g. Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.
    h. Provide a software utility capable of off-line programming for the DVC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the DVC shall not inhibit the emergency operation of other nodes on the fire alarm network.
    i. Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SLC controlled switching.
    j. The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.
    k. The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

J. Power Supply:

1. The Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
2. The Main Power Supply shall provide the required power to the CPU using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.

3. The Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 7-200 amp-hours within a 48-hour period.
4. The Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
5. The Main Power Supply shall be power-limited per UL864 requirements.
6. The Main Power Supply shall communicate power supply, line voltage, battery status and charger status to the local LCD display. Any abnormal condition shall be annunicated and logged to the system alarm history log.
7. Addressable Charger Power SupplyThe auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24 VDC power.
8. The addressable power supply for the fire detection system shall provide up to a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 10.0 amps of 24 volt DC general power. The power supply shall have an additional 0.5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 12 - 200 amp hour batteries.
9. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as Class "B" circuits. All circuits shall be power-limited per UL 864 requirements.
10. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
11. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
12. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire.
13. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
14. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of zero, two, eight or sixteen hours shall be programmable.
15. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be programmable.
16. The addressable power supply mounts in either the FACP backbox or it's own dedicated surface mounted backbox with cover.

17. Each of the power supply's four output circuits shall be programmed- for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
18. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "B" or by the use of and end-of-line resistor. When the power supply's output circuit is selected as General 24 VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
19. When selected for Notification Appliance Circuits, the output circuits shall be individually programmable for Temporal.
20. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
21. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
22. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

K. Audio Amplifiers

1. The Audio Amplifiers will provide Audio Power () for distribution to speaker circuits.
2. Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).
3. The audio amplifier shall include an integral power supply, and shall provide built-in LED indicators for the following conditions:

    a. Earth Fault on DAP A (Digital Audio Port A)
    b. Earth Fault on DAP B (Digital Audio Port B)
    c. Audio Amplifier Failure Detected Trouble
    d. Active Alarm Bus input
    e. Audio Detected on Aux Input A
    f. Audio Detected on Aux Input B
    g. Audio Detected on Firefighter's Telephone Riser
    h. Receiving Audio from digital audio riser
    i. Short circuit on speaker circuit 1
    j. Short circuit on speaker circuit 2
    k. Short circuit on speaker circuit 3
    l. Short circuit on speaker circuit 4
    m. Data Transmitted on DAP A
    n. Data Received on DAP A
    o. Data Transmitted on DAP B

p. Data Received on DAP B
q. Board failure
r. Active fiber optic media connection on port A (fiber optic media applications)
s. Active fiber optic media connection on port B (fiber optic media applications)
t. Power supply Earth Fault
u. Power supply 5V present
v. Power supply conditions - Brownout, High Battery, Low Battery, Charger Trouble

4. The audio amplifier shall provide the following built-in controls:

a. Amplifier Address Selection Switches
b. Signal Silence of communication loss annunciation Reset
c. Level adjustment for background music
d. Enable/Disable for Earth Fault detection on DAP A
e. Enable/Disable for Earth Fault detection on DAP A
f. Switch for 2-wire/4-wire FFT riser

5. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
6. Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).
7. System shall be capable of backing up digital amplifiers.
8. One-to-one backup shall be provided by either a plug-in amplifier card or a designated backup amplifier of identical model as the primary amplifier.
9. One designated backup amplifier shall be capable of backing up multiple primary amplifiers mounted in the same or adjacent cabinets.
10. Multi-channel operation from a single amplifier shall be supported by the addition of an optional plug-in amplifier card.

L. Audio Message Generator (Prerecorded Voice)/Speaker Control:

1. Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.
2. Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.
3. A built-in microphone shall be provided to allow paging through speaker circuits.
4. System paging from emergency telephone circuits shall be supported.
5. The audio message generator shall have the following indicators and controls to allow for proper operator understanding and control:

a. Lamp Test

b. Trouble
c. Off-Line Trouble
d. Microphone Trouble
e. Phone Trouble
f. Busy/Wait
g. Page Inhibited
h. Pre/Post Announcement Tone

M. Controls with associated LED Indicators:

1. Speaker Switches/Indicators

a. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
b. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.

2. Emergency Two-Way Telephone Control Switches/Indicators

a. The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.
b. The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

N. Remote Transmissions:

1. Provide local energy or polarity reversal or trip circuits as required.
2. The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.
3. Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.
4. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

O. Field Programming

1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.

2. All field defined programs shall be stored in non-volatile memory.Two levels of password protection shall be provided in addition to a key-lock cabinet. One level shall be used for status level changes such as point/zone disable or manual on/off commands (Building Manager). A second (higher-level) shall be used for actual change of the life safety program (installer). These passwords shall be five (5) digits at a minimum. Upon entry of an invalid password for the third time within a one minute time period an encrypted number shall be displayed. This number can be used as a reference for determining a forgotten password. .
3. The system programming shall be "backed" up via an upload/download program, and stored on compatible removable media. A system back-up disk shall be completed and given in duplicate to the building owner and/or operator upon completion of the final inspection. The program that performs this function shall be "non-proprietary", in that, it shall be possible to forward it to the building owner/operator upon his or her request.
4. The installer's field programming and hardware shall be functionally tested on a computer against known parameters/norms which are established by the FACP manufacturer. A software program shall test Input-to-Output correlations, device Type ID associations, point associations, time equations, etc. This test shall be performed on an IBM-compatible PC with a verification software package. A report shall be generated of the test results and two copies turned in to the engineer(s) on record.

P. Specific System Operations

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 0 to 60 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

Q. System Point Operations:

1. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
2. System output points shall be capable of being turned on or off from the system keypad or the video terminal.

3. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:

    a. Device Status.
    b. Device Type.
    c. Custom Device Label.
    d. Software Zone Label.
    e. Device Zone Assignments.
    f. Analog Detector Sensitivity.
    g. All Program Parameters.

4. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.
5. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
7. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

W. System Maintenance Analysis and Reporting

1. The system shall automatically track NFPA 72 installation and testing requirements for all addressable devices to ensure that every device is functionally tested upon installation and then periodically as required by the Code.
2. If after twelve months any device has not been functionally tested a led shall illuminate on the CPU or Network annunciator indicating the device that needs testing.
3. The system shall automatically track device testing to ensure that a visual inspection is performed at least semi-annually.

4. If after six months a device has not been indicated as "visually inspected" a led shall illuminate on the CPU or Network annunciator indicating the device that needs testing.
5. A hand-held IR tool may be used to interact with each SLC device to indicate that a visual inspection has been performed. The IR device will explicitly identify the device by loop and address to ensure the correct visual inspection has been performed.
6. A comprehensive report shall be available from the laptop programmer which shows a predictive report of all devices that have upcoming testing requirements. These reports shall be configurable as either 30, 60 or 90 day predictive, current status, and "all database."
7. Systems that do not automatically track the individual testing requirements of the field devices will not be accepted.

2.3 SYSTEM COMPONENTS:

A. Fixed Emergency Telephone Handset

1. The telephone cabinet shall be painted red and clearly labeled emergency telephone. The cabinets shall be located where shown on drawings.
2. The handset cradle shall have a switch connection such that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition.
3. The two-way emergency telephone system shall support a maximum of seven (7) handsets on line (off hook) without degradation of the signal.

B. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.

1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.
3. The UDACT shall be capable of transmitting events in 4+2, SIA, and Contact ID.
4. Communication shall include vital system status such as:

    a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
    b. Independent Addressable Device Status
    c. AC (Mains) Power Loss

d. Low Battery and Earth Fault
e. System Off Normal
f. 12 and 24 Hour Test Signal
g. Abnormal Test Signal (per UL requirements)
h. EIA-485 Communications Failure
i. Phone Line Failure

5. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 3,064 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
6. The UDACT shall be capable of being programmed with the same programming utility as the host FACP, and saved, edited and uploaded and downloaded using the utility. UDACT shall be capable of being programmed online or offline. The programming utility shall also support upgrading UDACT operating firmware.
7. The UDACT shall be capable of generating Central Station reports providing detailed programming information for each point along with the central station point address.
8. An IP or IP/GSM Communicator option shall be available to interface to the UDACT and be capable of transmitting signals over the internet/intranet or Cellular (GSM) network to a compatible receiver.

C. Field Wiring Terminal Blocks

1. For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.

D. Printer

1. The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.
2. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via

battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

3. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices – General

1. Addressable devices shall provide an address-setting means using rotary decimal switches. Addressable devices that require the address be programmed using a programming utility are not an allowable substitute.
2. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
3. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
4. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
5. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
6. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
7. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
8. Using software in the FACP, 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 72.
9. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.

10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
11. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
12. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
14. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

B. Addressable Manual Fire Alarm Box (manual station)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status; They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

C. Intelligent Photoelectric Smoke Detector: The intelligent photoelectric smoke detector shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

D. Intelligent Thermal Detectors: The intelligent thermal detectors shall be be rated at 135 degrees or 150 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.

E. Intelligent Duct Smoke Detector: The smoke detector housing shall accommodate an intelligent photoelectric detector that provides continuous analog monitoring and alarm verification from the panel. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken

to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system. The Intelligent Duct Smoke Detector shall support the installation of addressable Photoelectric detector capable or being tested remotely. The Intelligent Duct Detector housing shall be model # FSD-751PL.

F. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
2. The IDC zone shall be suitable for Style B/Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
4. For multiple dry contact monitoring a module shall be available that provides 10 Style B or 5 Style D input circuits.

G. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional circuit of compatible Notification Appliances, 24 VDC powered, polarized audio/visual notification appliances.
2. The control module NAC may be wired for Style Y (Class B) with a current rating of and 3 Amps for Style Y;
3. Audio/visual power shall be provided by a separate supervised circuit from the main fire alarm control panel or from a supervised UL listed remote supply.

H. Addressable Relay Module:

1. Addressable Relay Modules shall be available for HVAC control and other network building functions.
2. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.
3. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% of all auxiliary devices energize at the same time on the same pair of wires;
4. For multiple relay control a module shall be available that provides 6 programmable Form-C relays.

I. Isolator Module: Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class B branch. The isolator module shall

limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

1. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
2. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
3. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

J. Serially Connected Annunciator Requirements

1. The annunciator shall communicate to the fire alarm control panel via an EIA 485 (multi-drop) two-wire communications loop. The system shall support two 6,000 ft. EIA-485 wire runs. Up to 32 annunciators, each configured up to 96 points, may be connected to the connection, for a system capacity of 3,072 points of annunciation.
2. An EIA-485 repeater shall be available to extend the EIA-485 wire distance in 3,000 ft. increments. The repeater shall be UL864 approved.
3. Each annunciator shall provide up to 96 alarm and 97 trouble indications using a long-life programmable color LED's. Up to 96 control switches shall also be available for the control of Fire Alarm Control Panel functions. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge and lamp test switch, and custom zone/function identification labels.
4. The annunciator may be field configured to operate as a "Fan Control Annunciator". When configured as "Fan Control," the annunciator may be used to manually control fan or damper operation and can be set to override automatic commands to all fans/dampers programmed to the annunciator.
5. Annunciator switches may be programmed for System control such as, Global Acknowledge, Global Signal Silence, Global System Reset, and on/off control of any control point in the system.
6. An optional module shall be available to utilize annunciator points to drive EIA-485 driven relays. This shall extend the system point capacity by 3,072 remote contacts.
7. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

K. Speakers

1. The speaker shall be listed to UL 1480 for Fire Protective Signaling Systems. It shall be a dual-voltage transformer speaker capable of

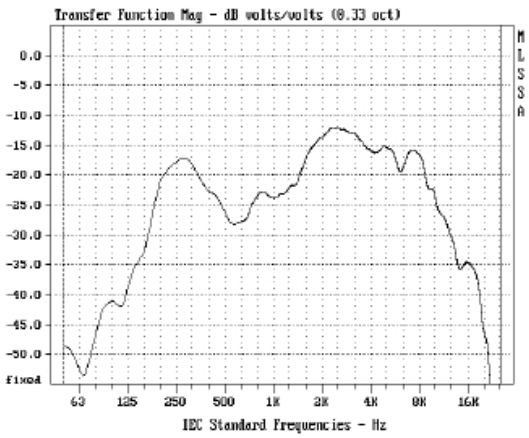
operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.

2. A universal mounting plate shall be used for mounting ceiling and wall speaker products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.
3. Speakers shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker design shall isolate speaker components to reduce ground fault incidents.
4. The speaker shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction.
5. All notification appliances shall be backward compatible.

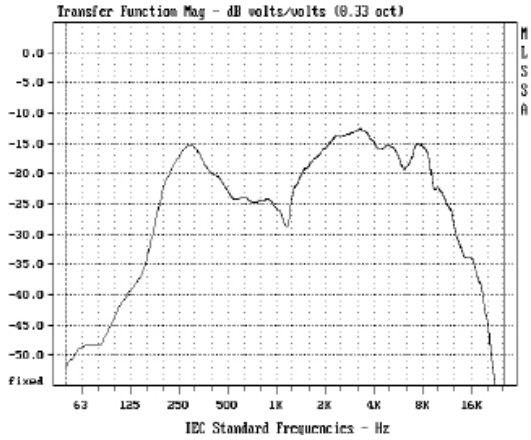
Ceiling Speaker

Wall Speaker

Wide Band Frequency Response



Wide Band Frequency Response



Note: The wide band frequency response is derived using MLS methods

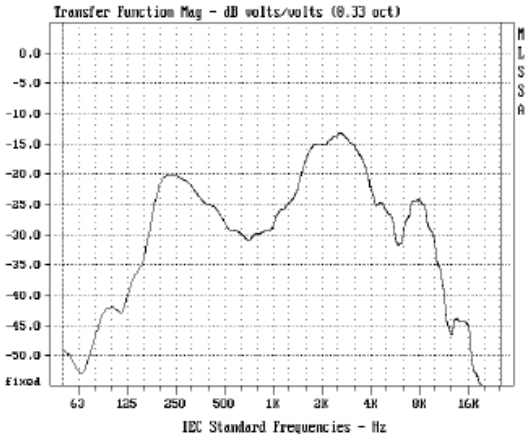
L. Speaker Strobes

1. The speaker strobe shall be listed to UL 1971 and UL 1480 and be approved for fire protective signaling systems. It shall be a dual-voltage transformer speaker strobe capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker strobe products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.

3. Speaker strobes shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker strobe design shall isolate speaker components to reduce ground fault incidents.
4. The speaker strobe shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12V or 24V. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12V and 15, 15/75, 30, 75, 110, or 115 when operating on 24V. The strobe shall comply with NFPA 72 and the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range.
5. All notification appliances shall be backward compatible.

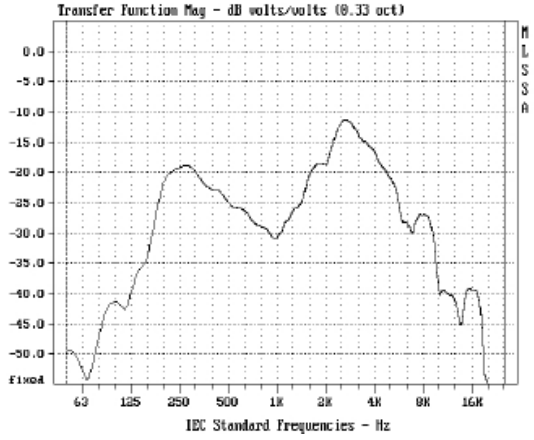
Ceiling Speaker Strobe

Wide Band Frequency Response



Wall Speaker Strobe

Wide Band Frequency Response



Note: The wide band frequency response is derived using MLS methods

6. Strobe lights shall meet the requirements of the ADA, UL Standard 1971and be fully synchronized.

PART 3 - EXECUTION

3.1. INSTALLATION:

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2. TEST:

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72.

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 flow valve and verify proper supervisory alarm at the FACP.

C. Verify activation of all waterflow 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 notification appliance circuits and verify that trouble signal actuates.

G. Ground all circuits and verify response of trouble signals.

H. Check presence and audibility of tone at all alarm notification devices.

I. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

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 shall 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.

3.3. FINAL INSPECTION:

A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4. INSTRUCTION

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION

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SECTION 31 10 00

SITE CLEARING

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.

B. Comply with rules and regulations of State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Subchapter 4, "Construction Safety Order."

C. Comply with applicable local and state agencies having jurisdiction.

D. Comply with governing EPA notification regulations.

E. Comply with Waste Diversion Specifications

1.02 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities.
8. Temporary erosion and sedimentation control.
9. The salvage of materials noted on drawings to be reinstalled.

B. Related Requirements:

1. Section 01 50 13 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
2. Section 02 41 19 - SELECTIVE DEMOLITION

1.03 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction as indicated on Drawings.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.04 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.05 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Provide Erosion Control Measures Material Submittals and Plan
Topsoil stripping and stockpiling program.

C. Rock stockpiling program.

D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.06 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.07 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property or the public Right-of-Way until directed by District Representative and all required permits are active.

C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Utility Locator Service: Notify Call Before You Dig (1.800.227.2600) before site clearing.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

F. Tree- and Plant-Protection Zones: Protect according to the landscape drawings and as directed by the Project Arborist or District Representative.

G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #23 (surface-tolerant, anticorrosive metal primer), or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed per the landscape drawings.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the Stormwater Pollution Prevention Plan (SWPPP) and erosion- and sedimentation-control Drawings and Notes and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.03 TREE AND PLANT PROTECTION

A. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations based on the landscape drawings.

3.04 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.

C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify District Representative not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without District Representative's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.05 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction as approved by District Representative.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of eighteen inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and stockpile in areas approved by District Representative and coordinate with the Landscape Architect on potential re-use on-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of eight inches, and compact each layer to a density equal to adjacent original ground.

3.06 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects larger than two inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to seventy-two inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.07 STOCKPILING ROCK

A. Remove from construction area naturally formed rocks that measure more than one foot across in least dimension. Do not include excavated or crushed rock.

   1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than two inches in diameter; trash, debris, weeds, roots, and other waste materials.

B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.

   1. Limit height of rock stockpiles to thirty-six inches.
   2. Do not stockpile rock within protection zones.
   3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.

3.08 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.
   3. Remove all artifact building foundations that remain within the excavation footprint of the new building.

3.09 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property in compliance with the District, City, County, and State regulations.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work. Comply with the Waste Diversion Plan and Specs.

C. Any Construction Waste shall be disposed of off of the Owner’s property per Spec Section 01 50 13 “Construction Waste Management and Disposal”.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

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.

B. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) latest edition of "Standard Specifications." (CSS)

C. Comply with State of California Code of Regulations (CCR).

D. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).

E. Comply with the latest Geotech Report recommendations.

1.02 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turfs and grasses
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 01 33 00 - SUBMITTALS
2. Section 01 50 13 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
3. Section 32 13 13 - CONCRETE PAVING
4. Section 32 13 73 - CONCRETE PAVING JOINT SEALANTS
5. Section 31 10 00 - SITE CLEARING

1.03 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated in compliance with Section 19 of the Caltrans Standard Specifications.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by District Representative. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in work.
2. Bulk Excavation: Excavation more than ten feet in width and more than thirty feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by District Representative. Unauthorized excavation, as well as remedial work directed by District Representative, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed one cubic yard for bulk excavation or three-quarters of a cubic yard for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material three-quarters of a cubic yard or more in volume that exceed a standard penetration resistance of one hundred blows per two inches when tested by a geotechnical testing agency, according to ASTM D 1586.

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

K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.04 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct pre-excavation conference at the Project Site

1.05 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: twelve inches by twelve inches
2. Warning Tape: twelve inches long; of each color.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

D. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.07 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by District Representative.

