PROJECT MANUAL FOR MCMASTER PARK BUILDING AND PARK IMPROVEMENTS

B 2014-37

JUNE 2014

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PART A

NOTICE INVITING BIDS

CITY OF TORRANCE
CALIFORNIA

NOTICE INVITING BIDS

Notice is hereby given that sealed proposals for performing the following described work will be received at the office of the City Clerk of the City of Torrance, California, until **3:00 p.m. on Wednesday, September 12, 2014** after which time they will be publicly opened and read at 3:15 p.m. in the Council Chambers of said City:

Bid for McMaster Park Building and Park Improvements
B2014-37

Plans, Bid Proposal (for reference only) and Specifications are available for viewing and printing from the City's website at http://www.torranceca.gov/25079.htm.

There will be a mandatory pre-bid conference held on Tuesday, August 12, 2014 at 10:00 a.m. commencing at 3624 Artesia Boulevard, CA 90504. The City of Torrance will consider the bidder as non-responsive if the bidder does not attend the mandatory pre-bid conference. **Addenda will be issued only by email and only to those attended the mandatory pre-bid conference.** All addenda must be acknowledged. Failure to acknowledge addenda on the bid forms provided may render the proposal non-responsive and cause it to be rejected.

An official bid proposal packet, which includes: bid proposal forms, and a bound Specifications booklet may be obtained at the Office of the City Clerk (310) 618-2870, $ 50.00 if picked up at City Hall, or payment of $ 60.00 if requested by mail. Both amounts include tax. Neither amount is refundable. A prospective bidder must provide to the City Clerk's office, the firm's name, address, telephone and fax number, a contact person and a valid email address.

If requesting any item(s) by mail, please send check to the following:

CITY OF TORRANCE
OFFICE OF THE CITY CLERK
3031 TORRANCE BLVD
TORRANCE, CA 90503-2970
ATTN: B2014-37

The project estimate is between 1.3 million to 1.6 million dollars. The work shall be completed within one hundred eighty (180) calendar days of receipt of the Notice to Proceed (NTP). The one hundred eighty calendar day schedule includes: completion of contractual paperwork, submittal review and onsite work. Bids are required for the entire work described herein.

The City has determined the bidder must have a valid "A" Engineering License or B" General Building Contracting license. Bidder, as the prime contractor, must have successfully completed at least four (4) projects of a similar size and scope within the last five (5) years. References must reflect this experience.

Per Division 2, Chapter 2 of the Torrance Municipal Code, the Torrance City Council may reject any and all bids, waive any informality or irregularity in such bids, and determine the lowest responsible bidder.

No Facsimile Bids shall be accepted by the City.

Non-prevailing wage project

By order of the City Council of the City of Torrance, California.

For further information, please contact Diane Megerdichian, Sr. Business Manager General Services Department at 310-781-7151 or dmegerdichian@torranceca.gov. If emailing questions, please put project title in the subject line.

PART B

INSTRUCTIONS TO BIDDERS

CITY OF TORRANCE
CALIFORNIA

INSTRUCTIONS TO BIDDERS

A. QUALIFICATION OF BIDDERS

1. Competency of Bidders

The Bidder shall be thoroughly competent and capable of satisfactorily performing the Work covered by the Bid. As specified in the Bid Documents, the Bidder shall furnish statements of previous experience on similar work. When requested, the Bidder shall also furnish a plan of procedure proposed; organization, machinery, plant and other equipment available for the Work; evidence of financial condition and resources; and any other documentation as may be required by the City to determine if the Bidder is responsible.

2. Contractor's License

At the time of submitting the Bid, the Bidder shall be licensed as a contractor in accordance with the provisions of Chapter 9, Division 3, of the California Business and Professions Code. The required prime contractor license class for the Work is shown in the project Notice Inviting Bids. However, the City reserves the right to award the Contract to a contractor with another class if the City determines that the license is proper for the work.

B. BIDDER RESPONSIBILITY

A responsible Bidder is a Bidder who has demonstrated the attribute of trustworthiness, as well as ability, fitness, capacity and experience to satisfactorily perform the work.

Bidders are notified that, in accordance with Division 2, Chapter 2 of the Torrance Municipal Code, the City Council may determine whether the Bidder is responsible based on a review of the Bidder's performance on other contracts.

If, based on the provision and criteria in Division 2, Chapter 2 of the Torrance Municipal Code, the General Services Director proposes not to recommend the award of contract to the apparent low bidder, the Director shall notify the Bidder in writing of its intention to recommend to the City Council that the Council award the contract to the next lowest responsible bidder. If the Bidder presents evidence in rebuttal to the recommendation, the Director shall evaluate the merits of such evidence, and based on that evaluation, make a recommendation to the City Council.

C. ADDENDA TO THE CONTRACT DOCUMENTS

The City reserves the right to revise or amend these specifications prior to the date set for opening bids. Revisions and amendments, if any, will be announced by an addendum to this bid. If the revisions require additional time to enable Bidders to respond, the City may postpone the opening date accordingly. In such case, the addendum will include an announcement of the new opening date.

All addenda must be attached to the bid. Failure to attach any addendum may render the bid non-responsive and cause it to be rejected.

D. PREPARATION OF THE BID

1. Examination of Site, Plans and Specifications

Bidders shall examine the site of the work and acquaint themselves with all conditions affecting the work. By submitting a bid, the bidder shall be held to have personally examined the site and the drawings, to have carefully read the specifications, and to have satisfied itself as to its ability to meet all the difficulties attending the execution of the proposed contract before the delivery of this proposal, and agrees that if awarded the contract, will make no claim against the City based on ignorance or misunderstanding of the plans, specifications, site conditions and/or contract provisions.

The Contractor shall have included in the contract price a sufficient sum to cover all items, including labor, materials, tools, equipment and incidentals, that are implied or required for the complete improvements as contemplated by the drawings, specifications, and other contract documents.

2. Bid Instructions and Submissions

The Bid shall be submitted on the Bid Proposal forms included in the Specifications. All Bid Documents must be completed, executed and submitted with Bid by Bidder. Required seven (7) Bid Proposal Documents:

1. Bidder's Proposal
2. Addenda Acknowledgment
3. Contractor's Affidavit
4. Bid Bond (10% of Bid)
5. List of Subcontractors
6. References (1 pages)
7. Bidder’s Information (2 pages)

All prices submitted will be considered as including any and all sales or use taxes. In case of a discrepancy between a unit bid price and total bid, the unit price shall prevail.

E. BID FORM/BOND

The Bid must be accompanied by cash, a certified or cashier's check, or a surety bond (bid bond) payable to the City of Torrance. Bids must be submitted on the proposal forms furnished by the City Clerk's office. The Bid Guaranty shall be in an amount equivalent to at least 10% of the Total Contract Bid Price.

Within ten (l0) days after the award of the contract, the City Clerk will return the proposal guarantees accompanying those proposals, which are not to be considered in making the award. All other proposal guarantees will be held until the contract has been finally executed, after which they will be returned to the respective bidders whose proposals they accompany.

F. AFFIDAVIT

An affidavit form is enclosed. It must be completed signifying that the bid is genuine and not collusive or made in the interest or on behalf of any person not named in the bid, that the bid has not directly or indirectly induced or solicited any other Bidder to put in a sham bid or any other person, firm, or corporation to refrain from bidding, and that the Bidder has not in any manner sought by collusion to secure for itself an advantage over any other Bidder. Any bid submitted without an affidavit or in violation of this requirement will be rejected.

G. NONRESPONSIVE BIDS AND BID REJECTION

1. A Bid in which bid proposal documents are not completed, executed and submitted may be considered non-responsive and be rejected.

2. A Bid in which the Contract Unit Prices are unbalanced, which is incomplete or which shows alteration of form or irregularities of any kind, or which contains any additions or conditional or alternate Bids that are not called for, may be considered non-responsive and be rejected.

H. AWARD OF CONTRACT

In accordance with Division 2, Chapter 2 of the Torrance Municipal Code, the City Council reserves the right to reject any and all bids received, to take all bids under advisement for a period not-to-exceed sixty (60) days after date of opening thereof, to waive any informality or irregularity in the Bid, and to be the sole judge of the merits of material included in the respective bids received.

This bid does not commit the City to award a contract or to pay any cost incurred in the preparation of a bid. All responses to this bid become the property of the City of Torrance.

I. NOTICE OF INTENT TO AWARD

Approximately two (2) weeks prior to the anticipated City Council meeting awarding a contract as a result of the RFP or bid, results will be posted on the City of Torrance Web site www.Torranceca.gov and may be found by clicking on the following:

- Government
- Current Bids and RFPs
- View evaluated results of Bids and RFPs tentatively scheduled for recommendation of award to the City Council here.

J. BID PROTEST PROCEDURES

Please refer to City of Torrance website link below to obtain the City's Protest Procedures. http://www.torranceca.gov/PDF/Bid_RFP_Protest_Procedures.pdf

K. EXECUTION OF CONTRACT

After the Contract is awarded, the awarded bidder shall execute the following six (6) documents:

1. Performance Bond (100% of Bid)
2. Labor and Material Bond (100% of Bid)
3. Contract – Public Works Agreement
4. Verification of Insurance Coverage (Certificates and Endorsements)
5. Business License Application Form

The contract shall be signed by the successful bidder and returned, together with the contract bonds and evidence of required insurance coverage, **within ten (10) working days**, not including Sundays, after the bidder has received notice that the contract has been awarded. Failure to execute the contract as specified above shall be just cause for annulment of the award and forfeiture of the proposal guarantee. The Contract shall not be considered binding upon the CITY until executed by the authorized CITY officials.

Bond amounts shall be as provided in Section 2-4 of the Standard Specifications for Public Works Construction. The Performance Bond shall be required to remain in effect for one (1) year following the date specified in the City's Notice of Completion, or, if no Notice of Completion is recorded for one (1) year following the date of final acceptance by the City Manager.

L. PERMITS, LICENSES AND CONTRACT SERVICES AGREEMENT

The Contractor shall procure and execute all permits, licenses, pay all charges and fees, and give all notices necessary and incidental to completion of Work. The Contractor shall execute a Public Works Agreement. No fee is charged for a permits issued by the City of Torrance for a public works project. The Contractor shall obtain a City of Torrance Business License. To obtain a Torrance Business License please call 310-618-5923.

M. INSURANCE

The Contractor shall maintain Automobile Liability, General Liability and Workers' Compensation Insurance as specified in the Public Works Agreement included in the Project Specifications.

N. SUBCONTRACTS

Each Bidder shall comply with the Chapter of the Public Contract Code including sections 4100 through 4113. The Contractor shall perform, with its own organization, Contract work amounting to at least 50 percent of the Contract price. When a portion of an item is subcontracted, the value of the work subcontracted will be based on the estimated percentage of the Contract Unit Price, determined from information submitted by the Contractor, subject to approval by the City Manager.

O TRAFFIC CONTROL

Traffic Control shall be per latest edition of the Manual of Uniform Traffic Control Devices (MUTCD) or City of Torrance Standard No. T1004. Major street lane closures are only allowed between the hours of 8:30 AM – 3:30 PM. One standard Arrow Board required for each lane closure.

The bidder must obtain a Construction and Excavation Permit from the Community Development Department, Permits & Inspection Division. If the bidder fails to obtain the permit or properly follow the California MUTCD or City of Torrance Standard No. T1004, the City may order the contractor to immediately cease work and provide a traffic control plan for review and approval. It will be at the City's discretion what steps the contractor will need to take in order to remedy the situation and be allowed to resume work. It will be no additional cost to the City for the failure of the contractor to follow the requirements of the bid documents.

P. PRE-BID INQUIRIES

Bidders with pre-bid inquiries must submit questions in writing to the General Services Department. Any and all questions must be emailed to Diane Megerdichian, Business Manager at DMegerdichian@torranceca.gov. Please list **"McMaster Park Building and Park Improvements"** in the subject line of the email. For questions of a general nature, bidders may contact Diane Megerdichian directly at 310-781-7151

Q. RESPONSIBILITY OF CITY.

The City of Torrance shall not be held responsible for the care or protection of any material or parts of the work prior to final acceptance, except as expressly provided in these specifications.

R. CONSTRUCTION SCHEDULE AND PRECONSTRUCTION CONFERENCE.

The office staff of the City is currently operating on a 9/80 work week; therefore, City Hall is closed every other Friday.

In accordance with the herein Special Provisions, after notification of award and prior to start of any work, **the Contractor shall submit to the City for approval its proposed Construction Schedule within ten (10) working days from the date of Notice of Proceed.** At least two (2) days, exclusive of Saturdays, Sundays and holidays, prior to commencement of work, the Contractor shall attend a pre-construction conference.

The Contractor will provide all product and equipment submittals to the City of Torrance or designated consultant within ten (10) working days from the date of Notice to Proceed. The Contractor shall immediately order materials requiring a delivery delay upon receipt of a written notice from the City that the City Council has approved an Award of Contract. Contractor shall provide written proof(s) of timely material order(s) and shall include any delivery delays in the Construction Schedule.

S. PROGRESS OF THE WORK AND TIME FOR COMPLETION

The Contractor shall begin work after the mailing, from the City Manager to the Contractor, by first class mail, postage prepaid, of a Notice to Proceed. **The Contractor shall diligently prosecute the same to completion within one hundred eighty (180) calendar days of the start date specified in said Notice.** The one eighty calendar day schedule includes, completion of contractual paper work, equipment material submittal review, the lead time for materials and equipment, and on site work.