C. Utility Locator Service: Notify Call Before You Dig (1.800.227.2600) for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 311000 "Site Clearing" are in place.

E. Do not commence earth-moving operations until plant-protection measures specified in the Landscape Plans are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 or a combination of these groups; free of rock or gravel larger than three inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Construction of the subgrade shall also conform to Section 25-1.03, "Subgrade" of the Caltrans Standard Specifications.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups.

1. Unsatisfactory on-site soils also include satisfactory soils with a plasticity index greater than 25.
2. Unsatisfactory import soils also include satisfactory soils with a plasticity index greater than 12.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve. Construction of subbase shall also conform to Section 25, "Aggregate Subbases", of the Caltrans Standard Specifications and in conformance with the lines, grades and dimensions shown on the Drawings and typical cross-sections.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve. Construction of the base course shall also comply with Section 26, "Aggregate Bases", of the Caltrans Standard Specifications and in conformance with the lines, grades and dimensions shown on the Drawings and typical cross-sections.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve. Engineered fill shall also comply with the provisions of Section 19-3.06 of the Caltrans Standard Specifications.

1. Import Select Soil shall be non-expansive and have a plasticity index less than 12.

G. Bedding Course: Clean, uniformly graded mixture of fine to medium grained sand; ASTM D 2940; with less than 3% fines and 100% passing the No. 8 sieve.

H. Drainage Course: Narrowly graded mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Apparent Opening Size: No. 70 (0.212-mm) sieve, maximum; ASTM D 4751.
3. Permittivity: 0.1 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.03 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, Type II.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, three-quarters of an inch nominal maximum aggregate size. Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, and other extraneous material and shall be in accordance with Section 90 "Portland Cement Concrete," of the Caltrans Standard Specifications.
   a. Gradation shall be Combined Aggregate Grading in accordance with Section 90 "Portland Cement Concrete," of the Caltrans Standard Specifications.
4. Class 2 Aggregate Bases and Sub-bases shall be in accordance with Caltrans Standard Specifications Section 25 and 26.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 30 to 36 pounds per cubic foot at point of placement, when tested according to ASTM C 138.
2. Compressive Strength: 80 psi, when tested according to ASTM C 495.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by District Representative. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
    a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.05 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus one inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus one inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in the landscape drawings.

3.06 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.07 SUBGRADE INSPECTION

A. Notify District Representative when excavations have reached required subgrade.

B. If District Representative determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by District Representative, and replace with compacted backfill or fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by District Representative, without additional compensation.

3.08 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by District Representative.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by District Representative.

3.09 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 321313 "Concrete Paving".

D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 321313 "Concrete Paving".

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
   a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

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

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use engineered fill.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, concrete flatwork, scarify and recompact top 8 inches of existing subgrade and each layer of backfill or fill soil material at 90 percent and to least 3 percent above optimum moisture content.
2. Under pavements, scarify and recompact top 8 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent and to least 3 percent above optimum moisture content.
3. Under turf or unpaved areas, scarify and recompact top 8 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent and to least 3 percent above optimum moisture content.
4. For utility trenches, compact each layer of initial backfill at 90 percent and to least 3 percent above optimum moisture content and final backfill soil material at 95 percent and to least 2 percent above optimum moisture content.

3.15 GRADING

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

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus one inch.
2. Walks: Plus or minus one inch.
3. Pavements: Plus or minus one-half inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of one-half inch when tested with a 10-foot straightedge.

3.16 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Place base course material over subbase course under hot-mix asphalt pavement.
2. Shape subbase course and base course to required crown elevations and cross-slope grades.
3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
4. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 8 inches thick or less than 3 inches thick.
5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections as required by the Owner.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed as required by the District.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

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

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

1. Scarify or remove and replace soil material to depth as directed by District Representative; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

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

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by District Representative.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property per Spec Section 01 50 13 “Construction Waste Management and Disposal”

END OF SECTION

SECTION 31 23 33

TRENCHING, BACKFILLING, AND COMPACTING

Part 1 - GENERAL

1.01 SUMMARY

A. Provide labor, material, equipment, and services necessary to complete the on-site trench backfilling and compacting as necessary for this project. Section includes, but is not limited to:

1. Initial Backfill Material.
2. Subsequent Backfill.
3. Detectable Tape.
4. Trench Excavation.
5. Pipe Bedding.
6. Trench Backfill.
7. Trench Surfacing.

1.02 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. Work specified in Related Sections include:

1. Section 01 50 13 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
2. Section 31 20 00 – EARTH MOVING.
3. Section 33 10 00 – WATER SYSTEMS.
4. Section 33 41 00 – STORM UTILITY DRAINAGE PIPING.

1.03 DEFINITIONS

A. Engineered Fill:

1. Soil or soil-rock material approved by the Geotechnical Engineer and transported to the site by the Contractor in order to raise grades or to backfill excavations.
2. Contractor shall provide sufficient tests, and a written statement that all materials brought onto the project site comply with specification requirements.

B. Excavation: Consists of the removal of material encountered to subgrade elevations.

C. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base.

D. Base: The layer placed between the subgrade and surface pavement in a paving system.

E. Relative Compaction: In-place dry density of soil expressed as percentage of maximum

dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.

F. System Description Requirements:

1. Comply with the recommendations of the Geotechnical Engineer.
2. Protect existing trees to remain. No grading is permitted under the drip line of protected trees unless otherwise noted.
3. Excavations for appurtenant structures, such as, but not limited to, manholes, transition structures, junction structure, vaults, valve boxes, catch basins, thrust blocks, and boring pits, shall be deemed to be in the category of trench excavation.
4. Unless otherwise indicated in the Drawings, all excavation for pipelines shall be open cut.

1.04 SUBMITTALS

A. Comply with provisions of the Standard General Conditions and Agreement for Construction Services.

B. Test Reports: Submit the following report for import material directly to the District's Representative from the Contractor's testing services:

1. Compaction test reports for aggregate base.

C. Submit description of compactors proposed for use when requesting placement of base material.

1.05 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) latest edition of "Standard Specifications." (Caltrans Standard Specifications).
2. Comply with State of California Code of Regulations (CCR).
3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).

B. Soil Testing:

1. Contractor shall engage a geotechnical testing agency, to include compaction testing and for quality control testing during fill operations.
2. Test results will be submitted to the District's Representative.

C. Codes and Standards:

1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

2. California Department of Transportation Standard Specifications (Caltrans Standard Specification):
    a. Section 19: Earthwork.
    b. Standard Test Methods: No. 202.
3. American Society for Testing and Materials (ASTM):
    a. D1556: Density of Soil by the Sand Cone Method.
    b. D1557: Moisture Density Relations of Soils and Soil-Aggregate Mixtures.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect materials before, during and after installation.

B. Comply with provisions of the Standard General Conditions and Agreement for Construction Services where necessary to control dust and noise on and near the work caused by operations during construction activities.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.
2. Protect existing streams, ditches and storm drain inlets during work on this project.

B. Barricade open excavations and post with warning lights.

1. Comply with requirements of the Standard General Conditions and Agreement for Construction Services.
2. Operate warning lights and barricades as required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout, and other hazards.

C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.

D. Transport all excess soils materials by legally approved methods to disposal areas.

1. Coordinate with the District's Representative.
2. Any additional fill requirements shall be the responsibility of the Contractor.

1.08 EXISTING UTILITIES

A. Locate existing underground utilities in the areas of work. For utilities that are to remain in place, provide adequate means of protection during excavation operations.

B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility agency immediately for directions.

1. Cooperate with the District's Representative and public and private utility companies in keeping their respective services and facilities in operation.
2. Repair damaged utilities to the satisfaction of the utility owner.

C. Do not interrupt existing utilities serving facilities occupied and used by the District or others, except when permitted in writing by the District's Representative and then only after acceptable temporary utility services have been provided.

1.09 SEQUENCING AND SCHEDULING

A. The sequence of operations shall be reviewed by the District's Representative prior to commencement of any work.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General:

1. Backfill materials will be subject to approval of the Engineer.
2. For approval of backfill fill material, notify the District's Representative at least 7 days in advance of intention to import material.
3. Consideration shall also be given to the environmental characteristics as well as the corrosion potential of backfill materials. Laboratory testing, including pH, soluble sulfates, chlorides, and resistivity shall be reviewed. Backfill materials shall not be more corrosive than the native materials.

B. Trench Bedding/Sand:

1. Material free from clay, organic materials, and other deleterious substances and conforming to Caltrans Standard Specification Section 19-3.025 B.

C. Underdrain Trench Backfill:

1. Granular material free from clay, organic materials, and other deleterious substances and conforming to Class 1 Type A Permeable Material, per Caltrans Standard Specification Section 68-1.025.

D. Approved General Fill:

1. Section 31 20 00 – EARTHWORK MOVING.

E. Imported Fill:

1. Section 31 20 00 – EARTHWORK MOVING.

F. Class II Aggregate Base: ¾" maximum, Class II AB, free from organic matter and other deleterious substances and conforming to Caltrans Standard Specification Section 26-1.02.

G. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

2.02 BURIED WARNING AND IDENTIFICATION TAPE

A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 75 mm 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

1. Warning Tape Color Codes.
   Red: Electric.
   Yellow: Gas, Oil; Dangerous Materials.
   Orange: Telephone and Other Communications.
   Blue: Water Systems.
   Green: Sewer Systems.
   White: Steam Systems.
   Gray: Compressed Air.
2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 920 mm 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.03 DETECTION WIRE FOR NON-METALLIC PIPING

A. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 – EXECUTION

3.01 GENERAL:

A. Prior to commencement of work, become thoroughly familiar with site conditions.

B. In the event discrepancies are found, immediately notify the District's Representative in writing, indicating the nature and extent of differing conditions.

C. Backfill excavations as promptly as work permits.

D. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the District's Representative.

E. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

F. In excavations, use satisfactory excavated or borrow material.

G. Under grassed areas, use satisfactory excavated or borrow material.

3.02 COMPACTING

A. Compact by power tamping, rolling or combinations thereof.

1. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
2. Scarify and re-compact any layer not attaining compaction until required density is obtained.

3.03 SITE PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, which are to remain, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.

3.04 EXISTING UTILITIES

A. Identity the location of existing utilities.

1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the Drawings, if any, and where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.
2. The Contractor shall contact Underground Service Alert (USA) at 1-800-227-2600 for assistance in locating existing utilities.
3. If, after the excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the District's Representative to clear the utility.

B. Protect all existing utilities to remain in operation.

C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at Contractor's risk.

D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.

1. Use hand or light equipment for excavating immediately adjacent to known utilities or for excavations exposing a utility or buried structure.
2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
4. Report damage of utility line or subsurface structures immediately to the District's Representative.

E. Backfill trenches resulting from utility removal in accordance with this section.

3.05 TRENCH EXCAVATION

A. General:

1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.
2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining utilities.
3. The Contractor shall be responsible to safely direct vehicular and pedestrian traffic through or around his/her work area at all times.
4. The Contractor shall relocate, reconstruct, replace or repair, at his/her own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor.

B. Existing Paving and Concrete:

1. Existing pavement over trench shall be saw cut, removed, and hauled away from the job. Existing pavement shall be neatly sawcut a minimum of 6-inches beyond the limits of excavations.
2. Existing concrete over the trench shall be saw cut to a full depth in straight lines either parallel to the curb or right angles to the alignment of the sidewalk.
3. Boards or other suitable material shall be placed under equipment out rigging to prevent damage to paved surfaces.

C. Trench Width:

1. The maximum allowable trench widths at the top of the pipe shall be as follows:

Pipe Type	Trench Width (Maximum)
Copper	Outside diameter of barrel plus 18 inches
Plastic	"
Vitrified Clay	"
Cast-Iron	Outside diameter of barrel plus 24 inches
Concrete Cylinder	"
Ductile-Iron	"
Reinforced Concrete	"

a. The maximum trench width shall be inclusive of all shoring.
b. If the maximum trench width is exceeded, the District's Representative or Inspector of Record may direct the Contractor to encase or cradle the pipe in concrete at no additional charge.

2. For pipes 3 inch diameter and larger, the free working space on each side of the pipe barrel shall not be less than 6 inches.

D. Open Trench:

1. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater. No trench shall be left open at the end of the day.
2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants.

E. Excavation Bracing:

1. The excavation shall be supported and excavation operations shall be conducted in accordance with the California Industrial Accident Commission and CAL/OSHA.
2. The Contractor shall, at his/her own expense, furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of all excavations (whether above or below the pipe grade), and to prevent any movement which could in any way diminish the required trench section or otherwise injure or delay the work. The sheeting and bracing shall be withdrawn in a manner such as to prevent any earth movement that might overload the pipe.

F. Excavated Material:

1. All excavated material not required for backfill shall be immediately removed and properly disposed of in a legal manner by the Contractor.
2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
3. Provisions shall be made whereby all storm and wastewater can flow uninterrupted in gutters or drainage channels.

G. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in the landscape drawings.

3.06 PIPE BEDDING

A. Bedding Excavation: The trench shall be excavated below the grade of the pipe bottom to the following minimum depths:

Pipe Type	Depth
Copper	3 inch
Reinforced Concrete	3 inch
Plastic: 2 inch diameter and smaller	3 inch
Cast/Ductile Iron	6 inch
Plastic: over 2 inch diameter	6 inch

1. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The Inspector of Record will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock as necessary.
2. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing pipe bedding material. Pipe bedding shall be trench sand or trench gravel, as defined in these specifications. Sufficient pipe bedding material shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe, plus 1/8th of the pipe diameter. The relative compaction of tamped material shall be not less than 90 percent. It is the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of 60 percent of the external diameter.

3.07 TRENCH BACKFILL

A. Initial Backfill:

1. Prior to trench backfill, the condition of the trench and lying of pipe must be inspected and approved by the Inspector of Record.
2. Trench Sand and Trench Gravel shall be used for initial backfill. After the pipe has been properly laid and inspected, initial backfill material shall be placed on both sides of the pipe and compacted to final depth as follows:

Pipe Type	Depth
Copper	6 inches above top of pipe
Cast Iron	6 inches above top of pipe
Plastic: less than 3 inches diameter	6 inches above top of pipe
Plastic: 3 inches diameter and larger	12 inches above top of pipe
Ductile Iron	12 inches above top of pipe

Reinforced Concrete ½ outside diameter of pipe (pipe spring line)

3. Compaction: Initial backfill compaction shall be by mechanical means. The initial backfill material shall be hand tamped in layers not exceeding 4 inches in un-compacted depth and shall be brought up uniformly on both sides of the pipe to avoid bending or distortional stress. After hand tamping, the relative compaction of the initial backfill material shall be not less than 90 percent.
4. Pipe Detection: In trenches containing pressurized plastic pipes, tracer wire shall be placed directly above the pipe and shall be connected to all valves, existing exposed tracer wires, and other appurtenances as appropriate.

B. Subsequent Backfill:

1. Subsequent backfill material shall consist of approved native material, imported fill, or Class II AB conforming to these specifications.
2. Structure and utility trench backfill should be moisture conditioned, placed in lifts eight inches or less in loose thickness, and mechanically compacted to at least 90 percent relative compaction except the relative compaction shall not be less than 95 percent within 2-1/2 feet of finished permanent surface grade or 1-1/2 feet below the finished subgrade, whichever is greater; jetting will not be permitted. The moderately expansive clay soils exposed in trenches should not be allowed to dry out prior to placement of trench backfill materials.
3. It must be the contractor's responsibility to select equipment and procedures that will accomplish the grading as described above. He/she must organize his/her work in such a manner that the Soil Engineer can test and/or observe each element of grading.

C. Jetting and Ponding:

1. Jetting of trench backfill is not permitted.

D. Compaction Testing:

1. Compaction testing shall be in accordance with California Test Method ASTM D1556 or D1557.

3.08 TRENCH SURFACING

A. Unpaved Areas:

1. In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
2. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

B. Temporary Surfacing:

1. Temporary surfacing shall be a minimum of 2 inches of cutback asphalt on 10 inches of Class 2 aggregate base and shall be placed at all trench locations subject to vehicular or pedestrian traffic.
2. Temporary surfacing shall be laid within one day after backfilling (except where the Contractor elects to place permanent surfacing within this time period).
3. Before the trenching area is opened for traffic, all excess dirt, rock, and debris shall be removed, the street surface shall be swept clean and the pavement shall be washed down with a water truck and pressure nozzle.
4. Temporary surfacing shall be maintained to prevent the occurrence of mud holes and prevent the surface from settling below 1 inch or rising more than 1 inch from the existing pavement grade.

3.09 MOISTURE CONTROL

A. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Testing Services: Allow testing agency to test each backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

B. When testing agency reports that backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.

3.11 PROTECTION

A. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

3.12 CLEAN-UP

A. Remove all debris, equipment, tools and materials upon completion prior to final inspections to the satisfactions of the engineer.

B. In unpaved areas without landscaping, cover with straw erosion control blanket. Follow manufacturer's recommendations for installation. Provide and place straw wattles or biodegradable fiber logs across the slope at the midpoint and along the downhill edge of site. No soil is to be left uncovered at the completions of construction.

C. Any Construction Waste shall be disposed of off of the Owner's property per Spec Section 01 50 13 "Construction Waste Management and Disposal".

END OF SECTION

SECTION 32 01 91
Tree and Landscape Protection

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work necessary to ensure that trees and landscaping in general designated on the Drawings to remain receive all due protection, care, and maintenance necessary to ensure their survival.

B. Work specifically includes the following:

1. Erection of barriers and other general protective measures.

2. Placement of wood shavings.

3. Care of roots during grading.

4. Inspection and recommendations.

1.2 EXAMINATION

A. At the outset of construction the Contractor shall have all trees to remain located within the Work area inspected by a qualified and experienced arborist, and the recommendations of the arborist shall be submitted in writing to the Architect.

B. The Contractor shall be notified by the Architect of any changes or additions to the procedures herein specified.

1.3 PROTECTION

A. In addition to the requirements of Division 1, every effort shall be made to protect all trees and landscaping on the site, except such shrubs and grasses which would be removed for grading at building sites and trees indicated to be relocated.

B. Trees to be saved shall be clearly indicated and shall be protected by the Contractor, who shall erect temporary barricades placed no closer than the drip line of the tree or directed by Architect.

1. Barricades shall be placed before commencing other Work and shall remain in place until completion of the entire construction or until removal is directed by the Architect.

2. Where 100% control of vehicular traffic cannot be maintained, a 3" thick layer of wood shavings shall be placed around any tree subject to such

traffic prior to commencement of construction.

C. No tree roots greater than 1" in diameter may be cut during the performance of demolition Work or installation of utilities.

   1. Tree roots shall be carefully uncovered and the material removed without root damage, after which the excavation shall be immediately backfilled.

   2. Where it is not possible to avoid cutting roots, the Architect shall be notified, and the Work shall be done only by a qualified tree surgeon.

D. Existing trees and landscaping to be saved shall be protected from the following:

   1. Stockpiling of any materials under the spread of the trees.

   2. Driving or parking vehicles under the spread of the trees.

   3. Dumping of refuse or chemically injurious materials or liquids.

   4. Continual puddling or running of water.

   5. Gathering of workmen under the trees during breaks or lunch periods.

E. After building construction, dispose fallen debris present around the existing trees and landscaping within the Work area. Restore the grounds around the trees to their existing natural condition.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

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.

B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site Development Requirements for ADA Accessibility.

C. California Department of Transportation (Caltrans):

1. Standard Specifications:

a. Section 26: Aggregate Bases.

b. Section 37: Bituminous Seals.

c. Section 39: Hot Mix Asphalt.

d. Section 92: Asphalts.

e. Section 93: Liquid Asphalts.

f. Section 94: Asphaltic Emulsions.

D. Traffic Manual.

E. Highway Design.

1.02 SUMMARY

A. Section Includes:

1. Cold milling of existing asphalt pavement.

2. Hot-mix asphalt patching.

3. Hot-mix asphalt paving.

4. Hot-mix asphalt overlay.

5. Asphalt curbs.

6. Asphalt traffic-calming devices.

7. Asphalt surface treatments.

B. Related Requirements:

1. Section 312000 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.

2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

B. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:

1. Paving Fabric: 12 by 12 inches minimum.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer, and testing agency.

B. Material Certificates: For each paving material.

C. Material Test Reports: For each paving material, by a qualified testing agency.

D. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the District Representative and/or Caltrans for asphalt paving work.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the District Representative and/or Caltrans for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 degrees Fahrenheit.

2. Tack Coat: Minimum surface temperature of 60 degrees Fahrenheit.

3. Slurry Coat: Comply with weather limitations in ASTM D 3910.

4. Asphalt Base Course: Minimum surface temperature of 40 degrees Fahrenheit and rising at time of placement.

5. Asphalt Surface Course: Minimum surface temperature of 60 degrees Fahrenheit at time of placement.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured.

C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 10 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242/D 242M or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.02 ASPHALT MATERIALS

A. Paint Binder: The asphaltic emulsion for paint binder shall conform to Section 94, "Asphaltic Emulsions", of the Caltrans Standard Specifications and shall be Grade RS-1.

B. Asphalt Cement: Asphalt concrete shall be Type B and shall be of the thickness as shown on the Drawings. Aggregate grading shall be the following: AC Layer Aggregate Grading Surface Course (Pavement) 1/2" maximum, medium Surface Course (Patches & Trenches) 3/8" maximum Base Course 3/4" maximum, medium. The surface course layer of asphalt concrete shall not exceed 2-1/2 inches and not be less than 1-1/2 inches in compacted thickness. Asphalt binder to be mixed with aggregate shall be PG 64-10 steam-refined paving asphalt conforming to the provisions of Section 92, "Asphalts" of the Caltrans Standard Specifications.

C. Prime Coat - Liquid asphalt shall be furnished and applied as a prime coat on a prepared subgrade at the locations shown on the Drawings or as directed by the Engineer. The prime coat shall be applied at the approximate rate of 0.25 gallons per square yard of surface covered. Sand cover shall be applied at driveways, in 2007 Standard Drawings and Specifications Asphalt Concrete, Section 13 Page 1 of 3 intersections and to the roadbed surface where continuous traffic access must be maintained.

D. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

F. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.03 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

C. Sand: ASTM D 1073 or AASHTO M 29, Grade No. 2 or No. 3.

D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

E. Joint Sealant: Asphalt concrete conforms shall receive a seal coat and shall be sanded as required for public convenience in conformance with ASTM D 6690 or AASHTO M 324 hot-applied, single-component, polymer-modified bituminous sealant.

2.04 MIXES

A. Surface Course Limit: Recycled content no more than ten percent by weight.

B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by the District Representative and Caltrans; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."

C. Emulsified-Asphalt Slurry: ASTM D 3910.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.

3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

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

3.02 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending twelve inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.

2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

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

D. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.03 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.

2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.04 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.

2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

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

3.05 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.

2. Place hot-mix asphalt surface course in single lift.

3. Spread mix at a minimum temperature of 250 degrees Fahrenheit.

4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.

5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.

2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.06 JOINTS

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

1. Clean contact surfaces and apply tack coat to joints.

2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

3. Offset transverse joints, in successive courses, a minimum of 24 inches.

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.07 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 degrees Fahrenheit.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or Caltrans but not less than 94 percent or greater than 100 percent.

2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

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

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.08 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.

2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.

2. Surface Course: 1/8 inch.

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.09 SURFACE TREATMENTS

A. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or Caltrans.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. No fewer than three core samples shall be taken.

b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

Attachments

- None

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site Development Requirements for ADA Accessibility.

C. California Department of Transportation (Caltrans):

1. Standard Specifications:
   a. Section 26: Aggregate Bases.
   b. Section 51: Concrete Structures.
   c. Section 52: Reinforcement.
   d. Section 73: Concrete Curbs and Sidewalks.
   e. Section 90: Portland Cement Concrete.

D. Traffic Manual.

E. Highway Design.

1.02 SUMMARY

A. Section Includes Concrete Pavements Including the Following:

1. Curbs and gutters
2. Cast in place stairs and ramps
3. Walkways
4. Retaining walls and Bio-treatment Planters
5. Utility cover concrete collars
6. Drainage Channel Inset Paving
7. Expansive Joint Filler Material

B. Related Requirements:

1. Section 31 20 00 - EARTH MOVING
2. Section 03 30 00 – CAST-IN-PLACE CONCRETE

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:
   a. Concrete mixture design.
   b. Quality control of concrete materials and concrete paving construction practices.
2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Concrete paving Subcontractor.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Samples of concrete colors for initial selection and samples for verification: see section 03 30 00.

D. Mockup showing integral color and finish: see section 03 30 00.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregates

1.07 QUALITY ASSURANCE

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

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

1.08 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.09 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees Fahrenheit and not more than 80 degrees Fahrenheit at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees Fahrenheit at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

B. Comply with ACI 117.

C. Concrete curbs, gutters, sidewalks, driveways and curb ramps shall be constructed of Minor Concrete per Caltrans Section 40, "Portland Cement Concrete Pavement"; Section 73, "Concrete Curbs and Sidewalks" and Section 90, "Portland Cement Concrete", of the Caltrans Standard Specifications, except as modified herein. Class 2 concrete have a minimum compressive strength of 3,000 pounds per square inch at 28 days and a 20-year pavement service life.

2.02 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

C. Textural architectural concrete formwork at designated site planters: see section 03 30 00.

2.03 STEEL REINFORCEMENT

A. Welded Wire Mesh: Wire mesh shall be Grade 40 or Grade 60 6" x 6" x 10 gauge per ASTM A497 in accordance with Section 52 "Reinforcement," of the Caltrans Standard Specifications.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064, flat sheet.

C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615, Grade 60; deformed.

E. Galvanized Reinforcing Bars: ASTM A 767, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615, Grade 60 deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775 or ASTM A 934; with ASTM A 615, Grade 60 deformed bars.

G. Steel Bar Mats: ASTM A 184; with ASTM A 615, Grade 60 deformed bars; assembled with clips.

H. Plain-Steel Wire: ASTM A 1064, galvanized.

I. Deformed-Steel Wire: ASTM A 1064.

J. Epoxy-Coated-Steel Wire: ASTM A 884, Class A; coated.

K. Joint Dowel Bars: ASTM A615, Dowels shall be Grade 60 steel, #4 rebar or smooth coated dowels epoxied in place with slip covers twelve inches long.

L. Epoxy-Coated, Joint Dowel Bars: ASTM A 775; with ASTM A 615, Grade 60 plain-steel bars.

M. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

N. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. Zinc Repair Material: ASTM A 780.

2.04 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, Type II.
2. Fly Ash: ASTM C 618, Class C or F.
3. Slag Cement: ASTM C 989, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595.

B. Normal-Weight Aggregates: Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, and other extraneous material and shall be in accordance with Section 90 “Portland Cement Concrete,” of the Caltrans Standard Specifications. 2.

Gradation shall be Combined Aggregate Grading in accordance with Section 90 "Portland Cement Concrete," of the Caltrans Standard Specifications. 3. Class 2 Aggregate Bases and Sub-bases shall be in accordance with Caltrans Standard Specifications Section 25 and 26

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260.

D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Retarding Admixture: ASTM C 494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

1. Color, integral: Provide Concentrated pigments specially processed for mixing into concrete. Locations of integrally colored concrete to be as shown on drawings and as per section 03 35 00.
2. 2. Color, grey: At pavement, planters and site stairs without integral color, Provide a coloring equivalent to ¼ pound of lampblack per cubic yard. Add to the concrete at the central mixing plant. Liquiblack, as supplied by Concrete Corporation of Redwood City, California, may be used in lieu of lampblack. One pint of liquiblack shall be considered equal to one pound of lampblack.

F. Water: Potable and complying with ASTM C 94.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

G. Curing Compound for Formed Surfaces: Complying with ASTM C309 and approved by color additive manufacturer for use on integrally colored concrete. Do not use white-pigmented curing compounds. Refer to section 03 35 00.

2.06 RELATED MATERIALS

A. Expansive Joint Filler Material: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork in preformed strips according to requirements in Section 321373 "Concrete Paving Joint Sealants".

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials. Coordinate with Architect and Landscape Architect for all concrete finishes.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/4 inch.

F. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

2.07 DETECTABLE WARNING MATERIALS

A. Stair Tread Warning Strip:

1. Provide anti-slip stair nosing style V24 as manufactured by Victory Treads, LLC, Pelham, AL 35124,1-888-707-0005, or approved equivalent. Warning Strip shall provide 70% contrast with adjacent paving.
2. Nosing to be type 6063 T5 extruded aluminum.
3. Anti-slip abrasive shall include virgin grain aluminum oxide and/or silicon carbide. Abrasive shall be black. Abrasives to be locked in the extruded channels with a UV protected 2-part epoxy. Abrasive ribs shall extend above the extruded ribs a minimum

of 1/16". Nosing shall not terminate more than 3" from the ends of the steps for poured concrete stairs.

2.08 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 and Section 90 "Portland Cement Concrete," of the Caltrans Standard Specifications for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Pozzolan: 25 percent.
2. Slag Cement: 50 percent.
3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

C. Add air-entraining admixture at manufacturer's prescribed rate.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

F. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate.

G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup. Coordinate with Project Architect and Landscape Architect.

H. Concrete Mixtures: Normal-weight concrete.

1. Minimum Compressive Strength: 3000 psi or as indicated at 28 days.
2. Maximum W/C Ratio at Point of Placement: 0.50
3. Slump Limit: 4 inches, plus or minus 1 inch.

2.09 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94 and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 degrees Fahrenheit reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees Fahrenheit reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

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

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 FORMWORK INSTALLATION

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.04 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.05 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1.

3.06 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.07 EXPANSIVE JOINT FILLER MATERIAL

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation / Expansion Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 20 feet on center or as indicated on the Drawings.
2. Extend joint fillers full width and depth of joint.
3. Terminate expansive joint filler material not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of expansive joint filler material flush with finished concrete surface if joint sealant is not indicated.
5. Furnish expansive joint filler material in one-piece lengths. Where more than one length is required, lace or clip expansive joint filler material sections together.
6. During concrete placement, protect top edge of expansive joint filler material with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
    a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
    a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301, and with Section 90 "Portland Cement Concrete," of the Caltrans Standard Specifications requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

3.09 SPECIAL FINISHES

A. We are specifying a water based surface retarder to provide a coarse sand texture - Lithocast Surface retarder.

B. We are specifying a water based re-active water repellent sealer - Butterfield Clear Guard First Seal.

3.10 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Slip-resistive Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8-inch-deep with a stiff-bristled broom, perpendicular to line of traffic.

3.11 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. per hour before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12

inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.12 PAVING TOLERANCES

A. Comply with tolerances in ACI 117.

B. Class B (+1/4 inch maximum irregularities).

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees Fahrenheit and below and when it is 80 degrees Fahrenheit and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test one specimen at seven days and two specimens at 28 days.

a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain

Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.14 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

E. Repair at concrete site elements if needed:

1. Fill holes and defects in concrete surface within 48 hours of form removal.
2. Use patching materials and techniques approved in mock-up.
3. Make patches with stiff mortar made with materials from same sources as concrete. Adjust mortar mix proportions so dry patch matches dry adjacent concrete. Add white cement to mortar mix if

4. necessary to lighten it.

END OF SECTION

SECTION 32 13 73

CONCRETE PAVING JOINT SEALANTS

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. Section Includes:

1. Cold-applied joint sealants.

2. Hot-applied joint sealants.

3. Cold-applied, fuel-resistant joint sealants.

4. Hot-applied, fuel-resistant joint sealants.

5. Joint-sealant backer materials.

6. Primers.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.

3. Joint-sealant formulation.

4. Joint-sealant color.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of joint sealant and accessory.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1.07 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.02 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893, Type SL.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

2.03 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I or Type II.

2.04 COLD-APPLIED, FUEL-RESISTANT JOINT SEALANTS

A. Fuel-Resistant, Single-Component, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

B. Fuel-Resistant, Multicomponent, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 12-1/2 or 25, for Use T.

2.05 HOT-APPLIED, FUEL-RESISTANT JOINT SEALANTS

A. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants: ASTM D 7116, Type I or Type II.

2.06 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.07 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.02 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION OF JOINT SEALANTS

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

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.

2. Do not stretch, twist, puncture, or tear joint-sealant backings.

3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.04 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

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

3.05 PAVING-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within concrete paving.

1. Joint Location:

    a. Expansion and isolation joints in concrete paving.

    b. Contraction joints in concrete paving.

    c. Other joints as indicated.

2. Joint-Sealant Color: Manufacturer's standard or as indicated on Drawings.

B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.

1. Joint Location:

    a. Joints between concrete and asphalt paving.

    b. Joints between concrete curbs and asphalt paving.

    c. Other joints as indicated.

2. Joint Sealant: Hot-applied, single-component joint sealant.

3. Joint-Sealant Color: Manufacturer's standard or as indicated on Drawings.

C. Joint-Sealant Application: Fuel-resistant joints within concrete paving.

1. Joint Location:

    a. Expansion and isolation joints in concrete paving.

    b. Contraction joints in concrete paving.

    c. Other joints as indicated.

2. Joint-Sealant Color: Manufacturer's standard or as indicated on Drawings.

Attachments

- None

END OF SECTION

SECTION 32 31 13
Chain Link Fences and Gates

GENERAL

1.1 SECTION INCLUDES

A. Fence framework, fabric, and accessories.

B. Excavation for post bases.

C. Concrete anchorage for posts, and center drop for gates, and mow strip, where indicated.

D. Manual gates and related hardware.

1.2 REFERENCES

A. ASTM A90 - Standards Test Method for Weight [Mass] of Coating on Iron or Steel Articles with Zinc or Zinc-Alloy Coatings.

B. ASTM A392 – Standard Specification for Zinc-Coated Steel Chain Link Fence Fabric.

C. ASTM A428 – Standard Test Method for Weight [Mass] of Coating on Aluminum-coated Iron or Steel Articles.

D. ASTM F567 – Standard Practice for Installation of Chain-Link Fence.

E. ASTM F900 - Standard Specification for Industrial and Commercial Steel Swing Gates.

F. ASTM F1083 – Standard Specification for Pipe, Steel, Hot-dipped Zinc-coated (Galvanized) Welded, for Fence Structures.

G. ASTM F1184 – Standard Specification for Industrial and Commercial Horizontal Slide Gates.

H. Chain Link Fence Manufacturers Institute - Chain Link Fence Wind Load Guide for Selection of Line Post and Line Post Spacing.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in commercial quality chain link fencing with three years documented experience.

B. Installation: Comply with ASTM F567.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00, unless specified otherwise.

B. Shop Drawings: Include plan layout, grid, spacing of components, accessories, fittings, hardware, anchorages, and schedule of components.

C. Submit hardware schedule at earliest possible date along with essential Product Data where acceptance of hardware schedule must precede fabrication of other Work.

D. Organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following:

1. Type, style, function, size and finish of each hardware item.

2. Name and manufacturer of each item.

3. Fastenings and other pertinent information.

4. Location of hardware set cross-referenced to indications on Drawings both on site plan and schedule.

5. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.

6. Mounting locations for hardware.

E. Submit manufacturer's installation instructions.

F. Submit two samples 12" x 12" in size, illustrating fence fabric finish.

G. Submit project record documents under provisions of Section 01 77 00. Accurately record actual locations of property perimeter posts relative to property lines and easements.

H.

PRODUCTS

1.5 MATERIALS

A. Framework: ASTM F1083; Schedule 40 steel pipe, standard weight, one piece without joints, finish same as fabric.

B. Acceptable Equivalent:; Class 1A pipe with minimum yield strength of 50,000 pounds per square inch as manufactured by Allied Tube and Conduit Fence Division, (800) 882-5543, or approved equal.

C. Fabric: ASTM A392, Class 1, zinc coated wire fabric.

1.6 CONCRETE MIX

A. Concrete: As specified in Section 03 30 00.

1.7 COMPONENTS

A. Line and terminal posts and footing size and depth shall be sized and spaced according to Table 1, set forth below. Component sizes for fences with requirements not shown in Table 1 shall be calculated using the Chain Link Fence Manufacturers Institute - Chain Link Fence Wind Load Guide for Selection of Line Post and Line Post Spacing or by using the Wind Load Calculator at www.wheatland.com.

TABLE 1 (Assumes Wind Speed MPH = 85)

Fence Height (Ft.)	End Post	Line Post	Post Spacing	Footing Diameter End Post	Footing Diameter Line Post	Footing Depth
2" Fabric - 9 Gauge						
0-4	2-3/8"	1-7/8"	10'	12"	12"	24"
>4-8	2-7/8"	2-3/8"	10'	12"	12"	36"
>8-12	3-1/2"	2-7/8"	10'	16"	12"	54"
>12-14	4"	3-1/2"	10'	16"	16"	60"
>14-16	4"	3-1/2"	8'	16"	16"	60"
1-1/4" Fabric - 9 Gauge						
0-4	2-3/8"	1-7/8"	10'	12"	12"	24"
>4-6	2-7/8"	2-3/8"	10'	16"	12"	30"
>6-8	3-1/2"	2-7/8"	10'	16"	12"	36"
>8-10	3-1/2"	2-7/8"	8'	16"	12"	48"
>10-12	4"	3-1/2"	8'	16"	16"	54"
>12-14	4"	3-1/2"	7'	16"	16"	60"
>14-16	6-5/8"	4"	7'	24"	16"	60"
1" Fabric - 9 Gauge						
0-4	2-3/8"	1-7/8"	10'	12"	12"	24"
>4-6	2-7/8"	2-3/8"	10'	12"	12"	30"
>6-8	3-1/2"	2-7/8"	10'	16"	12"	36"
>8-10	3-1/2"	2-7/8"	8'	16"	12"	48"
>10-12	4"	3-1/2"	8'	16"	16"	54"
>12-14	4"	3-1/2"	7'	16"	16"	60"
>14-16	6-5/8"	4"	7'	24"	16"	60"

B. Fabric: 1" diamond mesh steel wire, interwoven, 9 gauge thick, top and bottom selvage knuckle end closed. All fencing in contact with buildings or in areas which permit easy access to buildings and roofs shall be 1-1/4" fabric.

C. Caps: Cast steel or malleable iron, galvanized; sized to post dimension, set screw retained.

D. Fittings: Galvanized steel sleeves, bands, clips, rail ends, tension bars, fasteners and fittings.

E. Tension Wire: 7 gauge thick steel, single strand.

F. Swinging Gates: Constructed of tubular members welded at all corners in conformance with ASTM F900 and the following:

1. Gate Posts: 3" NPS steel pipe for gates up to 6' for a single gate or a single leaf of a double gate. 4" NPS steel pipe for gates over 6' and up to 12' in width. 6-5/8" NPS steel pipe for for gates over 12'.

2. Gate Frames: 1-7/8" NPS steel pipe, for welded fabrication with vertical intermediate brace at maximum 6' spacing and horizontal brace on all gates.

3. Gate Fabric: To match adjacent fencing.

4. Gate Hardware: Fork type latch with gravity drop and provision for padlock; center gate stop and drop rod where indicated, three 180° gate hinges per leaf.