During periods when weather or other conditions are unfavorable for construction, the Contractor shall pursue only such portions of the work as shall not be damaged thereby. No portions of the work whose acceptable quality or efficiency will be affected by any unfavorable conditions shall be constructed while those conditions exist. It is expressly understood and agreed by and between the Contractor and the City that the Contract time for completion of the work described herein is a reasonable time taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

T. LIQUIDATED DAMAGES

The Contractor agrees that failure to complete work within the time allowed will result in damages being sustained by the City. Contractor and City agree that failure to complete the project will result in inconvenience to the citizens of Torrance and the City of Torrance and their customers using the affected areas. Such delay will also result in the necessity of several inspections each day to ensure that the project is properly progressing. The parties also agree that failure to complete the project on time will prevent the City from having the use of the facility. Therefore, the parties agree such damages among others are, and will continue to be, impracticable and extremely difficult to determine, but that **Seven Hundred and fifty dollars ($750) per calendar day** is the minimum value of such costs to the City and is a reasonable amount that the Contractor agrees to reimburse the City for each calendar day of delay in finishing the work in excess of the time specified for completion, plus any authorized time extensions.

Execution of the contract under these specifications shall constitute agreement by the Contractor and the City that Seven Hundred fifty Dollars ($750) per calendar day is the minimum value of the costs and actual damage caused by failure of the Contractor to complete the work within the allotted time, that such sum is liquidated damages and

shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs. Said amount may be reduced by the City if work is sufficiently completed within the allotted time so that the damages are minimized.

The Contractor will not be assessed liquidated damages for any delay in completion of the work when such delay was caused by the failure of the City or the owner of a utility to provide for removal or relocation of the existing utility facilities; provided, however, that the Contractor shall have given the City and the owner of a utility timely notice of the interference. "Timely notice" shall be defined as a verbal notice (to be followed up in writing) no later than one (1) hour after initial discovery of the interference unless the City Representative is present, in which case notice shall be given immediately in writing to the City Manager.

U. GENERAL PREVAILING WAGE RATE

Not applicable

V. PRELIMINARY NOTICES

Preliminary Notices should be mailed to the following address.
Diane Megerdichian
General Services Department
3350 Civic Center Drive
Torrance, CA 90503

PART C

SPECIAL PROVISIONS

SECTION A. GENERAL

The Project Specifications for all work on this project are the specifications contained in the "**Project Manual for McMaster Park Building and Park Improvements"**, prepared by Land Concern LLC and the City of Torrance.

These Specifications are intended to govern all aspects of the appurtenant construction including, but not limited to, materials, methods and details, except as modified herein or as inconsistent with the provisions hereof.

DEFINITIONS

Whenever the following terms are used, they shall be understood to mean and refer to the following:

Agency or City - City of Torrance.

Board- The City Council of the City of Torrance herein referred to as City Council.

CITY- The General Services Director of the City of Torrance, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Consulting Architects –

Steven Philips	Ed Sapigao
Land Concern LLC	SC Consulting Group
1750 E. Deere Avenue	24881 Alicia Parkway, #317
Sana Ana, CA 92705	Laguna Hills, CA 92653
949-250-4822	949-280-4782
949-333-6310 Direct	949-458-7420 Fax
PStevens@landconcern.com	ed@sccg-inc.com

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Laboratory - The designated laboratory authorized by the City of Torrance to test materials and work involved in the contract.

SECTION B. REFERENCE TO STANDARDS OR PUBLICATIONS

Any reference made in the Contract Documents to any specification, standard, or publication of any organization shall, in the absence of a specific designation to the contrary, be understood to refer to the latest edition of the specification, standard, or publication in effect as of the date of advertising the work, except to the extent that said standard or publication may be in conflict with applicable laws, ordinances, or governing codes. Contractors should be aware of all new code requirements (such as Cal-Green) when dealing with HVAC and other general building work. No requirements of these specifications or the drawings shall be waived because of any provisions of, or omission from, said standards or publications.

SECTION C. DESCRIPTION OF THE WORK

1. Scope of the Work. The work to be done consists of furnishing all labor, materials, tools, equipment and incidentals complete the McMaster Park Building and Park Improvements as shown in the plans and specifications prepared by SC Consulting Group and Land Concern Ltd and the City of Torrance.

SECTION D. GENERAL PROCEDURES

1. Specifications and Drawings Complementary. The Specifications and Drawings are complementary, and what is called for in one shall be as binding as if called for in both.

2. Order of Precedence of Contract Documents. In resolving conflicts resulting from conflicts, errors, or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:

    1. Change Orders (including Plans and Specifications attached thereto).
    2. Permits Issued by other agencies.
    3. Public Works Agreement
    4. Addenda
    5. Special or General Provisions.
    6. Plans
    7. City Standard Plans
    8. Instructions to Bidders
    9. Reference Specifications

    Within the Specifications the order of precedence is as follows:

    1. Addenda/Change Orders
    2. Permits from other agencies/supplemental agreements
    3. Special or General Provisions
    4. Instructions to Bidders
    5. Referenced Standard Plans
    6. Referenced Specifications

    With reference to the Plans/Drawings the order of precedence is as follows:

    1. Change Orders plans govern over Addenda and Contract Drawings
    2. Addenda plans govern over Contract plans.
    3. Contract plans govern over standard plans
    4. Detail plans govern over general plans
    5. Figures govern over scaled dimensions

3. Discrepancies in the Contract Documents. Any discrepancies, conflicts, errors or omissions found in the Contract Documents shall be promptly reported in writing to the City Manager, who will issue a correction in writing. The Contractor shall not take advantage of any such discrepancies, conflicts, errors or omissions, but shall comply with any corrective measures regarding the same prescribed by the City Manager, and no additional payment or time shall be allowed therefor.

If discrepancies are discovered between the drawings and the specifications, and no specific interpretation is issued prior to bidding, the decision regarding this interpretation shall rest with the City Manager. The Contractor shall be compelled to act on the City Manager's decision as directed. In the event the installation is not in compliance with the direction of the City Manager, the installation shall be corrected by and at the expense of the Contractor at no additional cost to the City.

See Section E of these Special Provisions for "Claims".

4. Errors and Omissions. If the Contractor, in the course of the work, becomes aware of any claimed errors or omissions in the contract documents or in the City's field work, he shall immediately inform the City Manager. The City Manager shall promptly review the matter, and if the City Manager finds an error or omission has been made the City Manager shall determine the corrective actions and advise the Contractor accordingly. If the corrective work associated with an error or omission increases or decreases the amount of work called for in the Contract, the City shall issue an appropriate Change Order. After discovery of an error or omission by the Contractor, any related work performed by the Contractor shall be done at its risk unless authorized by the City Manager.

5. Changed Conditions. The plans for the work show conditions as they are believed by the City Manager to exist, but it is not intended or to be inferred that the conditions as shown thereon constitute a representation by the City that such conditions are actually existent, nor shall the City be liable for any loss sustained by the Contractor as a result of any variance of the conditions as shown on the plans and the actual conditions revealed during the progress of the work or otherwise. The word "conditions" as used in this paragraph includes, but is not limited to, site conditions, both surface and subsurface.

   The Contractor shall examine the site, compare it with the drawings and specifications and shall satisfy itself as to the conditions under which the work is to be performed. The Contractor shall ascertain and check the location of all existing structures, utilities and equipment, which may affect its work. The Contractor shall be responsible to re-examine the site, as necessary, for performance of change orders or other proposed changes, which may affect its work. No allowance shall subsequently be made on the Contractor's behalf for any extra expense or loss of time, which is incurred due to failure or negligence on its part to make such examination.

6. As-built Drawings. The Contractor shall maintain a control set of Plans and Specifications on the Work site at all times. All final locations determined in the field, and any deviations from the Plans and Specifications, shall be marked in red on this control set to show as-built conditions. Upon completion of the Work, the Contractor shall submit the control set to the Engineer for approval. Final payment will not be made until this requirement is met.

7. Construction Staking. The Contractor is responsible for all construction staking and shall be responsible for the cost of any restaking required due to disturbance caused by its operations, failure to protect the work site from vandalism or other causes of loss.

8. Notice to Proceed. Notwithstanding any other provisions of the Contract, the Contractor shall not be obligated to perform any work and the City shall not be obligated to accept or pay for any work performed by the Contractor prior to delivery of a Notice to Proceed. The City's knowledge of work being performed prior to delivery of the Notice to Proceed shall not obligate the City to accept or pay for such work. The Contractor shall provide all required contract bonds and evidences of insurance prior to commencing work at the site.

9. Delay in Obtaining Materials. No extension of time will be granted for a delay caused by the inability to obtain materials unless the Contractor either obtains advance written approval from the City Manager or obtains from the supplier and furnishes to the City Manager documentary proof that such materials could not be obtained due to war, government regulations, labor disputes, strikes, fires, floods, adverse weather necessitating the cessation of work, or other similar action of the elements. The Contractor is required to order materials in a timely manner as specified in the "Instruction to Bidders".

10. Inspection and Testing. The Work is subject to inspection and approval by the CITY any authorized representative. The Contractor shall notify the CITY a minimum of 48 hours in advance of the required inspection.

The CITY will make, or have made, such inspections and tests, as he deems necessary to see that the Work is in conformance with the Contract Documents. In the event such inspections or tests reveal noncompliance with the Contract Documents, the Contractor shall bear the cost of such corrective measures as deemed necessary by the CITY, as well as the cost of subsequent re-inspection and re-testing.

Work done in the absence of inspection by the CITY may be required to be removed and replaced under the inspection of the CITY, and the entire cost of removal and replacement, including the cost of all materials which may be furnished by the CITY and used in the work thus removed, shall be borne by the Contractor, regardless of whether the work removed is found to be defective or not. Work covered without the approval of the CITY shall, if so directed, be uncovered to the extent required by the CITY, and the Contractor shall similarly bear the entire cost of performing all the work and furnishing all the materials necessary for the removal of the covering and its subsequent replacement, including all costs for additional inspection.

The CITY and any authorized representatives shall at all times have access to the Work during its construction at shops and yards as well as the Work site. The Contractor shall provide every reasonable facility for ascertaining that the materials and workmanship are in accordance with the Contract Documents.

Inspection of the Work shall not relieve the Contractor of the obligation to fulfill all conditions of the Contract.

11. Project Schedule

Within ten (10) working days after the receipt of the Notice to Proceed, the Contractor shall submit a proposed construction schedule to the CITY for approval. The schedule shall be in accordance with section 11 and shall be in sufficient detail to show chronological relationship of all activities of the Work. These include, but are not limited

to: estimated starting and completion dates of various activities, submittal of shop drawings to the Engineer for approval, procurement of materials and scheduling of equipment.

No work may be started until the Schedule has been approved in writing. The work shall be scheduled to assure that construction will be completed within the specified time. The Contractor shall be responsible for coordination of all phases of the operation so that the time schedule can be met.

During construction, the Contractor shall also submit to the CITY, a two-week "look ahead" construction schedule during the construction progress meetings held biweekly.

If the Contractor decides to make a major change in the method of operations after commencing construction, or if the schedule fails to reflect the actual progress, the Contractor shall submit to the CITY a revised construction schedule in advance of beginning revised operations.

Sequence of Construction - The Contractor shall sequence the Work in a manner to expeditiously complete the project with a minimum of inconvenience to the CITY or adjacent owners.

The construction schedule shall conform to the following criteria:

1) The schedule shall be prepared using the latest version of Primavera, Microsoft Project or approved equal.

2) Work activities shall be based on the following:

    a) Contract Unit Price items shall be subdivided into those portions to be constructed during each stage or phase of construction. (if applicable)

    b) Lump sum items shall be subdivided into those portions to be constructed during each stage or phase of construction.

3) Utility relocations and/or coordination by the Contractor per section 14 of these Special Provisions shall be considered as activities.

4) Required submittals, working and shop drawings shall be included as activities.

5) The procurement of construction materials and equipment with long lead times for deliveries shall be included as activities.

6) Work to be performed by subcontractors shall be identified and shown as work activities.

7) Start and completion dates of each activity shall be illustrated.

8) Completion of all Work under the Contract shall be within the time specified in these Special Provisions and in accordance with the Plans and Specifications.

12. Mobilization

12.1 Scope. Mobilization shall include the provision of the Construction Schedule; NPDES Construction Permit, Best Management Practices and Storm Water Pollution Prevention Plan, site review; obtaining all permits, insurance, and bonds; moving onto the site all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities, and removal of same at completion of the project; all as required for the proper performance and completion of the work.

Mobilization shall include, but not be limited to, the following principle items.

(a) Submittal and modification, as required, of the Construction Schedule.

(b) All associated documentation and submittals as required.

(c) Installing temporary construction power and wiring.

(d) Establishing fire protection system.

(e) Developing construction water supply.

(f) Providing on-site sanitary facilities and portable water facilities, as required.

(g) Arranging for and erection of Contractor's work and storage yard.

(h) Submittal of all required insurance certificates and bonds, including subcontractors.

(i) Obtaining all required permits.

(j) Posting all OSHA required notices and establishment of safety programs.

(k) Have the Contractor's superintendent at the job site full-time.

(l) Pot-holing and other research and review as necessary to verify site conditions and utility locations, including research and review as necessary for change orders.

(m) Demobilization.

13. Markup.

The markups mentioned hereinafter shall include, but are not limited to, all costs for the services of superintendents, project managers, timekeepers and other personnel not working directly on the change order, and pickup or yard trucks used by the above personnel. These costs shall not be reported as labor and equipment elsewhere except when actually performing work directly on the change order and then shall be reported at the labor classification of the work performed.

The following percentages shall apply for additional work:

Profit	10% maximum
Overhead	5% maximum

Subcontractor markup: maximum allowed is 10% for profit and overhead on the subcontractor's costs.

To the sum of the costs and markups provided for in this subsection, one (1) percent shall be added as compensation for bonding.

14. Utilities. The Contractor shall provide coordination with all the utility companies involved and shall provide protection from damage to their facilities. The Contractor shall be responsible for repair or replacement to said facilities made necessary by its failure to provide required protection. The Contractor is required to include utility requirements in the Construction Schedule.

The Contractor shall be solely responsible to check all utility record maps, books, and/or other data in the possession of the CITY, other agencies, and/or all utility companies, and no allowance shall be made for any failure to have done so.

The Contractor shall utilize the services of "Underground Service Alert - Southern California" for utility locating in all public right-of-ways by calling 1-800-227-2600 at least 48 hours prior to any excavation.

15. Completion, Acceptance and Warranty. If, in the CITY's judgment, the Work has been completed and is ready for acceptance, the CITY will so certify and will determine the date when the Work was completed. This will be the date when the Contractor is relieved from responsibility to protect the Work. The CITY may cause a Notice of Completion to be filed and recorded with the Los Angeles County Recorder's Office. At the CITY's option, the CITY may certify acceptance to the City Council who may then cause a Notice of Completion to be filed and recorded with the Los Angeles County Recorder's Office.

Manufacturer's warranties and guaranties furnished for materials used in the Work and instruction sheets and parts listed supplied with materials shall be delivered to the CITY prior to acceptance of the Work. The duration of the warranty or guaranty shall be the standard of the industry with a minimum of 1 year from the date of Notice of Completion or Date of Acceptance.

The prime contractor will be required to warranty the entire project regardless of whether warranties from subcontractors are also required. Coordination and correction of any

issue related to project scope that arises during that one (1) year warranty period will be the responsibility of the prime contractor.

Manufacturer's warranties shall not relieve the Contractor of liability under these Specifications. Such warranties only shall supplement the Contractor's responsibility.

The CITY may require a manufacturer's warranty on any product offered for use.

16. Contractor's Representative. The Contractor's Representative shall be approved by the CITY prior to the start of the Work. If the designated representative is rejected, the Contractor shall immediately designate another representative in writing and submit to the City for consideration. The CITY shall have the authority to require the Contractor to remove its representative and/or alternate representative at any time and at no cost to the CITY.

17. Water Pollution Control

17.1 NPDES Construction Permit, Notice of Intent (NOI) and Notice of Termination (NOT). Construction activities including clearing, grading and excavating that result in land disturbances of equal to or greater than one acre are covered by the National Pollutant Discharge Elimination System General Construction Permit, State Water Board Order No. 2009-0009-DWQ. Dischargers obtaining coverage will file electronically for coverage under Order No. 2009-0009-DWQ. Order No. 2009-0009-DWQ is a Risk Based permitting approach. The Contractor is required to go to the State Water Resources Control Board website and determine risk level and apply for permit and update permit using the Storm Water Multiple Application and Reporting Tracking System (SMARTS). The SMARTS system is an online tool for submitting Notice of Intent (NOI), Notice of Termination (NOT), compliance and monitoring data and Annual Reports when required.

This General Construction Permit regulates pollutants in discharges of storm water associated with construction activity. To obtain authorization for proposed storm water discharges, pursuant to this General Construction Permit, the Contractor must submit use the SMARTS system to submit NOI and pay the appropriate fee to the State Regional Water Quality Control Board (SWQCB). Contractor shall provide to the City the Storm Water Pollution Prevention Plan (SWPPP). The Contractor shall terminate coverage under the General Construction Permit for a complete project by submitting a NOT via the SMARTS system after post construction storm water Best Management Practices (BMPs) are in place and approved by the City.

Full compensation for preparation of the NOI, NOT, required fees, construction, and post construction BMPs, sampling, analysis and reporting as required by Order No. 2009-0009-DWQ and all other related costs shall be considered as included in the bid for Mobilization (or NPDES Compliance).

17.2 Storm Water Pollution Prevention Plan (SWPPP). Construction activities covered by the General Construction Permit require submittal by the Contractor of a Storm Water Pollution Prevention Plan (SWPPP) prior to the start of any clearing, demolition, grading or excavation. A Storm Water Pollution Prevention

Plan (SWPPP) shall be defined as a report that includes site map(s), identification of construction and contractor activities that could pollute storm water, and a description of measures and practices to control the potential pollutants. The preparation and implementation of the SWPPP is intended to ensure that the Contractor will make every reasonable effort to prevent the pollution of water resources during the period of construction. The size and nature of this Contract place it under the regulations of the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharge Associated with Construction Activity. In the State of California, these regulations are adopted by the State Water Resources Control Board. These regulations require a SWPPP for any work where clearing, grading, and excavation result in a land disturbance of one or more acres. As a result, the Contractor shall prepare, submit to the CITY for review and approval, and implement a SWPPP for this Contract in compliance with these regulations.

If during construction operations, field conditions change in a manner which, in the opinion of the Engineer, significantly deviates from how the SWPPP, as approved by the CITY, addressed the current construction operation, the Engineer may direct the Contractor to revise the current construction operation and/or the SWPPP. Such directions will be made in writing and will specify the items of work for which the SWPPP is inadequate. No further work on these items will be permitted until the Contractor revises the construction operations to the satisfaction of the Engineer and/or until the Contractor submits a revised SWPPP and receives CITY approval. The Engineer will notify the Contractor of the acceptance or rejection of the revised SWPPP within seven (7) working days from the date of submittal.

The SWPPP shall be submitted to the CITY for review and approval a minimum of fifteen (15) working days prior to the commencement of construction operations in accordance with 6-1 of these Special Provisions. The SWPPP shall remain on the construction site while site is under construction, during working hours, commencing with the initial construction activity and ending with Notice of Termination.

Full compensation for preparation of the SWPPP, revisions to the SWPPP, and all other related costs shall be considered as included in the bid price for Mobilization (or NPDES compliance or prices bid for the various items of work).

17.3 Best Management Practices (BMPs). Best Management Practices shall be defined as any program, technology, process, siting criteria, operating method, measure, or device which controls, prevents, removes, or reduces pollution. The Contractor shall obtain and refer to the California Storm Water Best Management Practice Handbooks, Volume 3 Construction BMP Handbook and the Los Angeles County Department of Public Works Best Management Practices Handbook for Construction Activities. These publications are available from:

Los Angeles County
Department of Public Works
Cashier's Office
900 S. Fremont Avenue
Alhambra, CA 91803

Telephone (626) 458-6959

The Contractor shall have a minimum of two (2) readily accessible copies of each publication on the Work site at all times.

The Contractor shall implement BMPs in conjunction with the following construction operation and activities:

CONSTRUCTION PRACTICES	Clearing, Grading and Excavating
	Water Conservation Practices
	Dewatering
	Paving Operations
	Structure Construction and Painting
MATERIAL MANAGEMENT	Material Delivery and Storage
	Material Use
	Spill Prevention and Control
WASTE MANAGEMENT	Solid Waste Management
	Hazardous Waste Management
	Contaminated Soil Management
	Concrete Waste Management
	Sanitary/Septic Waste Management
VEHICLE AND EQUIPMENT MANAGEMENT	Vehicle and Equipment Cleaning
	Vehicle and Equipment Fueling
	Vehicle and Equipment Maintenance

The Contractor shall implement the following BMPs in conjunction with the previously listed construction operation activities:

VEGETATIVE STABILIZATION	Scheduling of Planting
	Preservation of Existing Vegetation
	Temporary Seeding and Planting
	Mulching
PHYSICAL STABILIZATION	Geotextiles and Mats
	Soil Stabilizer/Dust Control
	Temporary Stream Crossing
	Stabilized Construction Roadway
	Stabilized Construction Entrance
RUNOFF DIVERSION	Sodding, Grass Plugging, and Vegetative Buffer strips
	Earth Dikes, Drainage Swales, and Lined Ditches
	Top and Toe of Slope Diversion Ditches/Berms

	Slope Drains and Subsurface Drains

VELOCITY REDUCTION	Flared Culvert End Sections
	Outlet Protection/Velocity Dissipation Devices
	Check Dams
	Slope Roughening/Terracing/Rounding
SEDIMENT TRAPPING	Slit Fences
	Straw Bale Barrier
	Sand Bag Barrier
	Brush or Rock Filter
	Storm Drain Inlet Protection
	Sediment Traps
	Sediment Basin

Additional BMPs may be required as a result of a change in actual field conditions, contractor activities, or construction operations. When more than one BMP is listed under each specific BMP category, the Contractor shall select the appropriate and necessary number of BMPs within each category in order to achieve the BMP objective.

BMPs for contractor activities shall be continuously implemented throughout the year. BMPs for erosion control and sedimentation shall be implemented during the period from October 15 to April 15, and whenever the National Weather Service predicts rain within 24 hours. BMPs for erosion control and sedimentation shall also be implemented prior to the commencement of any contractor activity or construction operation that may produce run-off, and whenever run-off from other sources may occur.

The CITY is subject to enforcement actions by the State Water Resources Control Board, the Environmental Protection Agency and private citizens. The CITY may assess the Contractor a penalty of $1,000 for each calendar day that the Contractor has not fully implemented the appropriate BMPs and/or is otherwise in noncompliance with these provisions. In addition, the CITY will deduct, from the final payment due the Contractor, the total amount of any fines levied on the CITY, plus legal and staff costs, as a result of the Contractor's lack of compliance with these provisions and/or less than complete implementation of the appropriate BMPs.

Full compensation for the implementation of BMPs, including the construction, removal, and the furnishing of all necessary labor, equipment, and materials, shall be considered as included in the price bid for Mobilization (or NPDES compliance or the various items of work).

18. Requirements for Recycling Construction Materials

The City of Torrance requires that all demolition projects and construction or remodeling projects valued at $100,000 or more must recycle or reuse at least 50% of the materials that leave the project site and 100% of excavated soil and land-clearing debris. A Waste Management Plan (WMP) form is part of the permit process for projects that meet these criteria. The WMP form is available at the permit counter or a downloadable form is available here:

http://www.torranceca.gov/PDF/WMPFormRevised2012onestop.pdf

Step 1 - when applying for the permit, you must complete the WMP form stating that at least 50% of the waste generated by the project will be recycled or reused and that 100% of excavated soil and land-clearing debris will be recycled or reused.

Step 2 - collect and keep all receipts and records of the disposal, recycling, donations, and reuse of the materials from your project. Receipts must show material type, tonnage or weight, how the materials were treated, the facility used, and the address of the jobsite.

Step 3 - complete the WMP by attaching the receipts listing the actual disposal and recycling that occurred and submitting the WMP to Public Works for approval. This is required before your project can get its final inspection.

Failure to fulfill the requirements of the WMP process will result in penalties of $5,000 for construction projects and $10,000 for demolition projects, as per the Torrance Municipal Code.

For additional information concerning recycling or recycling facilities please visit the City of Torrance Public Works Department website at http://www.torranceca.gov/8614.htm

19. Health Department Inspections

Inspections by County of Los Angeles Department of Public Health are required for this project.

County of Los Angeles Department of Public Health shall inspect all onsite water pipelines before they are buried. Water lines shall include potable/domestic water mains & laterals, potable/fire water mains & laterals, and recycled/irrigation water mains & laterals.

Contractor and project owner shall make available necessary staff and equipment to assist in a cross connection test of the onsite water systems. Cross connection test shall be a shutdown test of both the potable water system (domestic uses) and recycled water system (irrigation uses).

20. Work Site Maintenance

Temporary Light, Power and Water. If required, the Contractor shall obtain a construction water meter from the CITY by calling Torrance Customer Service Operations ("CSO") at 310-921-6449. A $1,000 deposit is required and refundable upon return of the meter in good working condition. The Contractor shall pay for the water used, at the CITY's current water rates.

Some water mains in Torrance are owned and operated by California Water Service. For rental of a hydrant meter the contractor shall call California Water Service at 310-257-1400.

Graffiti Removal The Contractor shall maintain the Work, all of its equipment, and all traffic control devices, including signage, free of graffiti throughout the duration of the Contract. The Contractor shall respond to any request from the CITY to remove graffiti with 4 hours of notification. Should the Contractor fail to respond to such a request, the City reserves the right to make other arrangements for the requested graffiti removal and deduct the cost from any monies due the Contractor.

SECTION E. PAYMENTS TO CONTRACTOR AND CLAIMS

1. Breakdown of Contract Prices. The Contractor shall, within ten (10) working days of receipt of a request from the City, submit a complete breakdown of lump sum bid prices showing the value assigned to each part of the work, including an allowance for profit and overhead. The breakdown shall include separate line for each subcontractor's bid and/or contract amount. In submitting the breakdown, the Contractor certifies that it is not unbalanced and that the value assigned to each part of the work represents its estimate of the actual cost, including profit and overhead, of performing that part of the work. The breakdown shall be sufficiently detailed to permit its use by the City Manager as one of the bases for evaluating requests for payment. No extra costs shall be allowed for these breakdowns.

2. Payment for Labor and Materials. The Contractor shall pay and cause the subcontractors to pay any and all accounts for labor, including Worker's Compensation premiums, State Unemployment and Federal Social Security payments and all other wage and salary deductions required by law. The Contractor also shall pay and cause the subcontractors to pay any and all accounts for services, equipment and materials used by it and the subcontractors during the performance of work under this contract. All such accounts shall be paid as they become due and payable. If requested by the City Manager, the Contractor shall immediately furnish the City with proof of payment of such accounts.

3. Additional Work. Payment for additional work and all expenditures in excess of the bid amount must be authorized in writing by the City Manager. Such authorization shall be obtained by the Contractor prior to engaging in additional work. It shall be the Contractor's sole responsibility to obtain written approval from the City Manager for any change(s) in material or in the work proposed by suppliers or subcontractors. No payment shall be made to the Contractor for additional work which has not been approved in writing, and the Contractor hereby agrees that it shall have no right to additional compensation for any work not so authorized.

4. Claims. The Contractor shall not be entitled to the payment of any additional compensation for any cause, including any act, or failure to act, by the City, or the happening of any event, thing or occurrence, unless he shall have given the City due written notice of potential claim as hereinafter specified.

   The written notice of potential claim shall set forth the reasons for which the Contractor believes additional compensation will or may be due, the nature of the costs involved, and, insofar as possible, the amount of the potential claim. Said notice shall be submitted on a form approved by the City at least forty-eight (48) hours (two working days) in advance of performing said work, unless the work is of an emergency nature, in which case the Contractor shall notify and obtain approval from the Inspector prior to commencing the work. The City Manager may require the Contractor to delay

construction involving the claim, but no other work shall be delayed, and the Contractor shall not be allowed additional costs for any said delay but may be allowed on extension of time if the City Manager agrees that the work delayed is a controlling element of the Construction Schedule. The Contractor shall be required to submit any supporting data (or a detailed written explanation justifying further delay) within five (5) Work Days of a request from the City Manager and shall be responsible for any delays resulting from late and/or incomplete submittals. By submitting a Bid, the Contractor hereby agrees that this Section shall supersede Sections 6-6.3 and 6-6.4 of the Standard Specifications.