HARDWARE GROUP NO. GH-1 (MAINTENANCE)

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	FITT-RITE MAXUM HINGE	MKH100	631	MIS
1	EA	FORK LATCH WITH GRAVITY DROP, PADLOCKABLE.			

HARDWARE GROUP NO. GH-2 (ADA PEDESTRIAN)

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	FITT-RITE MAXUM HINGE	MKH100	631	MIS
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-EO W/CYL HOLE-990-WH	630AM	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN

GH-2 to have max opening force of 5# max (11B-404.2.9). Max operable force 5# max

(11B-309.4). Accessible in accordance with CBC Chapter 11B.

1.8 FINISHES

A. Galvanized: ; 1.8 oz./sq. ft. coating for Schedule 40 pipe. ASTM A90; 1.0 oz./sq. ft. coating for Class 1A pipe. [Powder coat, 2.5 mils thick.] [Vinyl coating, 7 mils thick.] [Color to be selected by Architect from manufacturer's standard colors.]

B. Accessories: Same finish as framing.

EXECUTION

1.9 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Provide fence of height indicated.

C. Space line posts at intervals according to Table 1.

D. Set terminal, gate and corner posts plumb, in 12" diameter concrete footings with top of footing 6" below finish grade. Slope top of concrete for water runoff. Footing depth below finish grade: As indicated in Table1. Form and place mow strip, where indicated, carefully aligning with the fence. Bottom of footing shall be 6" below bottom of post.

E. Provide top rail through line post tops and splice with 7" long rail sleeves.

F. Brace each gate and corner post back to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.

G. Install center and bottom brace rail on corner and gate leaves.

H. Stretch fabric between terminal posts or at intervals of 100' maximum whichever is less.

I. Do not stretch fabric until concrete has cured 28 days.

J. Position bottom of fabric 2" above finished grade.

K. Fasten fabric to top rail, line posts, braces, and bottom tension wire with wire ties maximum 15 inches on centers.

L. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

M. Install bottom tension wire stretched taut between terminal posts.

N. Install gates with fabric to match fence. Install three hinges per leaf, latch, catches, [drop bolt].

O. [Provide concrete center drop to foundation depth and drop rod retainers at center of double gate openings.]

1.10 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4".

B. Maximum Offset from True Position: 1".

C. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 32 94 51

SOIL CELLS

("SILVA CELL SYSTEM")

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Silva Cell system for planting and paving, including Silva Cell assemblies and related accessories.

2. Other materials including, but not limited to, geotextile, geogrid, aggregate, subbase material, backfill, root barrier, Water + Air System, and planting soil.

B. Related Requirements:

1. Section 01 33 00 - Submittal Procedures: For administrative and procedural requirements for processing of submittals during the construction phase.

2. Section 01 78 23 – Operations and Maintenance Data

3. Section 01 78 36 – Warranties

4. Section 01 78 39 – Record Documents

5. Section 01 79 00 – Demonstration and Training

6. Section 32 12 16 - Asphalt Paving

7. Section 32 84 00 - Planting Irrigation

8. Section 32 91 13 – Soil Preparation

8. Section 32 93 00 - Plants

1.02 REFERENCES

A. Definitions:

1. AGGREGATE BASE COURSE: Aggregate material between the paving and the top of the Silva Cell deck below, designed to distribute loads across the top of the deck.

2. AGGREGATE SUBBASE: Aggregate material between the bottom of the Silva Cell base and the compacted subgrade below, designed to distribute loads from the Silva Cell bases to the subgrade.

3. BACKFILL: The earth used to replace or the act of replacing earth in an excavation beside the Silva Cell system to the excavation extents.

4. FINISH GRADE: Elevation of finished surface of planting soil or paving.

6. BIORETENTION SOIL: Soil as defined in Division 32, Section 32 91 13 for Silve Cell infill

7. SILVA CELL SYSTEM:

a. Silva Cell: One assembled unit made up of 1 base, 6 post assemblies, and 1 Silva Cell deck.

b. Silva Cell System: Two or more Silva Cells used in combination with each other and with required accessories.

8. SUBGRADE: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill.

9. WALK-THROUGH COMPACTION: A process for light compaction of soils by walking through the soil following placement.

   a. Walk through compaction shall result in 75-85 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Do not exceed root limiting compaction for the given soil type.

B. Reference Standards:

1. American Association of State Highway and Transportation Officials (AASHTO):

   a. AASHTO H-20

2. ASTM International (ASTM):

   a. ASTM D448-12, Standard Classification for Sizes of Aggregate for Road and Bridge Construction

   b. ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 [600 kN-m/m^3])

   c. ASTM D1241-07, Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses

   d. ASTM D3786/D3786M-13, Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method

   e. ASTM D4491-99a(2014)e1, Standard Test Methods for Water Permeability of Geotextiles by Permittivity

   f. ASTM D4533-D4533M-15, Standard Test Method for Trapezoid Tearing Strength of Geotextiles

   g. ASTM D4632-D4632M-15, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

   h. ASTM D4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile

   i. ASTM D4833/D4833M-07(2013)e1, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

   j. ASTM D5262-07(2012), Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics

   k. ASTM D6241-14, Standard Test Method for Static Puncture Strength of Geotextile and Geotextile-Related Products Using a 50mm Probe

   l. ASTM D6637-11, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Prior to installation of the Silva Cell system and associated Work, meet with the Contractor, Silva Cell system installer and their field supervisor, manufacturer's technical representative, the Architect, the Owner at the Owner's discretion, and other entities concerned with the Silva Cell system performance.

1. Provide at least 72 hours advance notice to participants prior to convening preinstallation conference.

2. Introduce and provide a roster of individuals in attendance with contact information.

3. The preinstallation conference agenda will include, but is not limited to the review of:

a. Required submittals both completed and yet to be completed.

b. The sequence of installation and the construction schedule.

c. Coordination with other trades.

d. Details, materials and methods of installation.

1) Review requirements for substrate conditions, special details, if any, installation procedures.

2) Installation layout, procedures, means and methods.

e. Mock-up requirements.

B. Sequencing and Scheduling:

1. General: Prior to beginning Work of this Section, prepare a detailed schedule of the Work involved for coordination with other trades.

2. Schedule utility installations prior to beginning Work of this Section.

3. Where possible, schedule the installation of the Silva Cell system after the area is no longer required for use by other trades and Work. Where necessary to prevent damage, protect installed system if Work must occur over or adjacent to the installed Silva Cell system.

1.04 SUBMITTALS

A. Action Submittals: Submit in accordance with Section 01 33 00

B. Action Submittals: Submit these to the Architect for review and acceptance not less than 45 days prior to start of installation of materials and products specified in this Section.

1. Product Data: For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets these specifications.

2. Test and Evaluation Reports:

a. Submit results of compaction testing required by the Specifications for approval.

b. Include analysis of bulk materials including soils and aggregates, by a recognized laboratory that demonstrates that the materials meet the Specification requirements.

3. Samples:

a. One full size sample of an assembled Silva Cell (copy of manufacturers brochure with images of product may be accepted in lieu of product sample).

b. Manufacturer's product data/specification sheet for geogrid.

c. Manufacturer's product data/specification sheet for geotextile.

d. Manufacturer’s product data/specification sheet for Water+Air System components (when specified as part of the system)

4. Manufacturer's Report: Submit Silva Cell system manufacturer's letter of review and approval of the Project, including Drawings and Specifications, Addenda, Clarifications and Modifications, and for compliance with product installation requirements.

5. Qualification Statements:

a. Manufacturer:

1) Submit list of completed projects demonstrating durability and longevity of in-place systems.

a) Include project name, location, and date of completion.

2) Submit list of third party approval for stormwater management projects.

b. Installer:

1) Submit documentation of the qualifications of the Silva Cell system installer and their field supervisor, sufficient to demonstrate that both meet the requirements specified in Article 1.05 QUALITY ASSURANCE.

2) Submit list of completed projects of similar scope and scale demonstrating capabilities and experience.

B. Closeout Submittals: Submit these to the owner at completion of installation.

1. Warranty: Submit manufacturer's warranty, fully executed.

1.05 QUALITY ASSURANCE

A. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary permits/approvals from these authorities.

B. Manufacturer Qualifications:

1. A manufacturer whose product is manufactured in an ISO/TS 16949 compliant and ISO 9001 - 2008 registered factory.

2. A manufacturer with not less than 100 Silva Cell systems in-place, in the United States. Each system in use for not less than 7 years, confirming durability and longevity of the system.

3. A manufacturer with documented written approval of their product for use as a stormwater treatment device by a minimum of 3 governmental jurisdictions.

4. A manufacturer with an established and demonstrated utility service and repair process, including written procedure and photographs demonstrating work.

5. A manufacturer with a published operating and maintenance manual

C. Installer Qualifications: A qualified installer with not less than 5 years of successful experience installing Silva Cell systems or related products and materials, and whose work has resulted in successful installation of underground piping, chambers and vault structures, planting soils, and planter drainage systems of a similar scope and scale in dense urban areas.

D. Installer's Field Supervisor: A full-time supervisor employed by the installer with not less than 5 years of successful experience similar to that of the installer and present at the Project site when Work is in progress. Utilize the same field supervisor throughout the Project, unless a substitution is submitted to and approved in writing by the Architect.

E. Mock-Up: Prior to the installation of the Silva Cell system, construct a mock-up of the complete installation at the Project site in the presence of the Landscape Architect.

1. Size and Extent: Minimum of 100 sq. ft. (10 sq. m.) in area and including the complete Silva Cell system installation with subbase, aggregate subbase, drainage installation, Silva Cell decks, posts, and bases, base course aggregate, geotextile, geogrid, backfill, planting soil, and necessary accessories.

2. The mock-up area may remain as part of the installed Work at the end of the Project provided that it remains undamaged and meets the requirements of the Drawings and Specifications.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Silva Cell System: Protect Silva Cell system components from damage during delivery, storage and handling.

1. Store components on smooth surfaces, free from dirt, mud and debris. Store under tarp to protect from sunlight when time from delivery to installation exceeds one week.

2. Perform handling with equipment appropriate to the size (height) of Silva Cells and site conditions; equipment may include, hand, handcart, forklifts, extension lifts, or small cranes, with care given to minimize damage to Silva Cell bases, posts, decks and adjacent assembled Silva Cells.

B. Packaged Materials: Deliver packaged materials in original, unopened containers indicating weight, certified analysis, name and address of manufacturer, and indication of conformance with State and Federal laws, if applicable. Protect materials from deterioration during delivery and while on the Project site.

1. Do not deliver or place backfill, soils, or soil amendments in frozen, wet, or muddy conditions.

2. Provide protection including tarps, plastic and/or matting between bulk materials and finished surfaces sufficient to protect the finish material.

3. Bring planting soil to the site using equipment and methods that do not overly mix and further damage soil peds within the soil mix.

D. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the Project limits as needed.

1.07 FIELD CONDITIONS

A. Existing Conditions: Do not proceed with Work when subgrades, soils and planting soils are in a wet, muddy or frozen condition.

1.08 WARRANTY

A. The Contractor shall warrant the Silva Cell system to be free of faults and defects in accordance with the General Conditions, except that the warranty shall be extended by manufacturer's written warranty against defects in materials and workmanship as follows:

1. DeepRoot® warrants to the original purchaser of its Silva Cell™ product that such product will be free from defects in materials and workmanship, and perform to DeepRoot's written specifications for the warranted product, when installed and used as specifically provided in the product's installation guidelines for a period of 20 years from the date of purchase. This warranty does not cover wear from normal use, or damage caused by abuse, mishandling, alterations, improper installation and/or assembly, accident, misuse, or lack of

reasonable care of the product. This warranty does not apply to events and conditions beyond DeepRoot's control, such as ground subsidence or settlement, earthquakes and other natural events, acts of third parties, and/or Acts of God. If this warranty is breached, DeepRoot® will provide a replacement product. Incurred costs, such as labor for removal of the original product, installation of replacement product, and the cost of incidental or other materials or expenses are not covered under this warranty.

2. Deeproot® makes no other warranties, express or implied, and specifically disclaims the warranty of merchantability or fitness for a particular purpose. Deeproot® shall not be liable either in tort or in contract for any direct, incidental or consequential damages, lost profits, lost revenues, loss of use, or any breach of any express or implied warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers:

DeepRoot Green Infrastructure, LLC

101 Montgomery Street, Suite 2850

San Francisco, CA, 94104

Phone: 415.781.9700

Toll Free: 800.458.7668

Fax: 415.781.0191

www.deeproot.com

B. No substitutions are allowed.

2.02 DESCRIPTION

A. The term Silva Cell shall be used to refer to a single Silva Cell.

B. Silva Cells shall be designed for the purpose of growing healthy trees and providing stormwater management.

C. Silva Cells shall be modular, structural systems.

D. Each Silva Cell shall be structurally-independent from all adjacent Silva Cells for incorporating utilities and other site features as well as for future repairs.

E. Silva Cells shall be capable of supporting loads up to and including AASHTO H-20 (United States) or CSA-S6 87.5 kN (Canada) when used in conjunction with approved pavement profiles.

F. Silva Cells shall be open on all vertical faces and horizontal planes and shall have no interior walls or diaphragms.

G. Silva Cells shall be capable of providing a large, contiguous, continuous volume of planting soil that does not inhibit or prevent the following:

1. Placement of planting soil

2. Walk through compaction

3. Compaction testing of planting soil, once in place

4. Movement and growth of roots

5. Movement of water within the provided soil volume, including lateral capillary movement

6. Installation and maintenance of utilities placed within, adjacent to, or below the Silva Cell.

H. Silva Cells shall be able capable of being filled with a variety of soil types and soils that include peds 2 inches (50 mm) or larger in diameter as is appropriate for the application, location of the installation, and tree species.

2.03 SILVA CELL MATERIALS AND ACCESSORIES

A. Silva Cell System Components: Each "Silva Cell" soil cell module (hereafter Silva Cell or "cell") is composed of one base, 6 post assemblies, and one deck.

2x Silva Cell System:

a. Components: One base, six 2x posts, and one deck.

b. Assembled Dimensions (Each Cell): 47.2 inches long by 23.6 inches wide by 30.9 inches high (1200 mm long by 600 mm wide by 784 mm high).]

B. Silva Cell Materials and Fabrication:

1. Bases and Posts: Homopolymer polypropylene.

2. Decks: Fiberglass reinforced, chemically-coupled, impact modified polypropylene.

C. Manufacturer's Related Silva Cell Installation Accessories:

1. Strongbacks: An accessory designed to stabilize the Silva Cell posts temporarily, during soil placement, and removed for reuse prior to placing decks.

2. Anchoring Spikes: 10” landscape spike for securing assembled Silva Cells to subbase.

2.04 RELATED PRODUCTS

A. Root Barrier: Recyclable, black, injection molded panels manufactured with a minimum 50 percent post-consumer recycled polypropylene plastic with UV inhibitors, and integrated zipper joining system which allows instant assembly by sliding one panel into another; for redirecting tree roots down and away from hardscapes.

1. Panel Sizes:

a. No. UB12-2: 24 inches long by 12 inches deep by 0.080 inches thick (61 cm long by 30 cm deep by 2.03 mm thick); for use with 1x systems and for pavement profiles less than 12 inches (30 cm) deep.

b. No. UB18-2: 24 inches long by 18 inches deep by 0.080 inches thick (61 cm long by 46 cm deep by 2.03 mm thick); for use with 2x and 3x systems, and for pavement profiles 12 inches or more in depth.

2. Products meeting this specification:

a. DeepRoot Tree Root Barrier (DeepRoot Green Infrastructure, LLC)

B. Water+Air System: Used as a standalone system or in conjunction with the Silva Cell, the Water+Air System enables water and air to be directly added to tree roots and the surrounding soil system.

Water+Air System 02:

a. Cast aluminum body

b. Stainless steel gate

c. Threaded for adjustable height

d. Height- adjustable 3 ½" (89mm) – 10 ½" (267mm)

e. Compatible with 3" and 4" (80mm and 100mm) diameter pipe

f. Pipe

1. High density polyethylene corrugated pipe
2. Compliant with ASTM F405 and F667, SCS 606 and AASHTO M252
3. Knife cut perforations

5. Products meeting this specification:

   a. DeepRoot Water+Air System (DeepRoot Green Infrastructure, LLC)

B. Geogrid: Net-shaped woven polyester fabric with PVC coating, uniaxial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, and acids; used to provide a stabilizing force within soil structure as the fill interlocks with the grid.

1. Tensile strength at ultimate (ASTM D6637):

   a. 1850 lbs/ft (27.0 kN/m) minimum

2. Creep reduced strength (ASTM D5262):

   a. 1000 lbs/ft (14.6 kN/m) minimum

3. Long term allowable design load (GRI GG-4):

   a. 950 lbs/ft (13.9 kN/m) minimum

4. Grid aperture size (MD):

   a. 0.8 inch (20 mm) minimum

5. Grid aperture size (CD):

   a. 1.28 inch (32 mm) maximum

6. Roll size: 6-foot (1.8-m) width is preferred, up to 18-foot (5.4-m).

7. Products meeting this specification:

   a. Stratagrid SG 150; http://www.geogrid.com

   b. Miragrid 2XT; http://www.tencate.com

   c. Fortrac 35 Geogrid; (http://www.hueskerinc.com

   d. SF 20 Biaxial Geogrid; http://www.synteen.com

C. Geotextile: composed of high tenacity polypropylene yarns which are woven into a network such that the yarns retain their relative position and is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

1. Tensile strength at ultimate (ASTM D4595):
   a. 4800 lbs/ft (70.0 KN/m) MD minimum
   b. 4800 lbs/ft (70.0 KN/m) CD minimum
2. Tensile strength at 5% strain (ASTM D4595)
   a. 2400 lbs/ft (35.0 KN/m) MD minimum
   b. 2700 lbs/ft (43.8 KN/m) CD minimum
3. Flow rate (ASTM D4491):
   a. 30 gal/min/ft2 (2648 l/min/m2) minimum
4. Apparent opening size (ASTM D4751):
   a. 30 sieve (0.60 mm)
5. UV Resistance (at 500 hours):
   a. 80 percent strength retained
6. Products meeting this specification:
   a. Mirafi HP570; http://www.tencate.com
   b. Geolon PP40; http://www.tencate.com
   c. Nilex Woven 2044 (Nilex); http://www.nilex.com

D. Plastic Cable Ties: A tensioning device or tool used to tie similar or different materials together with a specific degree of tension.

2.05 OTHER RELATED MATERIALS

A. Wood Blocking: Nominal dimensioned untreated lumber used for spacing assembled Silva Cells.

B. Drain and Distribution Pipes:

1. See Section 33 46 00 - Subdrainage

C. Aggregate Subbase (Below Silva Cell Base):

1. Aggregate meeting one of the following specifications:
   a. Complying ASTM D1241, Type I, Gradation B; Type I mixtures shall consist of stone, gravel, or slag with natural or crushed sand and fine mineral particles passing a No. 200 sieve.

Sieve	Percent Passing
1-1/2 inches (37.5 mm)	100
1 inch (25 mm)	75 to 95
3/8 inch (9.5 mm)	40 to75
No 4 (4.75 mm)	30 to 60
No 10 (2 mm)	20 to 45
No 40 (425 µm)	15 to 30
No 200 (75 µm)	5 to 15

b. Local Department of Transportation (DOT) virgin aggregate that most closely meets the gradation of ASTM D1241.