The City shall be the sole authority to interpret all plans, specifications and contract documents, and no claim shall be accepted which is based on the Contractor's ignorance, misunderstanding or noncompliance with any provision or portion thereof.
The Contractor shall be responsible to provide all data and to obtain all approvals required by said Specifications. No claims or extras shall be approved by the City unless all work was done under the direction of and subject to the approval of the Inspector.

It is the intention of this Subsection that differences between the parties arising under and by virtue of the Contract be brought to the attention of the City Manager at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken. The Contractor hereby agrees that it shall have no right to additional compensation for any claim that may be based on any such act, failure to act, event, thing or occurrence for which no written notice of potential claim as herein required was filed.

5. Noncompliance with Plans and Specifications. Failure of the Contractor to comply with any requirement of the Plans and Specifications, and/or to immediately remedy any such noncompliance upon notice from the City Manager, may result in suspension of Contract Progress Payments. Any Progress Payments so suspended shall remain in suspension until the Contractor's operations and/or submittals are brought into compliance to the satisfaction of the City Manager. No additional compensation shall be allowed as a result of suspension of Progress Payments due to noncompliance with the plans or specifications. The Contractor shall not be permitted to stop work due to said suspension of Progress Payments.

6. Request for Payment. Contractor shall submit all requests for payment on AIA Document G702 – Application and Certificate for Payment and G703- Continuation Sheet. For each item provide a column for listing: Item Number; Description of Work; Scheduled Value, Previous Application; Authorized Change Orders; Total completed and Stored to Date of Application; Percentage of Completion; Balance to Finish; and Retainage.

Prior to submittal of said form, all items for which payment is requested shall be checked and approved in writing by the City Manager. No payments will be made unless all back-up data is submitted with the payment request and the Progress Payment Invoice is signed by both Contractor and Manager.

The City will retain 5 percent of the value of all work done and materials installed as part security for fulfillment of the contract by Contractor. The full 5 percent retention will be retained on all payments for 35 days after the filing of the Notice of Completion. In addition 125% of the amount of the “unreleased” STOP notice will be withheld.

There shall be no separate payment for any relocations, barriers or forms, grading or temporary construction required to construct the improvements herein. Payment for these items shall be absorbed in the Bid Prices for the applicable work to which they are appurtenant, and no extra costs shall be allowed.

The payment of amounts due to the Contractor shall be contingent upon the Contractor furnishing the City with a release of all claims against the City arising by virtue of the Contract related to said amounts. It is the contractor's responsibility to provide the correct releases in order to obtain payment by the City. The Contractor shall provide the City with Unconditional Lien Release on Final Payment with a zero balance is required from all material suppliers and subcontractors with the request for final payment.

PART D

BID DOCUMENTS

BIDDER'S PROPOSAL

BID FOR MCMASTER PARK BUILDING AND PARK IMPROVEMENTS
B2014-37

In accordance with the Notice Inviting Bids pertaining to the receiving of sealed proposals by the City Clerk of the City of Torrance for the above titled improvement, the undersigned hereby proposes to furnish all work to be performed in accordance with the Plans, Specifications and Contract Documents, prepared by Land Concern LLC, SC Consulting Group and City of Torrance for the bid as set forth in the following schedules.

Assignment of Contractor's values:

Item	Description	Total Amount In Figures*
Division 01	General Requirements:	
Division 02	Site Work:	
Division 03	Concrete:	
Division 04	Masonry:	
Division 05	Metals:	
Division 06	Wood and Plastics:	
Division 07	Thermal and Moisture Protection:	
Division 08	Openings:	
Division 09	Finishes:	
Division 10	Specialties:	
Division 11	Equipment:	
Division 12	Furnishings:	
Division 13	Specialty Structure:	

Item	Description	Total Amount In figures*
Division 22	Plumbing:	
Division 23	Mechanical:	
Division 26	Electrical:	
	B2014-37-BID TOTAL- in figures*	

BASE BID TOTAL: _____

(In Words)*****

Bid Alternates		**Total Amount**
Bid Alternate #1	Senior Shade Structure	

BID #1 ALTERNATE: _____

(In Words)*****

Bid Alternate #2	Early Childhood Center Patio	

BID #2 ALTERNATE: _____

(In Words)*****

Bid Alternate #3	Musco Sports Lighting	

BID #3 ALTERNATE: _____

(In Words)*****

***<u>BID MAY BE REJECTED IF TOTAL IS NOT SHOWN IN FIGURES AND WORDS</u>.**

The City of Torrance awards to the lowest responsible bidder per the Torrance Municipal Code. Based on the funding available, the City reserves the right to select any combination of base bid and bid alternate(s) to determine the lowest responsible bidder for award.

The undersigned furthermore agrees to enter into and execute a contract, with necessary bonds, at the prices set forth herein and in case of default in executing such contract, with necessary bonds, the check or bond accompanying this bid and the money payable thereon shall be forfeited thereby to and remain the property of the City of Torrance.

The above prices include all work appurtenant to the various items as outlined in the specifications and all work or expense required for the satisfactory completion of said item.

The undersigned declares that it has carefully examined the Specifications, and Contract Documents, and has investigated the site of the work and is familiar with the conditions thereon.

_____	_____
Company Name	Signature of principal in company
_____	_____
Date	Name and Title of Signer

Address: _____

Phone:_____ Fax: _____

License No. & Classifications _____

ACKNOWLEDGMENT OF ADDENDA RECEIVED

B2014-37

The Bidder shall acknowledge the receipt of addenda by placing an "X" by each addendum received.

Addendum No. 1 _____

Addendum No. 2 _____

Addendum No. 3 _____

Addendum No. 4 _____

Addendum No. 5 _____

Addendum No. 6 _____

Addendum No. 7 _____

Addendum No. 8 _____

If an addendum or addenda have been issued by the City and not noted above as being received by the Bidder, the Bid Proposal may be rejected.

_____ _____

Bidder's Signature Date

STATE OF CALIFORNIA }
}
COUNTY OF _____ }

CONTRACTOR'S AFFIDAVIT
B2014-37

_____, being first duly sworn, deposes and says:

1. That he is the_____
Title

of _____
(Name of Partnership, Corporation, or Sole Proprietorship)

hereinafter called "Contractor," who has submitted to the City of Torrance a proposal for the BID FOR MCMASTER PARK BUILDING AND PARK IMPROVEMENTS, B2014-37

2. That said proposal is genuine; that the same is not sham; that all statement of facts therein are true;

3. That such proposal was not made in the interest or behalf of any person, partnership, company, association, organization or corporation not named or disclosed;

4. That the Contractor did not directly or indirectly induce, solicit or agree with any-one else to submit a false or sham bid, refrain from bidding, or withdraw the bid, to raise or fix the bid price of the Contractor or anyone else, or to raise or fix any overhead, profit or cost element of the Contractor's price or the price of anyone else; and did not attempt to induce action prejudicial to the interest of the City of Torrance or any other bidder, or anyone else interested in the proposed contract;

5. That the Contractor has not in any manner sought by collusion to secure for itself an advantage over any other bidder or to induce action prejudicial to the interests of the City of Torrance, or of any other bidder or of anyone else interested in the proposed contract;

6. That the Contractor has not accepted any bid from any subcontractor or materialman through any bid depository, the bylaws, rules or regulations of which prohibit or prevent the Contractor from considering any bid from any subcontractor or materialman, which is not processed through said bid depository, or which prevent any subcontractor or materialman from bidding to any contractor who does not use the facilities of or accept bids from or through such bid depository;

<u>CONTRACTOR'S AFFIDAVIT</u> B2014-37 (CONTINUED)

7. That the Contractor did not, directly or indirectly, submit the Contractor's bid price or any breakdown thereof, or the contents thereof, or divulge information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, or to any individual or group of Individuals, except to the City of Torrance, or to any person or persons who have a partnership or other financial interest with said Contractor in its business.

Dated this _____ day of _____, 20_____.

Subscribed and Sworn to
before me this _____
of _____, 20_____

_____
(Contractor)

_____
(Title)

_____
Notary Public in and for said
County and State.
(Seal)

BID BOND

B2014-37

KNOW ALL MEN BY THESE PRESENTS: That we, _____

_____

as principal, and _____
as sureties, are held and firmly bound unto the City of Torrance, State of California, in the penal sum of _____ dollars ($_____), for the payment whereof we hereby bind ourselves, our successors, heirs, executors or administrators jointly and severally, firmly by these presents.

The condition of this obligation is such that, whereas the above bounded principal is about to file with and submit to the City of Torrance a bid or proposal for the performance of certain work as required in the City of Torrance, Project No. B2014-37, said work being: McMaster Park Building and Park Improvements, in compliance with the Specifications therefore under an invitation of said City contained in a notice or advertisement for bids or proposals; now if the bid or proposal of said principal shall be accepted and if said work be thereupon awarded to the principal by said City and if the said principal shall enter into a contract with the said City in accordance with said bid or proposal, or if the bid or proposal of the said principal is rejected, then this bond shall be void and of no effect and otherwise in full force and effect.

WITNESS our hands this _____ day of _____, 20 _____.

_____
Principal

_____
Surety/Attorney-in-Fact

_____
Signature

Name: _____
Local Address: _____
_____
Phone No.: _____
Fax No.: _____

LIST OF SUBCONTRACTORS

The Bidder is required to fill in the following blanks in accordance with the provisions of the Subletting and Subcontracting Fair Practices Act (Chapter 2 of Division 5, Title 1 of the Government Code of the State of California) and should familiarize itself with Section 2-3 of the Standard Specifications.

1. Name Under Which Subcontractor is Licensed: _____

Subcontractor's Address: _____

Specific Description of Sub-Contract: _____

License Number: _____ CA License Classification/Type: _____

2. Name Under Which Subcontractor is Licensed: _____

Subcontractor's Address: _____

Specific Description of Sub-Contract: _____

License Number: _____ CA License Classification/Type: _____

3. Name Under Which Subcontractor is Licensed: _____

Subcontractor's Address: _____

Specific Description of Sub-Contract: _____

License Number: _____ CA License Classification/Type: _____

4. Name Under Which Subcontractor is Licensed: _____

Subcontractor's Address: _____

Specific Description of Sub-Contract: _____

License Number: _____ CA License Classification/Type: _____

Subcontractors must be properly licensed under the laws of the State of California for the type of work which they are to perform. Do not list alternate subcontractors for the same work.

The Bidding Contractor must include each subcontractor's contract license number (AB 44). An inadvertent error in listing the subcontractor's license number shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive, if the corrected contractor's license number is submitted to the public entity by the prime contractor within 24 hours after the bid opening-provided that the correct license number corresponds to the submitted name and location of the subcontractor.

REFERENCES

(Bidder must have completed nine (9) full size soccer or football fields within the last three (3) years). The references must reflect this requirement.

1. Name (Firm/Agency): _____

Address:_____

Contact Person:_____Telephone No.:_____

Title of Project:_____

Project Location:_____

Date of Completion_____Contract Amount:$_____

2. Name (Firm/Agency): _____

Address:_____

Contact Person:_____Telephone No.:_____

Title of Project:_____

Project Location:_____

Date of Completion_____Contract Amount:$_____

3. Name (Firm/Agency): _____

Address:_____

Contact Person:_____Telephone No.:_____

Title of Project:_____

Project Location:_____

Date of Completion_____Contract Amount:$_____

4. Name (Firm/Agency): _____

Address:_____

Contact Person:_____Telephone No.:_____

Title of Project:_____

Project Location:_____

Date of Completion_____Contract Amount:$_____

Bidder's Information

The bidder must provide a detailed list of the trades and the description of the work they will perform with their own company for this project.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

Contractor's License No.: _____ Class: _____

Date first obtained: _____

Has License ever been suspended or revoked? _____

If yes, describe when and why _____

Any current claims against License or Bond? _____

If yes, describe claims: _____

Type of entity (check one)

_____ Incorporated _____ Partnership _____ Sole Proprietorship

If incorporated, in what state _____

Federal Tax ID Number #_____

Principals in Company (List all - attach additional sheets if necessary):

NAME	**TITLE**	**LICENSE NO.** **(If Applicable)**
_____	_____	_____
_____	_____	_____
_____	_____	_____

PART E

DOCUMENTS TO BE COMPLETED AND DELIVERED TO CITY AS PART OF CONTRACT WITH THE CITY

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, _____as Principal(s) and ____a corporation, incorporated, organized, and existing under the laws of the State of _____, and authorized to execute bonds and undertakings and to do a general surety business in the State of California, as Surety, are jointly and severally held and firmly bound unto the City of Torrance, a municipal corporation, located in the County of Los Angeles, State of California, in the full and just sum of: _____ Dollars ($_____), lawful money of the United States of America, for the payment of which sum, well and truly to be made, we bind ourselves and our respective heirs, executors, administrators, representative, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that: WHEREAS**,** said Principal(s) have/has entered into, or are/is about to enter into, a certain written contract or agreement, dated as of the _____ day of _____, 20____, with the said City of Torrance for the MCMASTER PARK BUILDING AND PARK IMPROVEMENTS B2014-37, all as is more specifically set forth in said contract or agreement, a full, true and correct copy of which is hereunto attached, and hereby referred to and by this reference incorporated herein and made a part hereof;

NOW, THEREFORE, if the said Principal(s) shall faithfully and well and truly do, perform and complete, or cause to be done, performed and complete, each and all of the covenants, terms, conditions, requirements, obligations, acts and things, to be met, done or performed by said Principal(s), including any guarantee period as set forth in, or required by, said contract or agreement, all at and within the time or times, and in the manner as therein specified and contemplated, then this bond and obligation shall be null and void; otherwise it shall be and remain in full force, virtue and effect.

The said Surety, for value received, hereby stipulates and agrees that no amendment, change, extension of time, alteration or addition to said contract or agreement, or of any feature or item or items of performance required therein or there under, shall in any manner affect its obligations on or under this bond; and said Surety does hereby waive notice of any such amendment, change, extension of time, alteration, or addition to said contract or agreement, and of any feature or item or items of performance required therein or there under.

<u>PERFORMANCE BOND</u> B2014-37 (CONTINUED)

In the event any suit, action or proceedings is instituted to recover on this bond or obligation, said Surety will pay, and does hereby agree to pay, as attorney's fees for said City, such sum as the Court in any such suit, action or proceeding may adjudge reasonable.

EXECUTED, SEALED AND DATED this _____ day of _____, 20____

CORPORATE SEAL

PRINCIPAL(S):

BY _____

BY _____

CORPORATE SEAL

SURETY:

BY _____

Name: _____
Local Address: _____
_____
Phone No.: _____
Fax No.: _____

LABOR AND MATERIAL BOND
B2014-37

KNOW ALL MEN BY THESE PRESENTS:

That we,_____
As Principal(s) and _____ a corporation, incorporated, organized, and existing under the laws of the State of _____, and authorized to execute bonds and undertakings and to do a general surety business in the State of California, as Surety, are jointly and severally held and firmly bound unto:

(a) The State of California for the use and benefit of the State Treasurer, as ex-officio Treasurer and custodian of the Unemployment Fund of said State; and

(b) The City of Torrance, California; and

(c) Any and all persons who do or perform or who did or performed work or labor upon or in connection with the work or improvement referred to in the contract or agreement hereinafter mentioned; and

(d) Any and all materialmen, persons, companies, firms, association, or corporations, supplying or furnishing any materials, provisions, provender, transportation, appliances or power, or other supplies used in, upon, for or about or in connection with the performance of the work or improvement contracted to be executed, done, made or performed under said contract or agreement; and

(e) Any and all persons, companies, firms, associations, or corporations furnishing, renting, or hiring teams, equipment, implements or machinery for, in connection with, or contributing to, said work to be done or improvement to be made under said contract or agreement; and

(f) Any and all persons, companies, firms, associations, or corporations who supply both work and materials;

and whose claim has not been paid by said Principal(s), in full and just sum of _____ Dollars ($_____), lawful money of the United States of America, for the payment of which will and truly to be made, said Principal(s) and said Surety do hereby bind themselves and their respective heirs, executors, administrators, representatives, successors and assigns, jointly and severally, firmly by these presents.

LABOR AND MATERIAL BOND (CONTINUED)

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH, THAT: WHEREAS, said Principal(s) have/has entered into or are/is about to enter into a certain written contract or agreement, dated as of the _____ day of _____20 ___, with the City of Torrance for the MCMASTER PARK BUILDING AND PARK IMPROVEMENTS, B2014-37, all as is more specifically set forth in said contract or agreement, a full, true and correct copy of which is hereunto attached, and hereby referred to and by this reference incorporated herein and made a part hereof;

NOW, THEREFORE, if the said Principal(s) (or any of his/her, its, or their subcontractors) under said contract or agreement fails or fail to pay:

(1) For any materials, provisions, provender, transportation, appliances, or power, or other supplies; or

(2) For the hire of any teams, equipment, implements, or machinery; or

(3) For any work or labor; supplies, furnished, provided, used, done or performed in, upon, for or about or in connection with the said work or improvement; or

(4) For amounts due under the Unemployment Insurance Act of the State of California with respect to such work or improvement;

the Surety on this bond will pay the same in an amount not exceeding the sum hereinabove specified in this bond; and, also, in case suit is brought upon this bond, said Surety will (and does hereby agree to) pay a reasonable attorney's fee, to be fixed and taxed as costs, and included in the judgment therein rendered.

This bond shall (and it is hereby made to) insure to the benefit of any and all persons entitled to file claims under Section 1192.1 of the Code of Civil Procedure of the State of California, so as to give a right of action to them or their assigns in any suit brought upon this bond, all as contemplated under the provisions of Section 4205 of the Government Code, and of Chapter 1 of Title 4 of Part 3 of the Code of Civil Procedure, of the State of California.

This bond is executed and filed in connection with said contract or agreement hereunto attached to comply with each and all of the provisions of the laws of the State of California above mentioned or referred to, and of all amendments thereto, and the obligors so intend and do hereby bind themselves accordingly.

<u>LABOR AND MATERIAL BOND</u> B2014-37 (CONTINUED)

The said Surety, for value received, hereby stipulates and agrees that no amendment, change, extension of time, alteration, or addition to said contract or agreement, or of any feature or item or items of performance required therein or thereunder, shall in any manner affect its obligations on or under this bond; and said Surety does hereby waive notice of any such amendment, change, extension of time, alteration, or addition to said contract or agreement, and of any feature or item or items of performance required therein or thereunder.

EXECUTED, SEALED AND DATED this _____ day of _____, 20 _____

CORPORATE SEAL PRINCIPAL:

BY _____

CORPORATE SEAL SURETY:

BY _____

Name: _____
Local Address: _____
_____
Phone No.: _____
Fax No.: _____

PUBLIC WORKS AGREEMENT

This PUBLIC WORKS AGREEMENT ("Agreement") is made and entered into as of DATE (the "Effective Date"), by and between the CITY OF TORRANCE, a municipal corporation ("CITY"), and CONTRACTOR NAME, TYPE OF ENTITY ("CONTRACTOR").

RECITALS:

A. The CITY wishes to retain the services of an experienced and qualified CONTRACTOR to construct the **PROJECT NAME & BID NUMBER**;

B. In order to obtain the desired services, The CITY has circulated a Notice Inviting Bids for the construction of the **PROJECT NAME & BID NUMBER** (the "NIB"); and

C. CONTRACTOR has submitted a Bid (the "Bid") in response to the NIB. CONTRACTOR represents that it is qualified to perform those services requested in the Plans and Specifications. Based upon its review of all Bids submitted in response to the NIB, The CITY is willing to award the contract to CONTRACTOR.

AGREEMENT:

1. <u>SERVICES TO BE PERFORMED BY CONTRACTOR</u>

CONTRACTOR will provide the services and install those materials listed in the Plans and Specifications, which are on file in the Public Works Department. The NIB and the Plans and Specifications are made a part of this Agreement. A copy of the Bid is attached as Exhibit A.

2. <u>TERM</u>

Unless earlier terminated in accordance with Paragraph 4 below, this Agreement will continue in full force and effect for two years from the Effective Date.

3. <u>COMPENSATION</u>

A. CONTRACTOR's Fee.

For services rendered pursuant to this Agreement, CONTRACTOR will be paid in accordance with CONTRACTOR's Bid; provided, however, that in no event will the total amount of money paid the CONTRACTOR, for services initially contemplated by this Agreement, exceed the sum of $INSERT DOLLAR AMOUNT ("Agreement Sum"), unless otherwise first approved in writing by the CITY.

B. Schedule of Payment.
Provided that the CONTRACTOR is not in default under the terms of this Agreement, upon presentation of an invoice, CONTRACTOR will be paid monthly, within 30 days after the date of the monthly invoice.

4. TERMINATION OF AGREEMENT

A. Termination by CITY for Convenience.

1. CITY may, at any time, terminate the Agreement for CITY's convenience and without cause.

2. Upon receipt of written notice from CITY of such termination for CITY's convenience, CONTRACTOR will:

   a) cease operations as directed by CITY in the notice;
   b) take actions necessary, or that CITY may direct, for the protection and preservation of the work; and
   c) 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.

3. In case of such termination for CITY's convenience, CONTRACTOR will be entitled to receive payment for work executed; and costs incurred by reason of such termination, along with reasonable overhead and profit on the work not executed.

B. Termination for Cause.

1. If either party fails to perform any term, covenant or condition in this Agreement and that failure continues for 15 calendar days after the nondefaulting party gives the defaulting party notice of the failure to perform, this Agreement may be terminated for cause; provided, however, that if during the notice period the defaulting party has promptly commenced and continues diligent efforts to remedy the default, the defaulting party will have such additional time as is reasonably necessary to remedy the default.

2. In the event this Agreement is terminated for cause by the default of the CONTRACTOR, the CITY may, at the expense of the CONTRACTOR and its surety, complete this Agreement or cause it to be completed. Any check or bond delivered to the CITY in connection with this Agreement, and the money payable thereon, will be forfeited to and remain the property of the CITY. All moneys due the CONTRACTOR under the terms of this Agreement will be retained by the CITY, but the retention will not release the CONTRACTOR and its surety from liability for the default. Under these circumstances, however, the CONTRACTOR and its surety will be credited with the amount of money retained, toward any amount by which the cost of completion exceeds the Agreement Sum and any amount authorized for extra services.

3. Termination for cause will not affect or terminate any of the rights of the CITY as against the CONTRACTOR or its surety then existing, or which may thereafter accrue because of the default; this provision is in addition to all other rights and remedies available to the CITY under law.

C. Termination for Breach of Law.

In the event the CONTRACTOR or any of its officers, directors, shareholders, employees, agents, subsidiaries or affiliates is convicted (i) of a criminal offense as an incident to obtaining or attempting to obtain a public or private contract or subcontract, or in the performance of a contract or subcontract; (ii) under state or federal statutes of embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property, or any other offense indicating a lack of business integrity or business honesty which currently, seriously, and directly affects responsibility as a public consultant or contractor; (iii) under state or federal antitrust statutes arising out of the submission of bids or proposals; or (iv) of violation of Paragraph 19 of this Agreement; or for any other cause the CITY determines to be so serious and compelling as to affect CONTRACTOR's responsibility as a public consultant or contractor, including but not limited to, debarment by another governmental agency, then the CITY reserves the unilateral right to terminate this Agreement or to impose such other sanctions (which may include financial sanctions, temporary suspensions or any other condition deemed appropriate short of termination) as it deems proper. The CITY will not take action until CONTRACTOR has been given notice and an opportunity to present evidence in mitigation.

5. FORCE MAJEURE

If any party fails to perform its obligations because of strikes, lockouts, labor disputes, embargoes, acts of God, inability to obtain labor or materials or reasonable substitutes for labor or materials, governmental restrictions, governmental regulations, governmental controls, judicial orders, enemy or hostile governmental action, civil commotion, fire or other casualty, or other causes beyond the reasonable control of the party obligated to perform, then that party's performance shall be excused for a period equal to the period of such cause for failure to perform.

6. RETENTION OF FUNDS

CONTRACTOR authorizes the CITY to deduct from any amount payable to CONTRACTOR (whether or not arising out of this Agreement) any amounts the payment of which may be in dispute or that are necessary to compensate the CITY for any losses, costs, liabilities, or damages suffered by the CITY, and all amounts for which the CITY may be liable to third parties, by reason of CONTRACTOR's negligent acts or omissions or willful misconduct in performing or failing to perform CONTRACTOR's obligations under this Agreement. In the event that any claim is made by a third party, the amount or validity of which is disputed by CONTRACTOR, or any indebtedness exists that appears to be the

basis for a claim of lien, the CITY may withhold from any payment due, without liability for interest because of the withholding, an amount sufficient to cover the claim. The failure of the CITY to exercise the right to deduct or to withhold will not, however, affect the obligations of CONTRACTOR to insure, indemnify, and protect the CITY as elsewhere provided in this Agreement.

7. THE CITY'S REPRESENTATIVE

The General Services Director is designated as the "City Representative," authorized to act in its behalf with respect to the work and services specified in this Agreement and to make all decisions in connection with this Agreement. Whenever approval, directions, or other actions are required by the CITY under this Agreement, those actions will be taken by the City Representative, unless otherwise stated. The City Manager has the right to designate another City Representative at any time, by providing notice to CONTRACTOR.

8. CONTRACTOR REPRESENTATIVE(S)

The following principal(s) of CONTRACTOR are designated as being the principal(s) and representative(s) of CONTRACTOR authorized to act in its behalf with respect to the work specified in this Agreement and make all decisions in connection with this Agreement:

REPRESENTATIVE 1
REPRESENTATIVE 2

9. INDEPENDENT CONTRACTOR

The CONTRACTOR is, and at all times will remain as to the CITY, a wholly independent contractor. Neither the CITY nor any of its agents will have control over the conduct of the CONTRACTOR or any of the CONTRACTOR's employees, except as otherwise set forth in this Agreement. The CONTRACTOR may not, at any time or in any manner, represent that it or any of its agents or employees are in any manner agents or employees of the CITY. CITY has no duty, obligation, or responsibility to CONTRACTOR's agents or employees under the Affordable Care Act. CONTRACTOR is solely responsible for any tax penalties associated with the failure to offer affordable coverage to its agents and employees under the Affordable Care Act and any other liabilities, claims and obligations regarding compliance with the Affordable Care Act with respect to CONTRACTOR's agents and employees. CITY is not responsible and shall not be held liable for CONTRACTOR's failure to comply with CONTRACTOR's duties, obligations, and responsibilities under the Affordable Care Act. CONTRACTOR agrees to defend, indemnify and hold CITY harmless for any and all taxes and penalties that may be assessed against CITY as a result of CONTRACTOR's obligations under the Affordable Care Act relating to CONTRACTOR's agents and employees.

10. BUSINESS LICENSE

The CONTRACTOR must obtain a City business license prior to the start of work under this Agreement, unless CONTRACTOR is qualified for an exemption.

11. OTHER LICENSES AND PERMITS

CONTRACTOR warrants that it has all professional, contracting and other permits and licenses required to undertake the work contemplated by this Agreement.

12. FAMILIARITY WITH WORK

By executing this Agreement, CONTRACTOR warrants that CONTRACTOR (a) has thoroughly investigated and considered the scope of services to be performed, (b) has carefully considered how the services should be performed, and (c) fully understands the facilities, difficulties and restrictions attending performance of the services under this Agreement. If the services involve work upon any site, CONTRACTOR warrants that CONTRACTOR has or will investigate the site and is or will be fully acquainted with the conditions there existing, prior to commencement of services set forth in this Agreement. Should CONTRACTOR discover any latent or unknown conditions that will materially affect the performance of the services set forth in this Agreement, CONTRACTOR must immediately inform the CITY of that fact and may not proceed except at CONTRACTOR's risk until written instructions are received from the CITY.