D. Aggregate Base Course (Above Silva Cell Deck):

1. Same as aggregate subbase specified above.

E. Aggregate Base Course for Porous Pavement (Above Silva Cell Deck):

1. Aggregate complying with ASTM D448, No. 57.

Sieve	Percent Passing
1-1/2 inches (37.5 mm)	100
1 inch (25 mm)	95 to 100
1/2 inch (12.5 mm)	25 to 60
No 4 (4.75 mm)	0 to 10
No 8 (2.36 mm)	0 to 5

F. Setting Bed for Unit Pavers (Above Silva Cell Deck):

1. Aggregate complying with ASTM D448, No. 8.

Sieve	Percent Passing
1/2 inch (12.5 mm)	100
3/8 inch (9.5 mm)	85 to 100
No 4 (4.75 mm)	10 to 30
No 8 (2.36 mm)	0 to 10
No 16 (1.18 mm)	0 to 5

G. Backfill Material (Adjacent to Silva Cells): Clean, compactable, coarse grained fill soil free of organic material, trash and other debris, and free of toxic material injurious to plant growth.

H. Planting Soil: Refer to Section 32 91 13 – Bioretention Soil.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the conditions under which the Silva Cells are to be installed.

1. Carefully check and verify dimensions, quantities, and grade elevations.

2. Carefully examine the Drawings to become familiar with the existing underground conditions before digging. Verify the location of aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system.

3. Notify the Contractor and the Architect in writing in the event of conflict between existing and new improvements, of discrepancies, and other conditions detrimental to proper and timely completion of the installation.

4. Obtain written approval of changes to the Work prior to proceeding. Proceed with installation only after changes have been made and unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Take proper precautions as necessary to avoid damage to existing improvements and plantings.

B. Prior to the start of Work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the complete Silva Cell system.

C. Coordinate installation with other trades that may impact the completion of the Work.

3.03 TEMPORARY PROTECTION

A. Protect open excavations and Silva Cell system from access and damage both when Work is in progress and following completion, with highly visible construction tape, fencing, or other means until related construction is complete.

B. Do not drive vehicles or operate equipment over the Silva Cell system until the final surface material has been installed.

3.04 EXCAVATION

A. General: Excavate to the depths and shapes indicated on the Drawings. Provide smooth and level excavation base free of lumps and debris.

B. Confirm that the depth of the excavation is accurate and includes the full section of materials required to place the subbase aggregate, Silva Cell, and pavement profile as indicated on the Drawings.

C. Over-excavate beyond the perimeter of the Silva Cell to allow for:

1. The extension of aggregate subbase beyond the Silva Cell layout as shown on the Drawings.

2. Adequate space for proper compaction of backfill around the Silva Cell system.

D. If unsuitable subgrade soils are encountered, consult the Owner's geotechnical consultants for directions on how to proceed.

E. If conflicts arise during excavation, notify the Architect in writing and make recommendations for action. Proceed with Work only when action is approved in writing.

3.05 SUBGRADE COMPACTION

A. Compact subgrade with a minimum of 3 passes with a vibratory plate compactor; or as directed by the project geotechnical consultant.

B. Do not exceed 10 percent slope for subgrade profile in any one direction. If the 10 percent slope is exceeded, contact manufacturer's representative for directions on how to proceed.

3.06 INSTALLATION OF GEOTEXTILE OVER SUBGRADE

A. Install geotextile over compacted subgrade.

1. Lay geotextile flat with no folds or creases.

2. Install the geotextile with a minimum joint overlap of 18 inches (450 mm).

3.07 INSTALLATION OF AGGREGATE SUBBASE BELOW SILVA CELL BASES

A. Install aggregate subbase to the depths indicated on the Drawings.

B. Extend subbase aggregate a minimum of 6 inches (150 mm) beyond the base of the Silva Cell layout.

C. Compact aggregate subbase to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method.

D. Do not exceed 10 percent slope on the surface of the subbase. Where proposed grades are greater than 10 percent, step the Silva Cells to maintain proper relation to the finished grade.

3.08 INSTALLATION OF SILVA CELL BASE

A. Install the Silva Cell system in strict accordance with manufacturer's instructions and as specified herein; where requirements conflict or are contradictory, follow the more stringent requirements.

B. Layout and Elevation Control:

1. Provide layout and elevation control during installation of the Silva Cell system to ensure that layout and elevations are in accordance with the Drawings.

C. Establish the location of the tree openings in accordance with the Drawings. Once the trees are located, mark the inside dimensions of the tree openings on the prepared subbase.

D. Locate and mark other Project features located within the Silva Cell layout (e.g. light pole bases, utility pipes). Apply marking to identify the extent of the Silva Cell layout around these features. Follow the layout as shown on the Drawings to ensure proper spacing of the Silva Cell bases. Refer to the Drawings for offsets between these features and the Silva Cells.

E. Check each Silva Cell component for damage prior to placement. Reject cracked or chipped units.

F. Place the Silva Cell bases on the compacted aggregate subbase. Start at the tree opening and place Silva Cell bases around the tree openings as shown on the Drawings.

G. Working from tree opening to tree opening, place Silva Cell bases to fill in the area between tree openings.

1. Maintain spacing no less than 1 inch (25 mm) and no more than 6 inches (150 mm) apart, assuming geotextile covering the decks meets the specifications in section 2.04 paragraph C.

H. Follow the Silva Cell layout plan as shown on the Drawings.

I. Install Silva Cell bases around, over, or under existing or proposed utility lines, as indicated on the Drawings.

J. Level each Silva Cell base as needed to provide full contact with subbase. Adjust subbase material, including larger pieces of aggregate, so each base sits solidly on the surface of the subbase. Silva Cell bases that rock or bend over any stone or other obstruction protruding above the surface of the subbase material are not allowed. Silva Cell bases which bend into dips in the subbase material are not allowed. The maximum tolerance for deviations in the plane of the subbase material under the bottom of the horizontal beams of each Silva Cell base is 1/4 inch in 4 feet (6 mm in 1200 mm).

K. Anchor Silva Cell base with 2 anchoring spikes per base.

1. For applications where Silva Cells are installed over waterproofed structures, use wood blocking or similar spacing system consistent with requirements of the waterproofing system to maintain required spacing.

3.09 INSTALLATION OF SILVA CELL POSTS

A. 2x Silva Cell System:

1. Attach 2x posts to the installed Silva Cell base. Each base will receive six 2x posts. Place the end of the post with tabs into the base. Rotate post clockwise to snap in place.

3.10 INSTALLATION OF STRONGBACKS, GEOGRID, BACKFILL AND PLANTING SOIL

A. For Silva Cell systems that have a perforated drain line located inside or adjacent to the system, consult Drawings for layout and details for requirements.

B. Install strongbacks on top of the Silva Cell posts by snapping into place over installed posts prior to installing planting soil and backfill.

1. Strongbacks are required only during the placement and compaction of the planting soil and backfill.

2. Move strongbacks as the Work progresses across the installation.

3. Remove strongbacks prior to the installation of the Silva Cell decks.

C. Install geogrid around the perimeter of the Silva Cell system where the compacted backfill and planting soil interface.

1. Do not place geogrid between the edge of the Silva Cells and adjacent planting areas.

2. Cut the geogrid to allow for a 6-inch (150-mm) overlap at the Silva Cell base and a 12-inch (300-mm) overlap at the Silva Cell deck.

3. Provide a minimum 12-inch (300-mm) overlap between adjacent sheets of geogrid.

4. Secure geogrid with cable ties below the top of the posts, along the post ridges.

D. Place the first lift of backfill material loosely around the perimeter of the Silva Cell system, between the geogrid and the sides of the excavation. Place backfill to approximately the midpoint of the Silva Cell post. Do not compact.

E. Place the first lift of planting soil in the Silva Cell system to approximately the midpoint of the Silva Cell post.

1. Level the planting soil throughout the system.

2. Walk-through the placed planting soil to remove air pockets and settle the soil.

a. Lightly compact soils by walking through the soil following placement.

b. Walk through compaction shall result in 75-85 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Do not exceed root limiting compaction for the given soil type.

F. Compact the first lift of backfill material, previously spread, to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method or in accordance with Project Specifications for hardscape areas, whichever is greater.

G. Add and compact additional backfill material so that the final finished elevation is at approximately the same level of the placed planting soil within the Silva Cells.

1. Maintain the geogrid between the Silva Cell system and the backfill material at all times.

H. Place the second lift of backfill material loosely around the perimeter of the Silva Cell system, between the geogrid and the sides of the excavation so that the material is 2 to 3 inches below the top of the posts. Do not compact.

I. Place the second lift of planting soil inside of the Silva Cell to the bottom of the strongbacks. Walk through compact.

3.11 INSTALLATION OF IRRIGATION AND WATER HARVESTING SYSTEM (including but not limited to Deeproot Water+Air System components)

A. Install irrigation and water harvesting system in accordance with the Drawings and Specifications. Remove only the minimum number of strongbacks needed to accommodate the Work and reinstall them immediately upon completion to maintain alignment of posts.

3.12 INSTALLATION OF SILVA CELL DECK

A. Obtain final approval by the Landscape Architect of planting soil installation prior to installation of the Silva Cell decks.

B. Remove strongbacks, level out the planting soil, and immediately install decks over the posts below. Place deck over the top of the posts. Push decks down until the deck clips lock into the posts, snapping the deck into place.

C. Fold the 12 inches (300 mm) of geogrid onto the top of the decks.

3.13 FINAL BACKFILL PLACEMENT AND COMPACTION

A. Place and compact final lift of backfill material to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method, such that the backfill is flush with the top of the installed deck. Do not allow compacting equipment to come in contact with the decks.

3.14 INSTALLATION OF GEOTEXTILE AND AGGREGATE BASE COURSE OVER THE DECK

A. Ensure geotextile meets the specifications in section 2.04 paragraph C.

B. Place geotextile over the top of the deck and extend to the edge of the excavation. Overlap joints a minimum of 18 inches (450 mm). Leave enough slack in the geotextile for the aggregate base course to push the geotextile down in the gaps in between the decks.

C. Install the aggregate base course (including aggregate setting bed if installing unit pavers) over the geotextile immediately after completing the installation of the fabrics. Work the aggregate from one side of the layout to the other so that the fabric and aggregate conform to the Silva Cell deck contours.

D. Maintain equipment used to place aggregate base course completely outside the limits of the Silva Cell excavation area to prevent damage to the installed system.

E. For large or confined areas, where aggregate cannot easily be placed from the edges of the excavated area, obtain approval for the installation procedure and types of equipment to be used in the installation from the Silva Cell manufacturer.

F. Compact aggregate base course(s) to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Utilize a vibration or plate compactor with a maximum weight of 800 lbs (362.87 kg).

G Do not drive vehicles or operate equipment over the completed aggregate base course.

3.15 INSTALLATION OF CONCRETE CURBS AT TREE OPENINGS, AGGREGATE SUBBASE AND PAVEMENT ABOVE THE SILVA CELL SYSTEM

A. Place concrete curbs along planting areas and tree openings as shown on the Drawings to retain the aggregate base course from migrating into the planting soil.

B. When staking concrete forms (e.g. curbs around the tree openings), prevent stakes from penetrating the Silva Cell decks.

C. Turn down edge of concrete paving to the Silva Cell deck along the edges of tree openings or planting areas to retain the aggregate base course material.

D. When paving type is a unit paver or other flexible material, provide a concrete curb under the paving at the edge of the Silva Cell deck to retain the aggregate base course material at the tree opening.

E. Place paving material over Silva Cell system in accordance with the Drawings.

1. The Silva Cell system does not fully meet loading strength until the final paving is installed. Do not operate construction equipment on top of the Silva Cell system until paving installation has been completed.

F. Use care when placing paving or other backfill on top of Silva Cell system to prevent damage to the Silva Cell system or its components.

3.16 INSTALLATION OF ROOT BARRIERS

A. Install root barrier in accordance with manufacturer's installation instructions.

3.17 INSTALLATION OF PLANTING SOIL WITHIN THE TREE PLANTING AREA

A. Remove rubble, debris, dust and silt from the top of the planting soil within the tree opening that may have accumulated after the initial installation of the planting soil within the Silva Cells.

B. Install additional planting soil within the tree openings, to the depths indicated on the Drawings.

1. Use the same soil used within the Silva Cells for planting soil within the tree openings.

C. Compact planting soil under the tree root ball as needed to prevent settlement of the root ball.

D. Place trees in accordance with the Drawings.

3.18 PROTECTION

A. Keep construction traffic away from the limits of the Silva Cells until the final pavement profile is in place. The Silva Cell system does not fully meet loading strength until the final paving is installed.

1. Do not operate equipment directly on top of the Silva Cell system until paving installation has been completed.

2. Provide fencing and other barriers to prevent vehicles from entering into the Silva Cell area.

B. When the Silva Cell installation is completed and the permanent pavement is in place, limit traffic and construction related activities to only loads less than the design loads.

3.19 CLEAN UP

A. Perform clean up during installation and upon completion of the Work. Maintain the site free of soil, sediment, trash and debris. Remove excess soil materials, debris, and equipment from the site following completion of the Work of this Section.

B. Repair damage to adjacent materials and surfaces resulting from installation of this Work using mechanics skilled in remedial work of the construction type and trades affected.

END OF SECTION

SECTION 33 05 00

COMMON WORK RESULTS FOR UTILITIES

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 the following:

1. Piping joining materials.
2. Transition fittings.
3. Dielectric fittings.
4. Sleeves.
5. Identification devices.
6. Grout.
7. Flowable fill.
8. Piped utility demolition.
9. Piping system common requirements.
10. Equipment installation common requirements.
11. Painting.
12. Concrete bases.
13. Metal supports and anchorages.

1.03 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. ABS: Acrylonitrile-butadiene-styrene plastic.

D. CPVC: Chlorinated polyvinyl chloride plastic.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.

2. Identification devices.

1.05 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.06 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.08 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Section 033000 "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.01 PIPING JOINING MATERIALS

A. 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 maximum thickness, unless otherwise 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 C110, rubber, flat face, 1/8-inch-thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.

2. CPVC Piping: ASTM F 493.

3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

4. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.02 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Transition Couplings NPS 1-1/2 and Smaller:

1. Underground Piping: Manufactured piping coupling or specified piping system fitting.

2. Aboveground Piping: Specified piping system fitting.

C. AWWA Transition Couplings NPS 2 and Larger:

1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

D. Plastic-to-Metal Transition Fittings:

1. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Description: MSS SP-107, PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:

1. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.03 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description: Factory fabricated, union, NPS 2 (DN 50) and smaller.

a. Pressure Rating: 250 psig at 180 deg F.

b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:

1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 (DN 65 to DN 100) and larger.

a. Pressure Rating: 175 psig.

b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 and larger.

a. Pressure Rating: 150 psig minimum.

b. Gasket: Neoprene or phenolic.

c. Bolt Sleeves: Phenolic or polyethylene.

d. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 (DN 80) and smaller.

a. Pressure Rating: 300 psig at 225 deg F.

b. End Connections: Threaded.

F. Dielectric Nipples:

1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.

    a. Pressure Rating: 300 psig at 225 deg F.

    b. End Connections: Threaded or grooved.

2.04 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.05 IDENTIFICATION DEVICES

A. General: Products specified are for applications referenced in other utilities Sections. If more than single type is specified for listed applications, selection is Installer's option.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

    1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.

    2. Location: Accessible and visible.

C. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

D. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

E. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

F. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

G. Lettering: Manufacturer's standard preprinted captions as selected by Architect.

H. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.

I. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils (0.08 mm) thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.

2. Color: Comply with ASME A13.1, unless otherwise indicated.

J. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.

1. Material: 0.032-inch-thick, polished brass or aluminum.

2. Material: 0.0375-inch-thick stainless steel.

3. Material: 3/32-inch-thick plastic laminate with 2 black surfaces and a white inner layer.

4. Material: Valve manufacturer's standard solid plastic.

5. Size: 1-1/2 inches in diameter, unless otherwise indicated.

6. Shape: As indicated for each piping system.

K. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

L. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.

2. Thickness: 1/16 inch, unless otherwise indicated.

3. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.

4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.

M. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.

2. Yellow: Heating equipment and components.

3. Brown: Energy reclamation equipment and components.

4. Blue: Equipment and components that do not meet criteria above.

5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.

6. Terminology: Match schedules as closely as possible. Include the following:

a. Name and plan number.

b. Equipment service.

c. Design capacity.

d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

N. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.

1. Size: 3-1/4 by 5-5/8 inches.

2. Fasteners: Brass grommets and wire.

3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

O. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.

1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

2.06 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

2.07 FLOWABLE FILL

A. Description: Low-strength-concrete, flowable-slurry mix.

1. Cement: ASTM C 150, Type I, portland.

2. Density: 115- to 145-lb/cu. Ft.

3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.

4. Aggregates: ASTM C 33, natural sand, fine.

5. Admixture: ASTM C 618, fly-ash mineral.

6. Water: Comply with ASTM C 94/C 94M.

7. Strength: 100 to 200 psig at 28 days.

PART 3 - EXECUTION

3.01 PIPED UTILITY DEMOLITION

A. Refer to Section 024119 "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.

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. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.

3. Equipment to Be Removed: Disconnect and cap 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 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.

3.02 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 and Smaller: Dielectric unions.

2. NPS 2-1/2 to NPS 12: Dielectric flanges or dielectric flange kits.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.

2. NPS 2-1/2 to NPS 4: Dielectric nipples.

3. NPS 2-1/2 to NPS 8: Dielectric nipples or dielectric flange kits.

4. NPS 10 and NPS 12: Dielectric flange kits.

3.03 PIPING INSTALLATION

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, 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 the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. PVC Pipe Sleeves: For pipes smaller than NPS 6.

b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

J. Verify final equipment locations for roughing-in.

K. Refer to equipment specifications in other Sections for roughing-in requirements.

3.04 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: 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 appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: 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.

2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.

3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

5. PVC Nonpressure Piping: Join according to ASTM D 2855.

6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.

2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.05 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3. Install dielectric fittings at connections of dissimilar metal pipes.

3.06 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.07 PAINTING

A. Painting of piped utility systems, equipment, and components is specified in Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.08 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.

2. Locate pipe markers on exposed piping according to the following:

a. Near each valve and control device.

b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.

c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.

d. At manholes and similar access points that permit view of concealed piping.

e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.

2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.09 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Section 055000 "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.11 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

Attachments

- None

END OF SECTION

SECTION 33 10 00

WATER SYSTEMS

PART 1 - GENERAL

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 describes general requirements, products, and methods of execution relating to on-site domestic water and fire water systems serving all buildings and appurtenances, unless otherwise superseded by the fire protection specification sections. Unless otherwise noted, this section does not apply to irrigation water systems and water systems inside and within 5 feet of buildings. Any work within the public right-of-way shall be constructed to the standards of the Oakland Unified School District, The State of California, The California Department of Transportation (CALTRANS), and the Division of the State Architect. This section applies to:

1. On-site domestic water distribution and services.
2. On-site fire water distribution and services.

B. Contractor shall provide all labor, equipment, materials, and testing services unless otherwise noted.

C. Related Sections:

1. Section 02 31 05 – TRENCHING, BACKFILLING, AND COMPACTING.

1.03 SUBMITTALS

A. Comply with requirements of the Standard General Conditions and Agreement for Construction Services.

B. Product Data: Manufacturer's literature and data, including, where applicable, sizes, pressure rating, rated capacity, listing/approval stamps, labels, or other marking on equipment made to the specified standards for materials, and settings of selected models, for the following:

1. Piping and fittings.
2. Gaskets, couplings, sleeves, and assembly bolts and nuts.
3. Gate valves and ball valves.
4. Blow-off valves, air release and vacuum valves, and combination air valves.
5. Check valves.
6. Pressure reducing valves.
7. Backflow preventers.
8. Valve boxes, frames and covers.
9. Water meter boxes, frames and covers.
10. Post indicators.

11. Fire department connections and wet stand pipes.
12. Thrust block concrete mix and/or restrained joints and fittings.
13. Tapping sleeves and tapping valves.
14. Service saddles and corporation stops.
15. Identification materials and devices.
16. Corrosion protection.

C. Shop Drawings and Calculations: Shop Drawings and Calculations shall be stamped and signed by a registered Fire Protection Engineer licensed by the State of California as required.

1. Include the following information:
   a. Design assumptions.
   b. Thrust block sizing and calculations.
   c. Materials to be used.
   d. Available water pressure.
   e. Required water pressure.
2. The review of fire system components constitutes only a portion of the review and approval required. A copy of the fire system component submittal package shall be forwarded to the local Fire Marshal for further review and approval.

D. Exhibits:

1. Contractor shall provide meter location number(s) of any new meters on an 8.5" x 11" Exhibit.

E. Test Reports:

1. Water Pressure Report: Contractor shall engage the public utility agency, or a qualified testing service to conduct a flow test of the existing water main(s). Provide date and location of test, type and method of test performed, static pressure and residual pressure in psig, observed flow in gpm, and orifice size.
2. Bacteriologic Testing: Provide copies of the test results indicating water sample meets City and State Drinking Water Standards.
3. Sterilization Test Report: Provide copies of the test results indicating water sample meets City and State Sterilization Standards.

F. Samples: None specified. Provide as necessary.

1.04 QUALITY ASSURANCE

A. Comply with the latest edition of the following Standards and Regulations:
   1. American Water Works Association (AWWA) and American National Standards Institute (ANSI):
      a. C104/A21.4 ANSI Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. C105/A21.5 ANSI Standard for Polyethylene Encasement for Ductile- Iron Pipe Systems.
      c. C110/A21.10 ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 inch - 48 inch for Water.
      d. C111/A21.11 ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

e. C115/A21.15 ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
f. C116/A21.16 ANSI Standard for Protective Fusion-Bonded Epoxy Coatings Interior & Exterior Surfaces for Ductile-Iron and Gray-Iron Fittings.
g. C150/A21.50 ANSI Standard for Thickness Design of Ductile-Iron Pipe.
h. C151/A21.51 ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
i. C153/A21.53 ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
j. C500 Metal-Seated Gate Valves for Water Supply Service.
k. C502 Dry-Barrel Fire Hydrants.
l. C503 Wet-Barrel Fire Hydrants.
m. C504 Rubber-Seated Butterfly Valves.
n. C507 Ball Valves, 6 inches - 48 inches.
o. C508 Swing-Check Valves for Waterworks Service, 2 inches - 24 inches NPS.
p. C509 Resilient-Seated Gate Valves for Water Supply Service.
q. C510 Double Check Valve Backflow Prevention Assembly.
r. C511 Reduced-Pressure Principle Backflow Prevention Assembly.
s. C512 Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
t. C550 Protective Epoxy Interior Coating for valves and Hydrants.
u. C600 Installation of Ductile-Iron Water Mains and their Appurtenances.
v. C602 Cement- Mortar Living of water Pipelines in place- 4 inches and larger.
w. C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
x. C651 Disinfecting Water Mains
y. C652 Disinfection of Water-Storage Facilities
z. C800 Underground Service Line Valves and Fittings for 1/2 inches - 2 inches.
aa. C900 Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 inches - 12 inches, for Water Distribution.
bb. C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inches through 3 inches, for Water Service.
cc. C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings,14 inches - 48 inches.
dd. C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inches - 63 inches, for Water Distribution and Transmission.
ee. C907 Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4 inches - 8 inches.
ff. C908 PVC Self-Tapping Saddle Tees for Use on PVC Pipe.
gg. D103 Factory-Coated Bolted Steel Tanks for Water Storage.

2. National Fire Protection Association (NFPA):
   a. NFPA 13 Standard for the Installation of Sprinkler Systems.
   b. NFPA 14 Standard for the Installation of Standpipe, Private Hydrants, and Hose Systems.
   c. NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection.
   d. NFPA 22 Standard for Water Tanks for Private Fire Protection.
   e. NFPA 24 Private Service Mains and their Appurtenances.
   f. NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
3. Uni-Bell Plastic Pipe Association (UNI).
   a. PUB 3 PVC Pipe – Technology Serving the Water Industry.
   b. PUB 7 External Corrosion of Underground Water Distribution Piping Systems.
   c. PUB 8 Tapping Guide for AWWA C900 Pressure Pipe.

d. PUB 9 Installation Guide for PVC Pressure Pipe.
e. PUB 8 Recommended Practice for the Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe (Nominal Diameters 6-12 inch).

4. American Society of Testing and Materials (ASTM).
   a. ASTM A536 Standard Specification for Ductile Iron Castings.
   b. ASTM A674 Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
   c. ASTM D1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   d. ASTM D2241 Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe.
   e. ASTM D2466 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   f. ASTM D2564 Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
   g. ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
   h. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
   i. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
   j. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
   k. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
   l. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
   m. ASTM F1056 Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings.
   n. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   o. ASTM A795 Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
   p. ASTM A865 Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints.
   q. ASTM B88 Standard Specification for Seamless Copper Water Tube.
5. American Society of Mechanical Engineers (ASME).
   a. ASME B16 series for valves, fittings, flanges, and gaskets applicable for use in water systems.
   b. ASME B1.20.1 American Standard Tapered Pipe Threads for factory-threaded pipe and pipe fittings.
6. National Sanitation Foundation (NSF).
   a. NSF/ANSI 14 Plastics Piping System Components and Related Materials.
   b. NSF/ANSI 61 Standard for Drinking Water Systems Components - Health Effects.
7. Underwriters Laboratories, Inc. (UL).
   a. UL 157 Standard for Safety for Gaskets and Seals.
   b. UL 194 Standard for Safety for Gasketed Joints for Ductile-Iron Pipe and Fittings for Fire Protection Service.
   c. UL 213 Rubber Gasketed Fittings for Fire-Protection Service.
   d. UL 246 Standard for Safety for Hydrants for Fire-Protection Service.
   e. UL 262 Standard for Safety for Gate Valves for Fire-Protection Service.

f. UL 312 Standard for Safety for Check Valves for Fire-Protection Service.
g. UL 405 Standard for Safety for Fire Department Connections.
h. UL 448 Standard for Safety for Pumps for Fire-Protection Service.
i. UL 789 Standard for Safety for Indicator Posts for Fire-Protection Service.
j. UL 860 Pipe Unions for Flammable and Combustible Fluids and Fire- Protection Service.
k. UL 1091 Standard for Safety for Butterfly Valves for Fire-Protection Service.
l. UL 1285 Pipe and Couplings, Polyvinyl Chloride (PVC), for Underground Fire Service.
m. UL 1468 Direct Acting Pressure Reducing and Pressure Restricting Valves.
n. UL 1478 Standard for Safety for Fire Pump Relief Valves.

8. FM Global (FM).
   a. FM 1020 Automatic Water Control Valves.
   b. FM 1045 Waterflow Detector Check Valves.
   c. FM 1110 Indicator Posts.
   d. FM 1111 Post-Indicator-Valve-Assembly.
   e. FM 1112 Indicating Butterfly Valves.
   f. FM 1120 and FM 1130 Fire Service Water Control Valves (OS&Y and NRS Type Gate Valves).
   g. FM 1210 Swing Check Valves.
   h. FM 1221 Backflow Preventers (Reduced Pressure Principle and Double Check Valve Types).
   i. FM 1311 Centrifugal Fire Pumps (Horizontal, Split-Case Type).
   j. FM 1312 Centrifugal Fire Pumps (Vertical-Shaft, Turbine Type).
   k. FM 1319 Centrifugal Fire Pumps (Horizontal, End Suction Type).
   l. FM 1361 Water Pressure Relief Valve.
   m. FM 1362 Pressure Reducing Valves.
   n. FM 1371 Centrifugal Fire Pumps (In-Line Type).
   o. FM 1510 Fire Hydrants (Dry Barrel Type) for Private Fire Service.
   p. FM 1511 Fire Hydrants (Wet Barrel Type) for Private Fire Service.
   q. FM 1530 Fire Department Connections.
   r. FM 1610 Plastic Pipe & Fittings for Underground Fire Protection Service.
   s. FM 1620 Pipe Joints & Anchor Fittings for Underground Fire Service Mains.
9. Plastics Pipe Institute (PPI).
   a. Underground Installation of Polyethylene Pipe.
   b. Polyethylene Joining Procedures.
   c. Inspections, Test and Safety Considerations.
10. American Association of State Highway and Transportation Officials (AASHTO) for H20 Loading.
11. American Concrete Institute (ACI).
   a. ACI 348 - Meter Pit Construction.
12. California Department of Transportation (Caltrans): Standard Specifications:
   a. Section 51: Concrete Structures.
   b. Section 52: Reinforcement.
   c. Section 55: Steel Structures.
   d. Section 70: Miscellaneous Drainage Facilities.
   e. Section 71: Existing Drainage Facilities.
   f. Section 75: Miscellaneous Metal.
   g. Section 90: Concrete.
13. East Bay Municipal Utility District Standard Specifications and Details.
14. City of Oakland Fire Prevention Regulations.

15. Other authorities having jurisdiction.

B. System Description: Grades and elevations are to be established with benchmarks referenced on Plans.

C. Comply with East Bay Municipal Utility District and City of Oakland Standards and authorities having jurisdiction for the installation and testing of potable water piping and fire protection systems.

D. All testing of systems specified in this section shall be witnessed by representatives of the local water department or local authority. Provide at least 7 days' notice.

E. The Contractor shall prepare shop drawings and calculations, and obtain all required approvals for the fire water system of the proposed project. Contractor shall have shop drawings and calculations stamped and signed by a fire protection engineer, licensed by the State of California, as required by the City of Oakland.

PART 2 - PRODUCTS

2.01 PIPING

A. Water Distribution Main (pipe size 4 inches and larger).

1. Ductile Iron Pipe (DIP): Pressure Class 350 pipe conforming to AWWA/ANSI C151/A21.5, cement-mortar lining conforming to AWWA/ANSI C104/A21.4, with standard thickness per AWWA/ANSI C150/A21.50. U.S. Pipe, American Cast Iron Pipe Company (ACIPCO), or approved equivalent.
   a. Flanged ends shall conform to AWWA/ANSI C115/A21.15.
   b. Rubber-gasket joints shall conform to AWWA/ANSI C111/A21.11.
2. Polyvinyl Chloride Pipe (PVC): Pressure Class 305, DR 14, spigot and gasket bell end, conforming to AWWA C900 or AWWA C905, with equivalent cast-iron pipe outer diameter (O.D.). J-M Manufacturing, PW Pipe, North American Pipe Company, or approved equivalent.
3. Polyethylene Pipe (PE): PE 3408, Pressure Class 160, DR 11, conforming to AWWA C906. Driscopipe 4000/4100, or approved equivalent.

B. Water Service Line (pipe size 3 inches and smaller)

1. Copper (Cu): Provide Type K soft or hard copper pipe conforming to ASTM B88.
2. High Density Polyethylene Pipe (HDPE): PE3408, Pressure Class 200, DR 9 conforming to AWWA C901. PW PIPE or approved equivalent.

2.02 FITTINGS, GASKETS, COUPLINGS, SLEEVES, AND ASSEMBLY BOLTS AND NUTS

A. For DIP: Provide fittings with pressure rating greater than or equal to that of the pipe. Provide flanged joints, mechanical joints, push-on joints, and insulating joints where indicated. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends. Provide mechanically coupled type joints using a sleeve-type mechanical coupling where indicated. Provide ends of pipe and fittings suitable for the specified joints. Fittings shall have cement-mortar lining conforming to AWWA/ANSI C104/A21.4.

1. Flanged Joints: Provide bolts, nuts, and gaskets in conformance with AWWA/ANSI C115/A21.15. Flanged fittings shall conform to AWWA/ANSI C110/A21.10 or C153/A21.53.
    a. Provide flange for set screwed flanges of ductile iron, ASTM A536, Grade 65-45-12, and conform to the applicable requirements of ASME B16.1, Class 250.
    b. Provide setscrews for set screwed flanges of 190,000 psi tensile strength, heat treated and zinc-coated steel.
    c. Gaskets for set screwed flanges shall conform to the applicable requirements for mechanical-joint gaskets specified in AWWA/ANSI C111/A21.11.
    d. Design of set screwed gaskets shall provide for confinement and compression of gasket when joint to adjoining flange is made.
    e. Unless otherwise required, above ground flange assembly bolts shall be standard hex-head, cadmium plated machine bolts with American Standard Heavy, hot-pressed, cadmium plated hexagonal nuts. Buried flange nuts and bolts shall be as above except they shall be of Type 304 stainless steel.
2. Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA/ANSI C111/A21.11.
3. Push-on Joints: Provide shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly conforming to AWWA/ANSI C111/A21.11. Modify bell design fittings, as approved.
4. Insulating Joints: Provide a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to- metal contact at the joint between adjacent sections of dissimilar metals.
    a. Provide joint of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers.
    b. Provide gasket of the dielectric type, full face, as recommended in AWWA/ANSI C115/A21.15.
    c. Provide bolts and nuts as recommended in AWWA/ANSI C115/A21.15.
    d. Fittings shall be epoxy lined and coated with a thickness not less than 6-mils.

B. For PVC: Fittings shall be DIP or PVC.

1. DIP fittings: Provide gray-iron or ductile-iron conforming to AWWA/ANSI C110/A21.10, with cement-mortar lining conforming to AWWA/ANSI C104/A21.4, and standard thickness, with equivalent cast-iron pipe O.D.
    a. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except the bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe.
    b. Provide push-on joints, compression joints and mechanical joints where indicated between pipe and fittings, valves, and other accessories.
    c. Mechanical joints, glands, bolts and nuts, and gaskets shall conform to AWWA/ANSI C111/A21.11.
    d. Fittings shall be epoxy lined and coated with a thickness not less than 6-mils.
2. PVC fittings: Provide fabricated PVC fittings for pressure pipe conforming to AWWA C900, C905, or C907.
    a. PVC fittings shall conform to ASTM D2466.
    b. Push-on joints shall conform to ASTM D3139.
    c. Compression joints shall conform to ASTM D3139.
    d. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets shall conform to ASTM F477.

C. For PE: Fittings shall conform to AWWA C901 or AWWA C906. Driscopipe, or approved equivalent.

1. Socket type fittings shall conform to ASTM D2683.
2. Butt fusion fittings shall conform to ASTM D3261.
3. Electrofusion fittings shall comply with ASTM F1055.

D. For Cu:

1. Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18.
2. Wrought copper solder-joint pressure fittings or wrought copper alloy unions shall conform to ASME B16.22
3. Cast copper alloy flare fittings shall conform to ASME B16.26.
4. Wrought copper alloy body, hexagonal stock, metal-to-metal seating surfaces, and solder-joint threaded ends shall conform to ASME B1.20.1.
5. Compression connections shall be Mueller 110, Ford or approved equivalent.

E. For HDPE:

1. Cast Copper Fittings shall conform to ASME B16.18.
2. Cast Copper Compression Fittings and connections shall be Mueller 110 Ford or approved equivalent.

2.03 GATE VALVES AND BALL VALVES

A. Gate Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.

1. Stuffing boxes shall have O-ring stem seals. Provide stuffing boxes bolted and constructed so as to permit easy removal of parts for repair.
2. Valves:
   a. Provide valves manufactured in accordance with AWWA C-504-87, Class 150B, short body valve conforming to AWWA C500 or AWWA C509 and of one manufacturer. Valves shall have a non-rising stem, a 2-inch square nut, and double-disc gates. Valves shall be rated for 250 psi maximum working pressure. Valves < 3 inches shall be American Darling and Manufacturing Co. No. 52 or Ludlow-Renssel Architect and Engineer Valve Division Model No HD-132, List 134. Valves 3-inches or larger shall be Walworth Fig 726F or Crane Fig No. 465-1/2.
   b. For the domestic water system, valves shall also conform to ANSI/NSF 61.
   c. For the fire water system, valves 2 inches through 16 inches in size shall also conform to UL 262 and FM 1120 or FM 1130 to a working pressure of 200 psi.
3. Where a post indicator is shown, provide valve with an indicator post flange.

B. Ball Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.

1. Valves (2-inches and smaller):
   a. Provide valves conforming to AWWA C800 and of one manufacturer and shall be Crane Co. Accesso Cat No. 2330-TF or Lunkenheimer Fig. No. 700SB.

2.04 Provide valve with operating nut or handle as shown on the Construction Documents.

2.05 BLOW-OFF VALVES, AIR RELEASE AND VACUUM VALVES, AND COMBINATION AIR VALVES

A. Blow-off valves: Provide valve and service size as shown in the Contract Documents. Provide 2-inch valves at low points of the piping system, and 4-inch valves at dead-ends of the piping system, unless otherwise directed by the Engineer.

1. 2-inch blow-off shall have a 2-inch vertical female iron pipe (FIP) inlet and a 2-inch normal pressure and temperature (NPT) nozzle outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF550, or approved equivalent.
2. 4-inch blow-off shall have a 4-inch vertical FIP inlet and a 4-inch male iron pipe (MIP) outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF800, or approved equivalent.

B. Air release and vacuum valves: Provide valve and service size as shown on the Contract Documents, and where there is an increase in the downward slope or a decrease in the upward slope of the piping system. Valve shall have cast-iron single valve body, and shall conform to AWWA C512. A compound lever system shall have a maximum operating pressure of 300psi. Provide a protective cap for the outlet of the valve. Provide universal air-vacuum type valves, Crispin Model UL, Apco, or approved equivalent.

C. Combination air valves: Provide valve and service size as shown on the Contract Documents, and at high points and sharp changes in gradient of the pipe system. Valve shall have cast-iron single valve or double valve body, and shall conform to AWWA C512. A simple or compound lever system shall have a maximum operating pressure of 300psi. Provide a protective cap for the outlet of the valve. Crispin Model C, Apco, or approved equivalent.

2.06 CHECK VALVES

A. Valves: Valves shall have clear port opening and a cast-iron body. Provide spring-loaded or weight-loaded valves where indicated on the Construction Documents.

1. For the domestic water system, provide swing-check type valves conforming to AWWA C508. Provide valves of one manufacturer. Mueller, Apco, or approved equivalent.
2. For the fire water system, provide swing-check type valves conforming to FM 1210 and UL 312. Mueller, Watts, or approved equivalent.

2.07 PRESSURE REDUCING VALVES

A. Pressure Reducing Valves: Valves shall have a cast-iron body, conforming to ASTM A536, with epoxy interior coating conforming to AWWA, and rated to Pressure Class 300 and be C.M. Bailey Co. or Fisher, or approved equivalent.

1. Valves shall have flanged ends.
2. Valves sized 3-inches or smaller may have screwed ends.

2.08 POST INDICATORS

A. Posts Indicators shall withstand up to 900 ft-lbs of operating torque, be free- standing, and tamper-proof.

B. Post Indicators shall conform to UL 789 and FM 1110. Mueller, ACIPCO, or approved equivalent.

2.09 VALVE BOXES, METER BOXES, FRAMES AND COVERS

A. Water Valve Box: Provide pre-cast concrete valve box for each buried valve. Provide box with steel or cast iron traffic cover marked "WATER." Christy Model G5 with G5C covers or approved equivalent.

B. Valve or Meter Boxes: Contractor shall verify box size required for water system appurtenances as shown in the Contract Documents. Provide a precast concrete utility box for each buried appurtenance. Provide a traffic-rated lid for H20 loading. A non-traffic rated lid may be used for boxes located in landscape areas. Christy, or approved equivalent.

2.10 BACKFLOW PREVENTERS

A. Provide backflow preventers as shown on the Contract Documents. Subject to local water department approval. Backflow preventers on the fire water system shall be subject to approval by the local office of the Fire Marshal.