13. CARE OF WORK

CONTRACTOR must adopt reasonable methods during the life of the Agreement to furnish continuous protection to the work, and the equipment, materials, papers, documents, plans, studies and other components to prevent losses or damages, and will be responsible for all damages, to persons or property, until acceptance of the work by the CITY, except those losses or damages as may be caused by the CITY's own negligence.

14. CONTRACTOR'S ACCOUNTING RECORDS; OTHER PROJECT RECORDS

Records of the CONTRACTOR's time pertaining to the project, and records of accounts between the CITY and the CONTRACTOR, will be kept on a generally recognized accounting basis. CONTRACTOR will also maintain all other records, including without limitation specifications, drawings, progress reports and the like, relating to the project. All records will be available to the CITY during normal working hours. CONTRACTOR will maintain these records for three years after final payment.

15. INDEMNIFICATION

CONTRACTOR will indemnify, defend, and hold harmless CITY, the Successor Agency to the Former Redevelopment Agency of the City of Torrance, the City

Council, each member thereof, present and future, its officers, agents and employees from and against any and all liability, expenses, including defense costs and legal fees, and claims for damages whatsoever, including, but not limited to, those arising from breach of contract, bodily injury, death, personal injury, property damage, loss of use, or property loss however the same may be caused and regardless of the responsibility for negligence. The obligation to indemnify, defend and hold harmless includes, but is not limited to, any liability or expense, including defense costs and legal fees, arising from the negligent acts or omissions, or willful misconduct of CONTRACTOR, its officers, employees, agents, subcontractors or vendors. It is further agreed, CONTRACTOR's obligations to indemnify, defend and hold harmless will apply even in the event of concurrent negligence on the part of CITY, the City Council, each member thereof, present and future, or its officers, agents and employees, except for liability resulting solely from the negligence or willful misconduct of CITY, its officers, employees or agents. Payment by CITY is not a condition precedent to enforcement of this indemnity. In the event of any dispute between CONTRACTOR and CITY, as to whether liability arises from the sole negligence of the CITY or its officers, employees, agents, subcontractors or vendors, CONTRACTOR will be obligated to pay for CITY's defense until such time as a final judgment has been entered adjudicating the CITY as solely negligent. CONTRACTOR will not be entitled in the event of such a determination to any reimbursement of defense costs including but not limited to attorney's fees, expert fees and costs of litigation.

16. NON-LIABILITY OF THE CITY'S OFFICERS AND EMPLOYEES

No officer or employee of the CITY will be personally liable to CONTRACTOR, in the event of any default or breach by the CITY or for any amount that may become due to CONTRACTOR.

17. INSURANCE

A. CONTRACTOR must maintain at its sole expense the following insurance, which will be full coverage not subject to self insurance provisions:

1. Automobile Liability, including owned, non-owned and hired vehicles, with at least the following limits of liability:

   a. Combined single limits of $2,000,000 per occurrence.

2. General Liability including coverage for premises, products and completed operations, independent contractors, personal injury and contractual obligations with combined single limits of coverage of at least $3,000,000 per occurrence, with an annual aggregate of no less than $5,000,000.

3. Workers' Compensation with limits as required by the State of California and Employers Liability with limits of at least $1,000,000.

B. The insurance provided by CONTRACTOR will be primary and non-contributory.

C. CITY, the Successor Agency to the Former Redevelopment Agency of the City of Torrance, the City Council and each member thereof, members of boards and commissions, every officer, agent, official, employee and volunteer must be named as additional insureds under the automobile and general liability policies.

D. CONTRACTOR must provide certificates of insurance and/or endorsements to the City Clerk of the City of Torrance before the commencement of work.

E. Each insurance policy required by this Paragraph must contain a provision that no termination, cancellation or change of coverage can be made without thirty days notice to the CITY.

F. CONTRACTOR must include all subcontractors as insureds under its policies or must furnish separate certificates and endorsements for each subcontractor. All coverage for subcontractors will be subject to all of the requirements of this Paragraph 17.

18. SUFFICIENCY OF INSURERS

Insurance required by this Agreement will be satisfactory only if issued by companies admitted to do business in California, rated "B+" or better in the most recent edition of Best's Key Rating Guide, and only if they are of a financial category Class VII or better, unless these requirements are waived by the Risk Manager of the CITY ("Risk Manager") due to unique circumstances. In the event the Risk Manager determines that the work or services to be performed under this Agreement creates an increased or decreased risk of loss to the CITY, the CONTRACTOR agrees that the minimum limits of any insurance policies and/or the performance bond required by this Agreement may be changed accordingly upon receipt of written notice from the Risk Manager; provided that CONTRACTOR will have the right to appeal a determination of increased coverage by the Risk Manager to the City Council of the CITY within 10 days of receipt of notice from the Risk Manager.

19. CONFLICT OF INTEREST

A. No officer or employee of the CITY may have any financial interest, direct or indirect, in this Agreement, nor may any officer or employee participate in any decision relating to the Agreement that effects the officer or employee's financial interest or the financial interest of any corporation, partnership or association in which the officer or employee is, directly or indirectly interested, in violation of any law, rule or regulation.

B. No person may offer, give, or agree to give any officer or employee or former officer or employee, nor may any officer or employee solicit, demand, accept, or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval,

disapproval, recommendation, preparation or any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any way pertaining to any program requirement, contract or subcontract, or to any solicitation or proposal.

20. NOTICE

A. All notices, requests, demands, or other communications under this Agreement will be in writing. Notice will be sufficiently given for all purposes as follows:

1. Personal delivery. When personally delivered to the recipient: notice is effective on delivery.

2. First Class mail. When mailed first class to the last address of the recipient known to the party giving notice: notice is effective three mail delivery days after deposit in an United States Postal Service office or mailbox.

3. Certified mail. When mailed certified mail, return receipt requested: notice is effective on receipt, if delivery is confirmed by a return receipt.

4. Overnight delivery. When delivered by an overnight delivery service, charges prepaid or charged to the sender's account: notice is effective on delivery, if delivery is confirmed by the delivery service.

5. Facsimile transmission. When sent by fax to the last fax number of the recipient known to the party giving notice: notice is effective on receipt. Any notice given by fax will be deemed received on the next business day if it is received after 5:00 p.m. (recipient's time) or on a non-business day.

6. Addresses for purpose of giving notice are as follows:

CONTRACTOR:	CONTRACTOR'S NAME AND ADDRESS Fax: INSERT FAX NUMBER
CITY:	City Clerk City of Torrance 3031 Torrance Boulevard Torrance, CA 90509-2970 Fax: (310) 618-2931

with a copy to: Attn: PROJECT MANAGER'S NAME
General Services Department
City of Torrance
3350 Civic Center Drive
Torrance, CA 90503
Fax: (310) 781-7199

B. Any correctly addressed notice that is refused, unclaimed, or undeliverable because of an act or omission of the party to be notified, will be deemed effective as of the first date the notice was refused, unclaimed or deemed undeliverable by the postal authorities, messenger or overnight delivery service.

C. Either party may change its address or fax number by giving the other party notice of the change in any manner permitted by this Agreement.

21. PROHIBITION AGAINST ASSIGNMENT AND SUBCONTRACTING

This Agreement and all exhibits are binding on the heirs, successors, and assigns of the parties. The Agreement may not be assigned or subcontracted by either the CITY or CONTRACTOR without the prior written consent of the other.

22. INTEGRATION; AMENDMENT

This Agreement represents the entire understanding of the CITY and CONTRACTOR as to those matters contained in it. No prior oral or written understanding will be of any force or effect with respect to the terms of this Agreement. The Agreement may not be modified or altered except in writing signed by both parties.

23. INTERPRETATION

The terms of this Agreement should be construed in accordance with the meaning of the language used and should not be construed for or against either party by reason of the authorship of this Agreement or any other rule of construction that might otherwise apply.

24. SEVERABILITY

If any part of this Agreement is found to be in conflict with applicable laws, that part will be inoperative, null and void insofar as it is in conflict with any applicable laws, but the remainder of the Agreement will remain in full force and effect.

25. TIME OF ESSENCE

Time is of the essence in the performance of this Agreement.

26. GOVERNING LAW; JURISDICTION

This Agreement will be administered and interpreted under the laws of the State of California. Jurisdiction of any litigation arising from the Agreement will be in Los Angeles County, California.

27. COMPLIANCE WITH STATUTES AND REGULATIONS

CONTRACTOR will be knowledgeable of and will comply with all applicable federal, state, county and city statutes, rules, regulations, ordinances and orders.

28. WAIVER OF BREACH

No delay or omission in the exercise of any right or remedy by a nondefaulting party on any default will impair the right or remedy or be construed as a waiver. A party's consent or approval of any act by the other party requiring the party's consent or approval will not be deemed to waive or render unnecessary the other party's consent to or approval of any subsequent act. Any waiver by either party of any default must be in writing and will not be a waiver of any other default concerning the same or any other provision of this Agreement.

29. ATTORNEY'S FEES

Except as provided for in Paragraph 15, in any dispute, litigation, arbitration, or other proceeding by which one party either seeks to enforce its rights under this Agreement (whether in contract, tort or both) or seeks a declaration of any rights or obligations under this Agreement, the prevailing party will be awarded reasonable attorney's fees, together with any costs and expenses, to resolve the dispute and to enforce any judgment.

30. EXHIBITS

All exhibits identified in this Agreement are incorporated into the Agreement by this reference.

31. CONTRACTOR'S AUTHORITY TO EXECUTE

The persons executing this Agreement on behalf of the CONTRACTOR warrant that (i) the CONTRACTOR is duly organized and existing; (ii) they are duly authorized to execute this Agreement on behalf of the CONTRACTOR; (iii) by so executing this Agreement, the CONTRACTOR is formally bound to the provisions of this Agreement; and (iv) the entering into this Agreement does not violate any provision of any other Agreement to which the CONTRACTOR is bound.

CITY OF TORRANCE,
a Municipal Corporation

_____
Frank Scotto, Mayor

ATTEST:

_____
Sue Herbers, City Clerk

APPROVED AS TO FORM:

JOHN L. FELLOWS III
City Attorney

By: _____

Attachment: Exhibit A: Bid

BUSINESS OR INDIVIDUAL NAME
TYPE OF ENTITY

By: _____
SIGNER, TITLE

EXHIBIT A

Bid

PART F

PROJECT SPECIFICATIONS

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End Table of Contents

Consultant List

Landscape Architect
Land Concern
1750 East Deere Avenue
Santa Ana, CA 92705
(949) 250-4822

Civil Engineer
Civil Design & Drafting, Inc.
885 Patriot Dr., Unit C
Moorpark, CA 93021
(805)522-2622

Architect
SC Consulting Group
24881 Alicia Parkway, #317
Laguna Hills, CA 92653

Irrigation Consultant
Water Concern
29829 Santa Margarita Parkway, Suite 200
Rancho Santa Margarita, CA 92688
(949) 635-0474

Lighting Consultant
Visual Concepts, Inc.
7343 Ronson Road, Suite C
San Diego, CA 92111
(858) 278-4503

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide materials, labor, and equipment necessary for the completion of field engineering as indicated on the drawings and specified herein.

1.02 GENERAL

A. Project Record Documents: Submit a record of Work performed and record survey data required under provisions of Sections “Submittals” and “Project Closeout”.

B. Surveyor: Engage a Land Surveyor registered in the State where the Project is located, to perform land surveying required.

C. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.

2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.

D. Existing Utilities and Equipment: The existence and location of underground utilities and construction indicated as existing are not guaranteed. Before beginning site work, verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

E. Performance: Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels where needed to properly locate each element. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities, of marked lines and levels provided for their use. As construction proceeds, check every major element for line, level and plumb.

F. Surveyor’s Log: Maintain a surveyor’s log of control and other surveys. Make this log available for reference.

1. Record deviations from required lines and levels. Advise the Landscape Architect when deviations that exceed indicated or recognized tolerances are detected. On record Drawings, record deviations that are accepted and not corrected.

G. Site Improvements: Locate and layout site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

H. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

I. Final Property Survey: Before Substantial Completion, prepare a final property survey showing significant features for the Project. Include a certification, signed by the Surveyor, to the effect that metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.

   1. Recording: At Substantial Completion, have the final survey recorded by or with local authorities as the official “property survey”.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1. 1.1 SUMMARY

A. A. Section includes: Administrative and procedural requirements governing product substitutions.

2. 1.2 DEFINITIONS

A. A. Substitutions: Contractor-proposed changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

3. 1.3 PROPOSED SUBSTITUTIONS

A. A. Owner and Architect will consider formal requests from Contractor for substitution of products and fabrication or installation methods in lieu of those specified under one or more of the following circumstances:

1. When the Contractor ascertains the specified product is not available. Proof shall be submitted that firm orders were placed in a timely manner or that the unavailability is due to strike, lockout, bankruptcy, discontinuance of manufacture or an act of God.

2. When, in the opinion of the Contractor, the specified product or process will not fulfill the design intent.

B. B. Substitutions will not be considered if:

1. They are indicated or implied on RFIs, shop drawings or project data submittals without formal request submitted in compliance with the requirements of this Section.

a. Make request for substitutions prior to the preparation of shop drawings, product data and samples.

b. Do not prepare shop drawings, product data and samples based on substitutions that have not been accepted by the Owner and Architect.

2. They are requested directly by a subcontractor or supplier.

3. Acceptance will require substantial revision of Contract Documents.

C. C. In making a request for substitution, Contractor represents:

1. Contractor has investigated proposed product or method and has determined it is equal to, or superior, in all respects to the product or method specified.

2. Contractor will provide same warranty for substitution of product or method specified.

3. Contractor will coordinate installation of accepted substitution into the Work, making such changes to adjacent materials as may be required for the Work to be complete in all respects without need for re-design of adjacent and supporting materials.

4. Contractor waives all claims for extension of time or time/sequence related consequences, and additional costs that subsequently become apparent.

5. Cost data is complete and includes all related costs under Contractor's Contract, but excludes development and implementation costs which may be incurred by the Owner and Architect.

4. 1.4 SUBMITTALS

A. Submit 3 copies of each request for substitution.

1. Use Substitution Request Form attached at end of Section.
2. Identify product or fabrication or installation method to be replaced.
3. Reference relevant specification Section number and title and Drawing numbers and titles.

B. Submit sufficient data to demonstrate compliance of substitutions with specified design and performance requirements and the following, as applicable.

1. Statement indicating why specified material or product cannot be provided.
2. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
3. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
4. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
5. Samples, where applicable or requested.
6. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
7. Material test reports from a qualified testing and inspection agency indicating and interpreting test results for compliance with requirements indicated.
8. Research/evaluation reports evidencing compliance with the requirements of the authorities having jurisdiction for Project, from a model code organization acceptable to authorities having jurisdiction.
9. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
10. Cost information, including a proposal of change, if any, in the Contract Sum.
11. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
12. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

C. If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution.

1. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 business days of receipt of request, or within 7 calendar days of receipt of additional information or documentation, whichever is later.
2. Use product specified if Architect does not make a decision on use of a proposed substitution within time allocated.

2. 1.5 REQUIREMENTS

A. Submit proposed substitutions to the Architect within 30 calendar days after the date the Notice to Proceed is issued, or the Agreement is executed, whichever is earlier.

B. After stated period of time, proposed substitutions will not be considered unless a specified product is no longer available for causes beyond control of the Contractor or a change in governing regulatory requirements makes a revision in specified product or method mandatory.

A. Approval or rejection: Approval or ejection of proposed substitutions is at the Owner's and Architect's discretion, which will be final and will include consideration of the following factors, among others, in comparing the equality of proposed substitutions with indicated or specified requirements:

1. Quality of materials, structural strength, construction, fabrication, and performance.
2. Appearance and finish, or surface characteristics permitting required finish to be applied.
3. Impact on adjoining or related work. Arrangements resulting in acceptance of proposed substitution shall be equal in appearance, convenience and practicality to original arrangements.
4. Availability of replacement parts and maintenance services.
5. Code approvals and service history.

B. Resubmission of proposed substitutions: Do not resubmit any previously rejected proposed substitutions in modified form.

1. Upon rejection of a proposed substitution, Contractor may submit another substitution within time limits stated above.
2. If second proposed substitution is rejected or not received by the Architect within time specified, provide only specified Work at no additional cost to the Owner.

C. Compliance: Acceptance of proposed substitutions does not relieve Contractor from compliance with the Contract Documents. Contractor shall bear all extra expense resulting from approved substitutions where approved substitutions affect adjoining Work.

D. Unauthorized substitutions: If substitute materials are installed without prior approval, remove unauthorized materials and install those indicated or specified at no additional cost to the Owner.

PART 2 - PRODUCTS (NOT USED) PART 3

- EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements for making proposals for change and modifications to the Contract Documents.

B. Modifications to the Contract Documents may be issued in the form of one or more of the following:

1. Architect's Supplemental Instructions.
2. Construction Change Directives.
3. Work Changes Proposal Requests.
4. Change Order Requests.
5. Change Orders

1.2 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS

A. In order to issue additional instructions or interpretations, or to order minor changes in the work, Architect may issue Architect's Supplemental Instructions (ASI), through the Construction Manager, to the Contractor instructing Contractor to proceed with minor changes in the Work that do not involve adjustment to the Contract Sum or the Contract Time.

B. ASI's shall be submitted using AIA Document G710, and shall include a complete description of minor change to the Work.

C. Proceed with changes without subsequent adjustment, or request for adjustment, to Contract sum or Contract Time. If Contractor believes a change in Contract Sum or Contract Time is involved, submit subsequent Change Order Request as specified below prior to beginning work described in ASI.

1.3 CONSTRUCTION CHANGE DIRECTIVES

A. For changes to the Work where the Owner and Contractor have not reached an agreement on proposed changes to Contract Sum or Contract Time, and which if not expeditiously implemented might delay the project, Architect may issue a Construction Change Directive (CCD) to Contractor instructing Contractor to proceed with a change in the Work for which subsequent adjustment to Contract Sum or Contract Time shall be included by Change Order.

B. CCD's shall be submitted using AIA Document G714, shall include a complete description of change in the Work, and shall also designate the method to be followed to determine the change to Contract Sum or Contract Time.

C. Upon receipt of a completed CCD, promptly proceed with the change in the work described in CCD. Maintain detailed records on a time and material basis of work required by the CCD.

D. After completion of change, submit Change Order Request including itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.4 WORK CHANGES PROPOSAL REQUESTS

1.1

A. In order to obtain price quotations and similar information related to a proposed change in the construction contract, Architect may issue a Work Change Proposal Request, through the Construction Manager, to the Contractor instructing Contractor to evaluate a

proposed change in the Work for which subsequent adjustment to Contract Sum or Contract Time may be required.

1. Work Changes Proposal Requests are for information only.
2. Do not consider Work Changes Proposal Requests as instructions either to stop work in progress or to execute a proposed change.

B. Work Changes Proposal Requests shall be submitted using AIA Document G709, and shall Include a complete description of change in the Work.

C. Within 10 business days of receipt of Work Changes Proposal Request, submit quotation estimating adjustments to Contract Sum and Contract Time required to execute proposed change.

1. Include list products and quantities required or eliminated, unit costs, and total amount of purchases and credits to be made. Furnish survey data to substantiate quantities.
2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
3. Include costs of labor and supervision directly attributable to change.
4. Include updated Contractor's Construction Schedule indicating effect of change, including changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

D. Based on submitted quotation and supporting data provided by Contractor, Owner will determine whether or not to accept corresponding change.

1. If accepted by Owner, Architect will issue a Change Order for signature by Owner and Contractor to incorporate subsequent adjustment to Contract Sum or Contract Time into the Work.
2. If not accepted by the Owner, erect, install, apply, construct, re-install or use of specified product, system or execution method.

1.5 CHANGE ORDER REQUESTS

A. If latent or unforeseen conditions require modifications to the Contract, submit a change order request (COR) to the Architect describing proposed change in the Work.

1. Include statement outlining reasons behind request for change, along with effect of proposed change on the Work and on the Contract Sum and the Contract Time.
2. Include list products and quantities required or eliminated, unit costs, and total amount of purchases and credits to be made. Furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to change.
5. Include updated Contractor's Construction Schedule indicating effect of change, including changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements of Section 01 25 00 if proposed change requires substitution of one product, system or execution method for specified product, system or execution method.

1.

B. If Contract Sum increases due to a change in scope or nature of allowance described in the Contract Documents, submit a COR to Architect for either the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Submit COR within 10 business days of receipt of the Change Order or Construction Change Directive authorizing work to proceed.
2. Owner will reject claims submitted later than 10 business days after such authorization.
3. Do not include in COR the Contractor's indirect expense amount unless it is clearly evidenced that the nature or extent of the Work has changed from what could have been foreseen from information available in the Contract Documents.
4. Changes to Contractor's indirect expense will not be accepted for Contractor's selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

C. Submit COR using AIA Document G709, shall include space for the signatures of the Owner, Architect and Contractor, and a complete description of change in the Work.

D. Deliver 3 copies of each COR to the Architect via hand carry, mail, overnight shipping, facsimile, messenger, email or otherwise as appropriate. It is the Contractor's responsibility to verify the Architect has received the COR, with all pages and attachments complete and legible.

E. Based on submitted quotation and supporting data provided by Contractor, Owner will determine whether or not to accept corresponding change in compliance with requirements specified below for Change Orders.

1.6 CHANGE ORDERS

A. Submit Change Orders using AIA Document G701, shall include space for the signatures of the Owner, Architect and Contractor, and a complete description of change in the Work.

B. Deliver 3 copies of each Change Order to the Architect via hand carry, mail, overnight shipping, facsimile, messenger, email or otherwise as appropriate. It is the Contractor's responsibility to verify the Architect has received the Change Order, with all pages and attachments complete and legible.

C. Based on submitted quotation and supporting data provided by Contractor, Owner will determine whether or not to accept corresponding change.

1. If accepted by Owner, Architect and Owner will sign Change Order indicating acceptance of adjustment to Contract Sum or Contract Time and approval to incorporate change into the Work.
2. If adjustment to Contract Sum or Contract Time cannot be agreed upon by Owner and Contractor, amounts shall be resolved in compliance with provisions of the Conditions of the Contract for resolution of disputes.
   a. Maintain detailed records of work on a time and material basis.
   b. Prepare itemized account and supporting data necessary to substantiate cost of change to Contract Sum or Contract Time.
   c. Provide complete information requested by Owner in order for Owner to evaluate proposed costs associated with change to Contract Sum or Contract Time.
   d. Owner reserves the right to audit Contractor's invoices and bid quotations in order to substantiate Change Order costs.

D. When agreement is reached regarding adjustment to Contract Sum or Contract Time, promptly comply with the following.

A.

1. Proceed with the change in the work described in Change Order.
2. Revise Schedule of Values and Application for Payment forms to record each authorized Change Order and adjustment to the Contract Sum as a separate line item.

3. Revise progress schedules to reflect changes in Contract Time.
   a. Revise sub-schedules to adjust time for other items of Work as may be affected by the change.
   b. Submit revised schedules at the next Application for Payment following approval and acceptance of the Change Order.

PART 2 - PRODUCTS (NOT APPLICABLE) PART 3 - EXECUTION (NOT APPLICABLE)
END OF SECTION

SECTION 01 26 13 REQUESTS FOR INTERPRETATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: General requirements for Contractor's Requests for Interpretation (RFIs).

1.2 REQUIREMENTS

A. Submit an RFI to the Architect when:
1. An unforeseen condition occurs.
2. Questions regarding constructability arise.
3. Clarification of information in the Contract Documents, or supplementary information not contained within the Contract Documents, is required.
4. Interpretation of the Contract Documents, including that of apparent conflicts, is necessary.

B. When possible, request information either verbally or in writing at the next scheduled Project meeting.
1. When an RFI is answered at the Project meeting, number the RFI and enter the response into the meeting minutes.
2. When the urgency of the need, or the complexity of the item makes clarification at the next scheduled Project meeting impractical, prepare and submit a formal written RFI to the Architect without delay.

C. Do not use RFIs for the following:
1. To request contract modification and to confirm action taken by the Contractor for requested contract modifications.
2. To request approval of submittals.
3. To request approval of substitutions.

1.3 SUBMITTALS

A. Direct RFIs to the Architect by hand carry, mail, overnight mail, fax, messenger, email or otherwise as appropriate.
1. It is the Contractor's responsibility to verify the Architect has received the RFI.
2. RFIs generated by subcontractors or material suppliers shall be submitted through the Contractor, and reviewed by the Contractor prior to submittal to the Architect.
3. RFIs received directly from a subcontractor will be returned to the Contractor without review.

B. When submitted in writing, provide a legible written request on a standard CSI or AIA pre- printed form, or another form approved in advance by the Architect. Include the following information:
1. Project name, as listed on the Contract Documents, and Architect's project number or other identifying number, if any.
2. Date of RFI submittal.
3. Name, address, telephone and FAX numbers of the Contractor.
4. Drawing numbers and detail references, where appropriate.
5. Number and title of affected specification Section or Sections.
6. Clear, concise explanation of interpretation or clarification requested.
7. Contractors suggested response or solution to the request.
8. Blank space for Architect's written response.

C. Submit RFIs within a reasonable time frame so as not to interfere with or impede the progress of the Work. When the number and frequency of RFIs submitted becomes unwieldy, the Architect may recommend the Contractor abandon the process and submit requests as submittals, substitutions, or requests for change.

D. Allow at least 5 business days for review and response time. The response time is increased when:

1. More information from the Contractor is requested by the Architect. If the Architect requires clarification to the RFI, the period of time required for Architect's response will begin when clarification is received from the Contractor.
2. The RFI is submitted out-of-sequence.
3. In the opinion of the Architect, more time is needed to respond to the RFI. Alert the Architect, in writing, to the time available before the response will cause an impact to the Project.

E. Consecutively number submitted RFIs. Each page of every attachment to the RFI shall also bear the RFI number.

F. Prepare and maintain an RFI log.
1. Log RFI number, brief description of content or subject discussed, date submitted, and date answered.
2. Keep log current and furnish copy when so requested by the Architect.

1.4 QUALITY ASSURANCE

A. Carefully study the Contract Documents to ensure requested information is not available therein.
1. Before submitting RFIs to the Architect, verify the information requested is not Indicated in the Contract Documents, or cannot be determined from a careful review of the Contract Documents.
2. RFIs requesting information available in the Contract Documents will be returned to the Contractor without review.

B. Where field conditions may dictate solutions, provide assessment of the potential problem and a suggested solution with the initial RFI submittal. RFIs failing to include a suggested solution may be returned to the Contractor without review.

C. Where an RFI is issued to request clarification of coordination issues (for example, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items) suggest a solution using drawings or sketches drawn to scale and submit them with the RFI.
1. Architect will review only those RFIs that include a suggested solution to a request.
2. If no apparent solution is obvious, a statement to that effect shall be made in the RFI.

D. If the Contractor believes that a response provided by the Architect may result in a change in Contract sum or time, the Contractor shall not proceed with the work indicated by the RFI until a Change Order or other acceptable tracking device is prepared and approved.
1. If the Contractor believes that a clarification by the Architect results in additional cost, the Contractor shall identify in the RFI the basis of the Contractor's bid as it relates to the RFI.
2. RFI responses shall not be construed as approval to perform extra work.