B. Reduced Pressure Principle Assemblies (RPPA): Provide a cast-iron body RPPA consisting of two independently operating check valves with a pressure differential relief valve located between the two check valves, two shut-off valves and four test cocks. RPPA shall be tamper-proof and conform to AWWA C511. Per the EBMUD approved list, Febco, Wilkins, Watts, Ames or approved equivalent.

C. Double Check Detector Assemblies (DCDA): Provide a cast-iron body DCDA consisting of mainline double check assemblies in parallel with a bypass double check and meter assembly, two shut-off valves and four test cocks. DCDA shall be tamper-proof and conform to AWWA C510. Per the EBMUD approved list, Febco, Wilkins, Watts, Ames or approved equivalent.

2.11 FIRE DEPARTMENT CONNECTIONS AND WET STAND PIPES

A. Fire Department Connections (FDC): Provide FDC's with 2-1/2 inch female hose connections, sidewalk or free-standing type. Number of inlets shall be as shown on the Contract Documents. Clapper and spring check inlets shall each have a minimum capacity of 250 gpm, and be furnished with knox FDC plug. Outlet shall be sized for simultaneous use of all inlets. Connection shall be branded "AUTO SPKR".

1. 2-Way FDC: Connection shall conform to UL 405 or FM 1530. Elkhart, Croker, or approved equivalent.
2. 3-Way FDC: Connection shall be subject to approval by the local water department or Fire Marshal. Elkhart, Croker, Potter-Roemer or approved equivalent.
3. 4-Way FDC: Connection shall conform to UL 405. Potter-Roemer, Croker, or approved equivalent.
4. 6-Way FDC: Connection shall be subject to approval by the local water department or Fire Marshal. Croker, Potter-Roemer or approved equivalent.

B. Wet Stand Pipes (WSP): Provide 2-Way WSP's with valves and two (2) 2-1/2 inch male hose connections free-standing type, with a 4" inlet. Each outlet shall each have a minimum capacity of 250 gpm, and be furnished with a cap and chain. Water to the WSP shall be controlled with a remote valve. Connection shall be branded "HYDRANT." Subject to approval by the local water department or Fire Marshal. Croker, Elkhart, Potter-Roemer or approved equivalent.

2.12 THRUST BLOCKS AND PIPE RESTRAINTS

A. Blocks: Provide thrust blocks in accordance with NFPA 24 Standards. Use concrete conforming to ASTM C94 having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.

B. Pipe Restraints: Provide thrust restraint systems for fittings and joints as required or as indicated on the Plans.

1. For mechanical joint fittings and joints: Pipe restraints shall be "Mega-Lug" pipe restraint system by EBBA Iron, Inc., or approved equivalent.
2. or push-on joint fittings and joints: Pipe restraints shall be "Field-Lok" gaskets by U.S. Pipe, or approved equivalent.

C. Thrust blocks, gravity blocks, or mechanical pipe restraints may be used at Contractor's option, unless otherwise indicated on the Plans.

D. Provide thrust blocks or mechanical pipe restraints at all fittings and changes in angle, alignment or elevation.

E. Where depth or location of water piping, existing utilities, or other structures prohibit the use of standard thrust blocks, gravity blocks or mechanical pipe restraints may be used. Conform to NFPA 24 Standards.

2.13 TAPPING SLEEVES AND TAPPING VALVES

A. Sleeves shall be epoxy coated and furnished with stainless steel washers, nuts and bolts. Mueller H-615 and H-619, Ford, or approved equivalent.

B. Tapping valves shall have flanged inlet, Class 125, conforming to ASME B16.1 and furnished with stainless steel washers, nuts and bolts. Tapping valves shall be constructed with a mechanical joint outlet. Mueller T-687, T-642, T-681, or approved equivalent.

2.14 SERVICE SADDLES AND CORPORATION STOPS

A. Service Saddles: Saddles shall conform to AWWA C800 and NSF 61.

1. For DIP: Provide bronze or stainless steel body, double strap type with a 200 psi maximum working pressure. Mueller BR2 Series, Ford, or approved equivalent.
2. For PVC: Provide bronze body, wide strap type. Mueller H-13000 Series, Ford, or approved equivalent.

B. Corporation Stops: Provide ground key type; bronze conforming to ASTM B61 or ASTM B62, for a working pressure of 100 psi. and suitable for the working pressure of the system.

1. Ends shall be suitable for adjoining pipe and connections, solder-joint, or flared tube compression type joint.
2. Threaded ends shall conform to AWWA C800.
3. Coupling nut for connection to flared copper tubing shall conform to ASME B16.26.
4. Mueller H-15000 Series with "CC" threads and a copper flare straight connection outlet, Ford, or approved equivalent.

2.15 IDENTIFICATION MATERIALS AND DEVICES

A. Marker Tape: Provide marker tape consisting of metallic foil bonded to plastic film not less than 2-inches wide. Film shall be inert polyethylene plastic. Film and foil shall each not be less than 1-mil. thick. The tape shall be identified with lettering, not less than 3/4-inch high, "CAUTION: WATER MAIN BELOW," repeated at approximately 24-inch intervals.

B. Tracer Wire for Nonmetallic Piping: Provide 12 gage, coated copper or aluminum wire not less than 0.10 inch in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe. Wire shall be tied in at all valves.

2.16 CORROSION PROTECTION

A. In soils with high resistivity, high sulfides, high/low ph, redox potential and/or poor surrounding drainage conditions, or as indicated in the Contract Documents, encase underground pipe and appurtenances in 4-mil, high-density cross- laminated (HDCL) polyethylene film or 8-mil linear low-density (LLD) polyethylene film in accordance with AWWA/ANSI C105/A21.5. U.S. Pipe, ACIPCO, or approved equivalent.

B. Contractor to follow all recommendations in the geotechnical report for the project.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces and areas for suitable conditions where water service is being installed.

B. Do not begin installation until unsatisfactory conditions have been corrected.

3.02 LOCATION OF WATER LINES

A. Where the location of the water line is not clearly defined by dimensions on the Plans, do not lay water line closer than 10 feet horizontally from any sewer line.

B. Where water lines cross under gravity sewer lines, encase sewer line in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing.

C. Where water lines cross sewer force mains and inverted siphons, install water line at least 2 feet above these sewer lines.

D. When joints in the sewer line are closer than 3 feet horizontally from the water line, encase sewer line joints in concrete.

E. Do not lay water lines in the same trench with other utilities.

F. Install water lines at 3'-0" minimum depth or as detailed on Construction Documents or municipal details.

3.03 INSTALLATION OF PIPING

A. Inspection:

1. Before placing in position, inspect pipe for noticeable defects. Clean the pipe, fittings, valves, and accessories, and maintain in a clean condition.
2. Remove fins and burrs from pipe and fittings.

B. Pipe laying and jointing:

1. Provide proper facilities for lowering sections of pipe into trenches.
2. Do not drop or dump pipe, fittings, valves, or any other water line material into trenches.
3. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
4. Blocking or wedging between bells and spigots will not be permitted. Lay bell- and-spigot pipe with the bell end pointing in the direction of lying.
5. Grade the pipeline in straight lines; avoid the formation of dips and low points.
6. Support pipe at proper elevation and grade.
7. Provide secure firm, uniform support. Wood support blocking will not be permitted.
8. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
9. Provide anchors and supports where indicated and where necessary for fastening work into place.
10. Make proper provision for expansion and contraction of pipelines.
11. Keep trenches free of water until joints have been properly made.
12. Do not lay pipe when conditions of trench or weather prevent proper installation.
13. All fittings shall be blocked with appropriately sized thrust blocks as shown in the Contract Documents.

C. Installation of Tracer Wire:

1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

D. Connections to Existing Lines:

1. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.
2. Make connections to existing lines under pressure in accordance with the recommended procedures of a manufacturer of pipe of which the line being tapped is made.

E. The end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads to keep out debris and contamination.

INSTALLATION OF DUCTILE-IRON PIPING

F. Install pipe and fittings in accordance with requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

G. Jointing:

1. Provide push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
2. Provide mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and with the recommendations of AWWA C111.
3. Provide flanged joints with the gaskets, bolts, and nuts specified for this type joint.

a. Install flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories.
b. Align bolt holes for each flanged joint.
c. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted.
d. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without over straining the flange.
e. Where flanged pipe and fitting have dimensions that do not allow the installation of a proper flanged joint as specified, replace it by one of proper dimensions.
f. Use set screwed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe. Assemble in accordance with the recommendations of the set screwed flange manufacturer.

4. Provide insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints. Bolts for insulating sleeves shall be full size for the bolt holes.
5. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.

H. Exterior Protection: Completely encase buried ductile iron pipelines and underground appurtenances with polyethylene wrap. Install 8-mil linear low- density polyethylene (LLD) film or 4-mil high-density cross-laminated (HDCL) film per manufacturer's recommendations and in accordance with AWWA/ANSI C105/A21.5 and ASTM A674.

I. Pipe Anchorage:

1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Construction Documents.

2. Pipe anchorage shall be in accordance with NFPA 24 Standards.

INSTALLATION OF POLYVINYL CHLORIDE PIPING

J. Install pipe and fittings in accordance with the requirements of UNI B-3 for the following:

1. The laying of pipe, joining PVC pipe to fittings and accessories.
2. The setting of hydrants, valves, and fittings.

K. Comply with the recommendations for pipe joint assembly and appurtenance installation in AWWA Manual M23, Chapter 7, “Installation.”

L. Comply with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111.

M. Jointing:

1. Provide push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
2. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
3. For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.
4. Use an approved lubricant recommended by the pipe manufacturer for push- on joints.
5. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of UNI B-3 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly.
6. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint. Cut off spigot end of pipe for compression-type joint or mechanical-joint connections and do not re-bevel.
7. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

N. Pipe Anchorage:

1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Construction Documents.
2. Anchorage. shall be in accordance with the requirements of UNI B-3 and in accordance with NFPA 24 Standards for reaction or thrust blocking and plugging of dead ends, except that size and positioning of thrust blocks shall be as indicated on the Construction Documents.

INSTALLATION OF POLYETHYLENE PIPING

O. Install pipe, fittings, and appurtenances in accordance with PPI and Manufacturer’s Recommendations.

P. Jointing:

1. Provide mechanical joints, compression fittings, or flanges as recommended by the manufacturer.
2. Jointing shall be performed using proper equipment and machinery by trained and certified personnel.
3. Joints, fittings and tools shall be clean and free of burrs, oil, and dirt.
4. Butt fusion:
    a. Pipe ends shall be faced to establish clean, parallel mating surfaces.
    b. Align and securely fasten the components to be joined squarely between the jaws of the joining machine.
    c. Heat the ends of the pipe to the pipe manufacturer's recommended temperature interface pressure and time duration. A pyrometer or other surface temperature measuring device should be used to insure proper temperature of the heating tool. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
    d. Prevent molten plastic from sticking to the heater faces. Molten plastic on the heater faces shall be removed immediately according to the tool manufacturer's instructions.
    e. Bring the molten ends together with sufficient pressure to properly mix the pipe materials and form a homogeneous joint. Hold the molten joint under pressure until cooled adequately to develop strength. Refer to the Manufacturer's Recommendations for temperature, pressure, holding, and cooling times.
    f. Remove the inside bead from the fusion process using Manufacturer's recommended procedure.
5. Socket fusion:
    a. Mixing manufacturers' heating tools and depth gages will not be allowed unless the tools conform to ASTM F1056.
    b. Pipe ends shall be faced square to establish clean, parallel mating surfaces.
    c. Clamp the cold ring on the pipe at the proper position using a depth gauge.
    d. Heat the tool to the pipe manufacturer's recommended temperature. A pyrometer or other surface temperature measuring device should be used to insure proper temperature. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
    e. Follow manufacturer's recommendations for bringing the hot tool faces into contact with the outside surface of the end of the pipe and the inside surface of the socket fitting.
    f. Simultaneously remove the pipe and fitting from the tool.
    g. Inspect the melt pattern for uniformity and immediately insert the pipe squarely and fully into the socket of the fitting until the fitting contacts the cold ring. Do not twist the pipe or fitting during or after the insertion.
    h. Hold or block the pipe in place during cooling.
6. Electrofusion:
    a. Unless the operation is for a saddle-type electrofusion joint, pipe ends shall be faced square to establish clean, parallel mating surfaces.
    b. Clamp the pipe and fitting at the proper position in the fixture.
    c. Connect the electrofusion control box to the fitting and to the power source. Apply the electric current using manufacturer's instructions.
    d. Allow the joint to cool before removing the clamping fixtures.

3.04 INSTALLATION OF VALVES

A. Install gate valves conforming to AWWA C500 and UL 262 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, operation, and Maintenance of Gate Valves) to AWWA C509.

B. Install gate valves conforming to AWWA C509 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C509.

C. Install gate valves on PVC water mains in addition in accordance with the recommendations for appurtenance installation in AWWA Manual M23, Chapter 7, “Installation.”

D. Install check valves in accordance with the applicable requirements of AWWA C600 for valve-and-fitting installation, except as otherwise indicated.

E. Provide and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings.

3.05 INSTALLATION OF VALVE AND METER BOXES

A. Boxes shall be centered over the appurtenance so as not to transmit shock or stress. Covers shall be set flush with the surface of the finished pavement, or as shown in the Construction Documents. Backfill shall be placed around the boxes and compacted to the specified level in a manner that will not damage or displace the box from proper alignment or grade. Misaligned boxed shall be excavated, plumbed, and backfilled at no additional cost to the Owner.

3.06 SERVICE LINE CONNECTIONS TO WATER MAINS

A. Connect service lines of size shown on plans to the main with a rigid connection or a corporation stop and gooseneck. Install a gate valve on the service line.

B. Connect service lines to ductile-iron water mains in accordance with AWWA C600 for service taps.

C. Connect service lines to PVC plastic water mains in accordance with UNI-B-8 and the recommendations of AWWA Manual M231, Chapter 9, “Service Connections.”

3.07 INSTALLATION OF BACKFLOW PREVENTERS

A. Devices shall be installed horizontal and level, with three feet minimum clearances from obstructions.

3.08 HYDROSTATIC PIPELINE TESTING

A. Requirements:

1. After the pipe has been laid and backfilled, perform hydrostatic pressure tests.
2. Do not conduct tests until at least 12 hours have elapsed since pipe lying and at least 5 days have elapsed since placing of concrete thrust blocks.

3. Fill the pipe with water which shall remain without external application of pressure for 24 hours before tests are conducted.
4. Prior to hydrostatic testing, flush pipe system with fresh water until piping is free of dirt and foreign matter.
5. Apply pressure by a pump and measured by a test gage. All necessary apparatus and labor for conducting the pressure and leakage tests shall be furnished by the Contractor.
6. Ensure the release of air from the line during filling, and prevent collapse due to vacuum when dewatering the line.
7. For pressure test, use a hydrostatic pressure not less than 200 psi. The duration of the test shall not be less than 4 hours with the variation in pressure of not more than 5 psi for the duration of the test.

B. Leakage Tests:

1. Perform tests at the same time as pressure tests.
2. Leakage rate shall be measured for at least 4 hours with a certified water meter, or other approved method. If requested, meter certification shall be submitted to the Owner's Representative for approval prior to testing.
3. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
4. Leakage at mechanical couplings and joints, tapping sleeves, saddles, flanged joints, and copper piping will not be accepted. Correct any visible leaks.
5. Push-on joints: Test ductile iron pipe for leakage in accordance with AWWA C600 as shown in the following table:

TABLE 1
Allowable Leakage per 1000 feet of DIP Pipeline (Gal/Hr)

Average Test Pressure	Nominal Pipe Diameter - Inches									
(psi)	3	4	6	8	10	12	14	16	18	20
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60
275	0.37	0.50	0.75	1.00	.124	1.49	1.74	1.99	2.24	2.49
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12

6. When the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
7. Test polyvinyl chloride pipe for leakage in accordance with the recommendations of the Uni-Bell Plastic Pipe Association (UNI) as shown in the following table:

TABLE 2
Allowable Leakage per 1000 feet or 50 joints of PVC Pipeline (Gal/Hr)

Nominal Pipe Size (inches)	Average Test Pressure in Line (psi.)	
	200	250
4	0.38	0.43
6	0.57	0.64
8	0.76	0.85
10	0.96	1.07
12	1.15	1.28
14	1.34	1.50
16	1.53	1.71
18	1.72	1.92
20	1.91	2.14

8. Should any section of new pipe fail to pass either test, locate and repair the defective pipe and repeat the test.

3.09 STERILIZATION AND FLUSHING

A. General:

1. Domestic water lines, mains, and branches by chlorination in accordance with AWWA C601 and as herein specified.

B. Sterilization Methods:

1. Liquid Chlorine Solution Method:
   a. Flush all foreign matter from mains, branch runs, hydrant runs, and installed services.
   b. Introduce liquid chlorine solution at appropriate locations to assure uniform distribution through the facilities at the proper concentration.
   c. Do not use installed copper service lines to convey the concentrated chlorine solution to the mains.
   d. The sanitizing solution shall be retained in the facilities for a period of 24 hours after which each service, hydrant run, branch run and dead end shall be flushed until:
   i. Residual chlorine is less than 1 part per million.
   ii. Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.
   e. Chlorine shall be a 1 percent solution (containing 10,000 parts per million available chlorine) or shall be obtained by use of dry chlorine in tablet form firmly attached to inside tope of the pipe.

f. The required concentration of chlorine in the pipe is 50 parts per million. This concentration may be attained by adding 5 gallons of the chlorine solution to 1,000 gallons of water.

g. The weight of chlorine or chlorine compound required to make a 1 percent chlorine solution is as follows:

TABLE 3
One-Percent Chlorine Solution Mix

AMOUNT OF PRODUCT COMPOUND		QUANTITY OF WATER
High-Test Calcium Hypochlorite (65-70% Cl)	1 pound	7.50
Chlorinated Lime (32-35% Cl)	2 pounds	7.50
Liquid Laundry Bleach (5.25% Cl)	1 gallon	4.25
Liquid Chlorine (100% available chlorine)	0.62 pounds	7.50

2. HTH Tablet Method:

a. The required concentration of chlorine in the mains may be obtained by the use of HTH tablets as produced by Olin Mathieson in the following quantities or equivalent:

TABLE 4
HTH Tablet (70%) Dosage
Number of Tablets Per Length of Pipe

Length of Section	DIAMETER OF PIPE				
	4 inches	6 inches	8 inches	10 inches	12 inches
13 feet	1	2	3	4	6
18 feet	1	2	3	5	6
20 feet	1	2	3	5	7
30 feet	2	3	5	7	10
36 feet	2	3	5	8	12
40 feet	2	4	6	9	14
100 feet	4	9	15	23	30

b. Tablets are to be fastened to the inside top surface of each length of pipe using “Permatex No. 1" no earlier than the day pipe is laid.

c. Tablets shall not be installed in the pipe and left overnight before laying and shall not be accessible at any time for casual pilferage by the general public or by children. Tablets shall be stored in a hermetically sealed container.

d. The new water lines are to be slowly filled with water. Air is to be exhausted from each dead end, branch run, hydrant run, and installed service.

e. Water shall be retained for a period of 24 hours, after which each service, hydrant run, branch run and dead end shall be thoroughly flushed to clear foreign matter and until:

i. Residual chlorine concentration is less than 1 part per million.

ii. Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.

C. Bacteriological Testing:

1. Samples shall be gathered and tests conducted at the expense of the Contractor by a laboratory certified by the California Department of Health Services as an Environmental Testing Laboratory (ELAP).
2. Samples are to be taken at representative points as required by the Owner's Representative and authorities having jurisdiction.
3. The new water lines shall remain isolated and out of service until satisfactory test results have been obtained that:
   a. Meet the requirements of the California Department of Health Services, Drinking Water Standards.
   b. Owner's Representative has accepted the results as indicative of the bacteriological condition of the facilities.
   c. If unsatisfactory or doubtful results are obtained from the initial sampling, repeat the chlorination process until acceptable test results are reported.

3.10 UTILITY SERVICES VERIFICATION

A. Contractor shall record location and meter number(s) of any new meters on an 8.5" x 11" site plan of the project site and submit to the Owner's Representative upon completion of the meter installations.

END OF SECTION

SECTION 33 41 00

STORM UTILITY DRAINAGE PIPING

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.

B. California Department of Transportation (Caltrans) Standard Specifications:

1. Section 51: Concrete Structures.
2. Section 52: Reinforcement.
3. Section 55: Steel Structures.
4. Section 70: Miscellaneous Facilities.
5. Section 72: Slope Protection.
6. Section 75: Miscellaneous Metal.
7. Section 90: Portland Cement Concrete.

1.02 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Expansion joints and deflection fittings.
4. Cleanouts.
5. Drains.
6. Encasement for piping.
7. Manholes.
8. Channel drainage systems.
9. Catch basins.
10. Stormwater inlets.
11. Pipe outlets.

1.03 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

1.04 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.

2. Catch basins, stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

1.05 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

D. Field quality-control reports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Municipality and District no fewer than three days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without Municipality written permission.

PART 2 - PRODUCTS

2.01 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.02 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI-Trademarked, Shielded Couplings:

1. Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Shielded Couplings:

1. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Shielded Couplings:

1. Description: ASTM C 1277 and ASTM A 48, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.03 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.04 STEEL PIPE AND FITTINGS

A. Corrugated-Steel Pipe and Fittings: ASTM A 760, Type I with fittings of similar form and construction as pipe.

1. Special-Joint Bands: Corrugated steel with O-ring seals.

2. Standard-Joint Bands: Corrugated steel.

3. Coating: Zinc.

2.05 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.

2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.

3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Profile Sewer Piping:

1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.

2. Fittings: ASTM D 3034, PVC with bell ends.

3. Gaskets: ASTM F 477, elastomeric seals.

C. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.

2. Fittings: ASTM D 3034, SDR-26, PVC with bell ends.

3. Gaskets: ASTM F 477, elastomeric seals.

D. PVC Gravity Sewer Piping:

1. Pipe and Fittings: ASTM F 679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

E. PVC Pipe Reducer:

1. Pipe reducer: ASTM D-3034, SDR 35, PVC pipe.

2. Fittings: J-M Manufacturing Co. Concentric Increaser (G & G or G & S), or approved equivalent.

2.06 CONCRETE PIPE AND FITTINGS

A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14, Class 3, 1350-D, with tongue and groove or bell-and-spigot or flanged ends and gasketed joints with ASTM C 443 rubber gaskets.

B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.

1. Bell-and-spigot or flanged ends and gasketed joints with ASTM C 443, rubber gaskets.

2.07 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443, rubber.

2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.

3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.08 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron Flexible Expansion Joints:

1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:

1. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron or steel with protective coating, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated.

C. Ductile-Iron Deflection Fittings:

1. Description: Compound-coupling fitting, with ball joint, flexing section, gaskets, and restrained-joint ends, complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees of deflection.

2.09 BACKWATER VALVES

A. Cast-Iron Backwater Valves:

1. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.

2. Horizontal type; with swing check valve and hub-and-spigot ends.

3. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.

4. Terminal type; with bronze seat, swing check valve, and hub inlet.

B. Plastic Backwater Valves:

1. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.10 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

2. Top-Loading Classification(s): Light Duty, Medium Duty, Heavy Duty and Extra-Heavy Duty.

3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.11 DRAINS

A. Cast-Iron Area Drains:

1. Description: ASME A112.6.3 gray-iron, round body with anchor flange and round grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.

2. Top-Loading Classification(s): Medium and Heavy Duty.

2.12 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density polyethylene film of 0.008-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Any.

2.13 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints. Shall conform to Section 70-1.02H and 71-1.07 of the Caltrans Standard Specifications.

2. Diameter: 48 inches minimum unless otherwise indicated.

3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.

4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.

6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.

7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.

9. Steps: Individual FRP steps wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 24 inches

10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.

2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.

3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

4. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.

5. Steps: Individual FRP wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 24 inches.

6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER", 2” high.

2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.14 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel.

2.15 CHANNEL DRAINAGE SYSTEMS

A. General Requirements for Polymer-Concrete, Channel Drainage Systems: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include quantity of units required to form total lengths indicated.

B. Sloped-Invert, Polymer-Concrete Systems:

1. Channel Sections:

a. Interlocking-joint, precast, modular units with end caps.

b. 4-inch inside width and deep, rounded bottom, with built-in invert slope of 0.6 percent and with outlets in quantities, sizes, and locations indicated.

c. Extension sections necessary for required depth.

d. Frame: Include gray-iron or steel frame for grate.

2. Grates:

a. Manufacturer's designation "Heavy Duty," with slots or perforations that fit recesses in channels.

b. Material: Galvanized steel.

3. Covers: Solid gray iron if indicated.

4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

C. Narrow-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:

a. Interlocking-joint, precast, modular units with end caps.

b. 5-inch inside width and 9-3/4-inch- deep, rounded bottom, with level invert and with NPS 4 outlets in quantities, sizes, and locations indicated.

2. Grates:

a. Slots or perforations that fit recesses in channels.

b. Material: Galvanized steel.

3. Covers: Solid gray iron if indicated.

4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

D. Wide-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:

a. Interlocking-joint, precast, modular units with end caps.

b. 8-inch inside width and 13-3/4-inch-deep, rounded bottom, with level invert and with outlets in quantities, sizes, and locations indicated.

2. Grates:

a. Slots or other openings that fit recesses in channels.

b. Material: Gray iron.

3. Covers: Solid gray iron if indicated.

4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

E. Drainage Specialties: Precast, polymer-concrete units.

1. Large Catch Basins:

a. 24-by-12-inch polymer-concrete body, with outlets in quantities and sizes indicated.

b. Gray-iron slotted grate.

c. Frame: Include gray-iron or steel frame for grate.

2. Small Catch Basins:

a. 19- to 24-inch by approximately 6-inch polymer-concrete body, with outlets in quantities and sizes indicated.

b. Gray-iron slotted grate.

c. Frame: Include gray-iron or steel frame for grate.

F. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.

G. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.16 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.

4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.

7. Steps: Individual FRP steps wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 24 inches.

8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.

1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.

2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.

3. Steps: Individual FRP steps wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 24 inches

4. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches minimum unless otherwise indicated.

2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.

3. Steps: Individual FRP steps wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of structure to finished grade is less than 24 inches.

E. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER", 2" high.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.

2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.

3. Install piping with 30-inch minimum cover.

4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.

7. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.

8. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

9. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

10. Install fiberglass sewer piping according to ASTM D 3839 and ASTM F 1668.

11. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

12. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

4. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.

5. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.

6. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.

7. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.

8. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.

9. Join fiberglass sewer piping according to ASTM D 3839 for elastomeric-seal joints.

10. Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.

11. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.

12. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.04 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.

2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.

3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.

4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roadways.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.05 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.

2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.

3. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.

4. Use Extra-Heavy-Duty, top-loading classification drains in roadways.

B. Embed drains in 4-inch minimum concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

3.06 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.07 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.08 STORMWATER INLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.09 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.10 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Shielded flexible couplings for same or minor difference OD pipes.

b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.

c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.11 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.

2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

1. Remove manhole or structure and close open ends of remaining piping.

2. Remove top of manhole or structure down to at least 48 inches below final grade. Fill to within 24 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 312000 "Earth Moving."

3.12 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.13 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.

2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

c. Damage: Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

4. Submit separate report for each test.

5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

   a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.

   b. Option: Test plastic piping according to ASTM F 1417.

   c. Option: Test concrete piping according to ASTM C 924.

6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.

   a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.

   b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.14 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

Attachments

- None

END OF SECTION

SECTION 33 46 00

SUBDRAINAGE

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.

B. California Department of Transportation (Caltrans) Standard Specifications:

1. Section 66: Corrugated Metal Pipe.

2. Section 70: Miscellaneous Facilities.

1.02 SUMMARY

A. Section Includes:

1. Perforated-wall pipe and fittings.

2. Drainage conduits.

3. Geotextile filter fabrics.

1.03 ACTION SUBMITTALS

A. Product Data:

1. Shop Drawings:

a. Foundation Wall Drainage System: Indicate dimensions, layout of piping, high and low points of pipe inverts, gradient of slope between corners and intersections, and method of connection to site storm sewer systems.

b. Trench Drain System: Indicate schematic of drainage system listing parts being provided, assembly, relation to adjacent material, methods of leveling and anchorage, method of connection to building storm piping and exact centerline dimensions suitable for installation.

2. Product Data: Provide data on pipe drainage products, pipe accessories, slot drain system and drain system accessories. Drainage conduits, including rated capacities.

3. Drainage panels, including rated capacities.

4. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.01 PERFORATED-WALL PIPES AND FITTINGS

A. Perforated PVC Sewer Pipe and Fittings: ASTM D 2729, bell-and-spigot ends, for loose joints.

2.02 DRAINAGE CONDUITS

A. Molded-Sheet Drainage Conduits: Prefabricated geocomposite with cuspated, molded-plastic drainage core wrapped in geotextile filter fabric.

1. Nominal Size: 12 inches high by approximately 1 inch thick.

a. Minimum In-Plane Flow: 30 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

2. Nominal Size: 18 inches high by approximately 1 inch thick.

a. Minimum In-Plane Flow: 45 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

3. Filter Fabric: PP geotextile.

4. Fittings: HDPE with combination NPS 4 and NPS 6 (DN 100 and DN 150) outlet connection.

B. Multipipe Drainage Conduits: Prefabricated geocomposite with interconnected, corrugated, perforated-pipe core molded from HDPE complying with ASTM D 1248 and wrapped in geotextile filter fabric.

1. Nominal Size: 6 inches high by approximately 1-1/4 inches thick.

a. Minimum In-Plane Flow: 15 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

2. Nominal Size: 12 inches high by approximately 1-1/4 inches thick.

a. Minimum In-Plane Flow: 30 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

3. Nominal Size: 18 inches high by approximately 1-1/4 inches thick.

a. Minimum In-Plane Flow: 45 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

4. Filter Fabric: Nonwoven, needle-punched geotextile.

5. Fittings: HDPE with combination NPS 4 and NPS 6 (DN 100 and DN 150) outlet connection.

6. Couplings: HDPE.

C. Single-Pipe Drainage Conduits: Prefabricated geocomposite with perforated corrugated core molded from HDPE complying with ASTM D 3350 and wrapped in geotextile filter fabric.

1. Nominal Size: 12 inches high by approximately 1 inch thick.

a. Minimum In-Plane Flow: 30 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

2. Nominal Size: 18 inches high by approximately 1 inch thick.

a. Minimum In-Plane Flow: 45 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

3. Filter Fabric: PP geotextile.

4. Fittings: HDPE with combination NPS 4 and NPS 6 (DN 100 and DN 150) outlet connection.

5. Couplings: Corrugated HDPE band.

D. Mesh Fabric Drainage Conduits: Prefabricated geocomposite with plastic-filament drainage core wrapped in geotextile filter fabric. Include fittings for bends and connection to drainage piping.

1. Nominal Size: 6 inches high by approximately 0.9 inch thick.

a. Minimum In-Plane Flow: 2.4 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

2. Filter Fabric: Nonwoven geotextile made of PP or polyester fibers or combination of both. Flow rates range from 120 to 200 gpm/sq. ft when tested according to ASTM D 4491.

E. Ring Fabric Drainage Conduits: Drainage conduit with HDPE rings-in-grid pattern drainage core, for field-applied geotextile filter fabric. Include fittings for bends and connection to drainage piping.

1. Nominal Size: 18 inches high by 1 inch thick.

a. Minimum In-Plane Flow: 82 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

2. Nominal Size: 36 inches high by 1 inch thick.

a. Minimum In-Plane Flow: 164 gpm at hydraulic gradient of 1.0 when tested according to ASTM D 4716.

3. Filter Fabric: Comply with requirements of the Caltrans Standard Specifications.

2.03 TRENCH DRAIN SYSTEM

A. Manufacturers:

1. ACO Polymer Products, Inc.: Brickslot and K100S Trench Drain System, or approved equivalent.

2. Manufacturer Offering Acceptable Equivalent Product: Elkington Gatic or approved equivalent.

3. Substitutions: Under provisions of Division 1.

B. Components:

1. Grate System: Galvanized steel grate with 0.47-inch-wide flared drainage slot along 1 side and recessed solid color; configured to fit directly into drainage channel and be secured with manufacturer's standard boltless locking system; ADA compliant; engineered to withstand DIN 19580 Load Class C; 4.84-inch overall width; 3.50 inches high; Brickslot Grate System with QuickLok Locking Bar System or approved equivalent.

2. Drain Channels: Manufactured from polyester polymer concrete; engineered to withstand DIN 19580 Load Class C; neutral invert; full radius trench bottom; male-to-female interconnecting end profile; horizontal cast in anchors on outside wall; minimum 1/8-inch-thick stainless steel edge rail integrally cast into drain body; preformed 4-inch diameter drill-outs on bottom for connection with piping; supplied with closing caps; KlassikDrain K1000S, or approved equivalent.

   a. Channel Dimensions:

      1) Nominal Clear Opening: 4.00 inches.

      2) Overall Width: 5.10 inches.

      3) Overall Depth: As indicated on Drawings.

      4) Minimum Wall Thickness: 0.50-inch minimum wall thickness

      5) Polymer Concrete Properties:

Property	Test Method	Result
Compressive Strength	ASTM C579	14,000 psi
Flexural Strength	ASTM C580	4,000 psi
Water Absorption	ASTM C97	0.07%
Freeze-Thaw	ASTM C666	Maintains 95.1% modulus of elasticity after 300 cycles
Coefficient of Expansion/Contraction	ASTM D696	11.0 x 1O^-6/degree Farhenheit
Flame Spread	ASTM E84	0
Smoke Density	ASTM E84	5
Weathering	ASTM G153	No change after 2,000 hr exposure

3. Accessories:

   a. Access Unit: 2-piece galvanized steel assembly consisting of sleeve attached to drain channel with removable cover having drainage slot along 1 side and recess to receive matching paving; configured to provide access to drainage channel after grate system is covered with paving; 7.00 inches wide x 19.69 inches long x 3.30 inches deep overall; Brickslot Access Unit or approved equivalent.

   b. Access Unit Removal Tool: QuickLok/PowerLok Grate Removal Tool or approved equivalent.

2.04 SOIL MATERIALS

A. Soil materials are specified in Section 312000 "Earth Moving."

2.05 WATERPROOFING FELTS

A. Material: Comply with ASTM D 226, Type I, asphalt or ASTM D 227, coal-tar-saturated organic felt.

2.06 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

B. Structure Type: Nonwoven, needle-punched continuous filament.

1. Survivability: AASHTO M 288 Class 2

2. Styles: Flat and sock.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

B. If subdrainage is required for landscaping, locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and

C. Verify that drainage panels installed as part of foundation wall waterproofing is properly positioned to drain into subdrainage system.

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

3.02 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.03 FOUNDATION DRAINAGE INSTALLATION

A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.

B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.

D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.

E. Install drainage piping as indicated in Section 330500 “Common Work Results for Utilities” for foundation subdrainage.

F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

G. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.

H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

I. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

J. Install drainage panels on foundation walls as follows:

1. Coordinate placement with other drainage materials.

2. Lay perforated drainage pipe at base of footing. Install as indicated in Section 330500 “Common Work Results for Utilities”

3. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.

4. Attach panels to wall beginning at subdrainage pipe. Place and secure molded-sheet drainage panels, with geotextile facing away from wall.

K. Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.04 LANDSCAPING DRAINAGE INSTALLATION

A. Provide trench width to allow installation of drainage conduit. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system.

B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.

D. Install drainage conduits as indicated in Section 330500 “Common Work Results for Utilities” for landscaping subdrainage with horizontal distance of at least 6 inches between conduit and trench walls. Wrap drainage conduits without integral geotextile filter fabric with flat-style geotextile filter fabric before installation. Connect fabric sections with adhesive or tape.

E. Add drainage course to top of drainage conduits.

F. After satisfactory testing, cover drainage conduit to within 12 inches of finish grade.

G. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

H. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

I. Fill to Grade: Place satisfactory soil fill material over drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish grade.

3.05 TRENCH DRAIN SYSTEM INSTALLATION

A. Install slot drain system in accordance with final reviewed shop drawings and manufacturer's instructions and recommendations.

1. Lay drain channels starting from outlet point interlocking ends; cap ends of runs. Level and support with sheet metal shims.

2. Connect drainage channels to rain water leader piping.

3. Place slot grates and access units in drain channels; adjust to final position and engage locking bolts.

4. Coordinate installation of adjacent deck insulation, compressible filler and top ping slabs.

5. Remove protective wrapping from slot drains.

6. Remove access units and remove debris from drain channel. Flush channels to check for blockages; unblock if necessary and reinstall access units.

7. Deliver access unit removal toli to Owner; obtain receipt.

3.06 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.

1. Foundation Subdrainage: Install piping level and with a minimum cover of 30 inches unless otherwise indicated.

2. Underslab Subdrainage: Install piping level.

3. Plaza Deck Subdrainage: Install piping level.

4. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping level and with a minimum cover of 30 inches unless otherwise indicated.

5. Landscaping Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 30 inches unless otherwise indicated.

6. Lay perforated pipe with perforations down.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install thermoplastic piping according to ASTM D 2321.

3.07 PIPE JOINT CONSTRUCTION

A. Join perforated PE pipe and fittings with couplings according to ASTM D 3212 with loose banded, coupled, or push-on joints.

B. Join perforated PVC sewer pipe and fittings according to ASTM D 3212 with loose bell-and-spigot, push-on joints.

C. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.08 BACKWATER VALVE INSTALLATION

A. Comply with requirements for backwater valves specified in Section 334100 "Storm Utility Drainage Piping."

B. Install horizontal backwater valves in header piping downstream from perforated subdrainage piping.

3.09 CLEANOUT INSTALLATION

A. Comply with requirements for cleanouts specified in Section 334100 "Storm Utility Drainage Piping."

B. Cleanouts for Landscaping Subdrainage:

1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.

2. In vehicular-traffic areas, use NPS 4 (DN 100) cast-iron soil pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 18 by 18 by 12 inches deep. Set top of cleanout flush with grade.

3. In non-vehicular-traffic areas, use NPS 4 (DN 100) PVC pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 12 by 12 by 4 inches deep. Set top of cleanout 1 inch above grade.

4. Comply with requirements for concrete specified in Section 033053 "Miscellaneous Cast-in-Place Concrete."

C. Cleanouts for Underslab Subdrainage:

1. Install cleanouts and riser extensions from piping to top of slab. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.

2. Use NPS 4 (DN 100) cast-iron soil pipe and fittings for piping branch fittings and riser extensions to cleanout flush with top of slab.

3.10 CONNECTIONS

A. Comply with requirements for piping specified in Section 334100 "Storm Utility Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect low elevations of subdrainage system to solid-wall-piping storm drainage system.

3.11 IDENTIFICATION

A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Section 312000 "Earth Moving."

1. Install PE warning tape or detectable warning tape over ferrous piping.

2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.

2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. Drain piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.13 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

Attachments

- None

END OF SECTION