PART 2 - PRODUCTS (NOT USED) PART 3 - EXECUTION (NOT USED)
END OF SECTION

SECTION 01 29 00 PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. General:

1. Correlate line items in the schedule of values with other required administrative schedules and forms, including:
   a. Construction schedule.
   b. Application for payment form.
   c. List of subcontractors.
   d. Schedule of unit prices.
   e. List of products.
   f. List of principal suppliers and fabricators.
   g. Submittal schedule.
2. Submit the schedule of values to the Architect at the earliest feasible date, but in no case later than 7 calendar days before the date scheduled for submittal of the initial application for payment.

B. Format and content: Use the Project Manual table of contents as a guide to establish the format for the schedule of values.

1. Include the following on the schedule of values:
   a. Project name and location.
   b. Contractor's name and address.
   c. Project number.
   d. Architect's name.
   e. Date of submittal.
2. Arrange the schedule of values in a tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section.
   b. Generic name.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that have affected value.
   g. Dollar value.
   h. Percentage of Contract Sum to the nearest 1/100 percent, adjusted to total 100 percent.

a.

3. Provide a breakdown of the Contract sum in sufficient detail to facilitate continued evaluation of applications for payment and progress reports. Break principal subcontract amounts down into several line items.
4. Round amounts off to the nearest whole dollar. The total shall equal the Contract Sum.
5. For each part of the Work where an application for payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the schedule of values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

6. For margins of cost, show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in applications for payment.
   a. Each item in the schedule of values and applications for payment shall be complete including its total cost and proportionate share of general overhead and profit margin
   b. At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the schedule of values or distributed as general overhead expense.
7. Update and resubmit the schedule of values when Change Orders or construction Change Directives result in a change in the Contract sum.

1.3 APPLICATIONS FOR PAYMENT

A. General: Each application for payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner. The initial application for payment, the application for payment at time of Substantial Completion, and the final application for payment involve additional requirements.

B. Payment application times: Unless otherwise indicated in the Agreement, the date for each progress payment is the 15th day of each month. The period of construction work covered by each application for payment is the period ending 15 days prior to the date for each progress payment and starting the day following the end of the preceding period.

C. Payment application forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets, or other form acceptable to the Architect, as form for Applications for Payment.

D. Application preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions have been made.
   2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
   3. Submit evidence of updated project record documents for changes and as-built conditions.

E. Transmittal:
   1. Submit 3 executed copies of each application for payment to the Architect so that they are received within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.
   2. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.

1.

F. Waivers of mechanics lien: With each application for payment, submit waivers of mechanics lien from every entity who may lawfully be entitled to file a mechanics lien arising out of the Contract, and related to the work covered by the payment.
   1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Waiver delays:
      a. Submit each application for payment with the Contractor's waiver of mechanics lien for the period of construction covered by the application.

b. Submit final application for payment with or preceded by final waivers from every entity involved with performance of work covered by the application who could lawfully be entitled to a lien.

5. Submit waivers of lien on forms, and executed in a manner, acceptable to Owner.

G. Initial application for payment: Administrative actions and submittals that must precede or coincide with submittal of the first application for payment include the following.

1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of unit prices.
4. Schedule of values.
5. Contractor's construction schedule (preliminary if not final).
6. Initial product list.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from governing authorities for performance of the Work.
12. Initial progress report.
13. Report of pre-construction meeting.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds, if required.
16. Data needed to acquire Owner's insurance.
17. Initial settlement survey and damage report, if required.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

1.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Assurance that unsettled claims will be settled.
4. Assurance that work not complete and accepted will be completed without undue delay.
5. Transmittal of required Project construction records to Owner.
6. Certified property survey.
7. Proof that taxes, fees and similar obligations have been paid.
8. Removal of temporary facilities and services.
9. Removal of surplus materials, rubbish and similar elements.
10. Change of door locks to Owner's access.
11. Consent of surety to final payment and insurance certificates.
12. Final meter readings of utilities, a record of stored fuel, and similar data as of the date of Substantial Completion.

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Requirements for coordinating construction operations on Project.
   2. Coordination Drawings.
   3. Project meetings.

1.2 REQUIREMENTS

A. Coordination: Coordinate the Work of all subcontractors to ensure efficient and orderly installation of each part of the Work.
   1. Establish on-site lines of authority and communication.
   2. Allocate spaces for temporary structures furnished by Subcontractors.
   3. Monitor use of temporary utilities.
   4. Administer traffic and parking controls.

B. Construction schedule: Prepare detailed construction schedule for all subcontractors and monitor the schedule and compliance as the Work progresses.

C. Changes:
   1. Review subcontractor's requests for interpretations and substitution requests.
   2. Submit recommendations for necessary or desirable changes in the Work to Architect.
   3. Process Change Orders.

D. Permits and fees: Verify that subcontractors have obtained permits for all required inspections.

E. Submittals: Review subcontractor submittals for compliance with the Contract Documents before submitting to the Architect.

F. Interpretation of documents: Consult Architect for interpretations of the Contract Documents.
   1. Assist in resolution of questions that arise.
   2. Transmit resolved interpretations in writing to all concerned parties.

G. Cleaning: Verify specified cleaning is performed during progress of the Work and at completion of each stage of the Work.

H. Startup:
   1. Direct checkout of utilities, operating systems and equipment.
   2. Assist initial startup testing.
   3. Record operation start dates of systems and equipment.
   4. Submit written notice of completion of startup operations and placing of equipment in service to Architect.

A. I. Substantial completion:

1. Upon determination the Work is complete, submit notice to Architect that the Work is ready

for final inspection.

2. Secure and transmit all required closeout submittals.

1.3 PROJECT MEETINGS

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 a minimum of 5 business days in advance of meeting date.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to concerned parties, including Owner and Architect, within 3 business days of the meeting.
4. Revisions to published minutes:
   a. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
   b. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
   c. Challenge to minutes shall be settled as priority portions of "old business" at the next regularly scheduled meeting.

B. Pre-construction meetings: No later than 5 business days after execution of the Agreement, schedule a preconstruction conference at Project site or another convenient location before starting construction to review responsibilities and personnel assignments. Owner and Architect must both approve meeting date and time.

1. Attendees:
   a. Authorized representatives of Owner.
   b. Architect and Architect's consultants.
   c. Contractor and Contractor's superintendent.
   d. Major subcontractors and material suppliers.
   e. Other concerned parties.
2. Agenda:
   a. Review, discuss, clarify and establish the following procedural issues:
      1) Identify individuals who represent the parties to the Contract, their duties and responsibilities and proper lines of communication.
      2) Submission requirements for list of subcontractors, materials, equipment, and named products.
      3) Procedures for measurement and payment, including schedule of values, applications for payment, proposal requests, and change orders.
      4) Preliminary scheduling, the construction progress schedule, and the submittal schedule.
      5) Critical issues.
      6) Long lead items and priorities and their relationship to critical dates.
      7) Submittal procedures for shop drawings, product data, and samples.

1)

      8) Requirements for quality control submittals and submittals required for closeout.

9) Permitted product options and substitutions, explaining the ground rules and procedures associated with them.

10) Procedures for Requests for Interpretation (RFIs), field decisions, construction change directives, and filing claims.

11) Procedures for testing and inspection, including timely notification when the work is ready for testing and inspection.

12) Responsibilities and limitations of authority of an inspection service or laboratory and distribution of reports.

13) Procedures for maintaining project record documents.

14) Establish the schedule for project meetings.

b. Review, discuss, clarify and establish the following mobilization issues:

1) Access to the site, including access roads, parking restrictions, environmental controls, and security.

2) Identification of benchmarks and data, including survey and layout of work.

3) Use of site and existing facilities by contractor and owner, including access to building areas, use of elevators, and maintenance of fire exits.

4) Occupancy and use by owner, tenants, and public during construction periods, including partial use and occupancy of completed work, and related coordination of insurance requirements.

5) Separation of work areas, barriers, and dust control.

6) Maintenance of site, including traffic control, cleaning, trash removal.

7) Hours of work, including restriction for noise control, etc.

8) Protection of existing materials and equipment to remain in place.

9) Use of existing utilities, consumption limitations, and prior notification of interruption of services or system operations.

10) Project phases or sequences.

3. Minutes: Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

a. Distribute minutes of the meeting to each party present and to parties who should have been present.

b. 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.

C. Progress Meetings: Conduct progress meetings at the Project site at weekly intervals. Owner and Architect must both approved meeting dates and times. Coordinate dates of meetings with preparation of payment requests.

1. Attendees:

a. General Contractor project manager.

b. General Contractor's jobsite superintendent.

c. Owner's Representative.

d. Architect and its consultants, as pertinent to agenda.

e. Subcontractors, as pertinent to agenda.

1. 2. Agenda:

a. Review and approve minutes of previous meeting.

b. Review work progress since last meeting.

1) Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule.

2) Determine how construction behind schedule will be expedited secure

commitments from parties involved to do so.

3) Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

c. Review status of RFIs and submittals.

d. Review other items of significance that could affect progress of construction.

1) Note field observations, problems and decisions.

2) Review any off-site fabrication problems.

3) Develop corrective measures and procedures to regain planned schedule.

4) Revise construction schedule as indicated.

5) Plan progress during next work period.

e. Include topics for discussion as appropriate to status of Project.

f. Complete other current business.

3. Minutes: Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

a. Distribute minutes of the meeting to each party present and to parties who should have been present.

b. 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.

1.4 SUBMITTALS

A. Submit a copy of the coordination drawings to the Architect no later than time of submittal of the individual trades' shop drawings. The individual trades' shop drawings will not be reviewed without submission of the coordination drawings with a completely executed sign-off table.

B. The Contractor and each subcontractor for the above work shall certify by endorsement on the coordination drawings that the coordination drawings represent a complete and accurate record of the work to be executed.

C. After coordination drawings are completed, subcontractors shall date and sign each coordination drawing with the understanding that the signature signifies that the work shown thereupon has been fully coordinated and is ready for construction.

END OF SECTION

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SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements for documenting the progress of construction during performance of the Work.

1. 1. Submittals Schedule.
2. 2. Contractor's Construction Schedule.

1.2 REQUIREMENTS

A. Coordinate preparation and processing of schedules with performance of construction activities and with scheduling of separate subcontractors.

B. Obtain the concurrence of each subcontractor for the scheduling of activities and revise as necessary to accurately reflect their agreement to the scheduling of their work.

C. Coordinate contractor's construction schedule with the schedule of values, list of subcontracts, submittals schedule, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity with other activities and schedule them in proper sequence.

1.3 SUBMITTALS

A. Submittals schedule: Submit 3 copies of submittals schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section numbers and titles.
3. Name of subcontractor.
4. Description of the Work covered.
5. Scheduled date for Architect's final release or approval.

B. Contractor's construction schedule:

1. Submit 3 copies of initial schedule, large enough to show entire schedule for entire construction period.
2. Submit an electronic copy of schedule, using scheduling software such as Microsoft Project.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule.

1. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1.

2. Coordinate submittals schedule with list of subcontracts, the schedule of values, and contractor's construction schedule.

3. Submit concurrently with the first complete submittal of contractor's construction schedule.

1. 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Time Frame:

1. Extend schedule from date established for the Notice to Proceed to date of Final Completion.

2. 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 building story or separate area as a separate numbered activity for each principal element of the Work.

1. Procurement activities: Include procurement process activities for long lead items, and for major items requiring a cycle of more than 60 days, as separate activities on the schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

2. Submittal review time: Include review and resubmittal times in contractor's construction schedule. Coordinate submittal review times with submittals schedule.

3. Startup and testing time: Indicate number of days reserved for Project startup and testing.

4. Substantial Completion: Indicate completion date in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and show how the sequence of Work is affected.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

F. Format:

1. Submit a comprehensive, fully developed, horizontal Gantt-chart-type contractor's construction schedule within 15 calendar days of date established by the Notice to Proceed.

2. Indicate each significant construction activity separately.

3. Identify first workday of each week with a continuous vertical line.

4. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

G. Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue updated construction schedule before regularly scheduled progress meetings.

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.

1.

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 Actual Completion percentage for each activity.

H. Distribution: Distribute copies of approved schedule to Architect, 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.

3. 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

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SECTION 01 33 00

SUBMITTAL

PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements for submitting shop drawings, product, physical samples, and other specified submittals.

B. Related work:

1. Procedures for submitting coordination drawings, schedules and reports, test and inspection reports warranties project record documents and operation and maintenance manuals are specified elsewhere in Division One.
2. Procedures for mockups and field samples are specified elsewhere in Division One.

1.2 DEFINITIONS

A. Action submittal: Written and graphic information or physical samples, required by the specifications, which receive responsive action from the Architect.

B. Informational submittal: Written information required by the specifications that does not require responsive action from the Architect.

1. All information submittals to be printed on green-colored paper.
2. If submitted digitally, each page must be clearly marked as information submittal.

C. Partial or incomplete submittal: Submittals that do not contain complete information about all specified requirements.

D. Multiple submittal: Submittals for which information for each specific item or class of material or equipment required by multiple specification sections is organized into a single submittal package. Normally a separate transmittal form shall be used.

E. Early submittal: Submittals that do not correspond to the chronological sequence of construction for products or assemblies not affecting the critical path

F. Out-of sequence submittal: Submittals that do not comply with the milestone dates indicated on the submittal and construction schedules, as accepted by the Architect.

G. Samples for initial selection: Full set of manufacturer's charts showing full range of colors, textures, and patterns available for selection. Architect will return submittal with options selected.

H. Samples for verification: Full-size units prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, which show full range of color and texture variations expected.

A.

1.3 PROCEDURAL REQUIREMENTS

A. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Include the following information on label for processing:

a. Project name.

b. Date.

c. Name and address of subcontractor, supplier or manufacturer.

d. Number and title of appropriate Specification Section.

e. Unique identifier, incorporating the specification number and including revision number (e.g., 079200-01).

f. Drawing number and detail references, as appropriate.

g. Other necessary identification.

3. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect. Allow 3 inches by 4 inches for the Architect's submittal review stamp.

B. Deviations: Highlight, encircle, or otherwise clearly identify deviations from the Contract Documents on submittals.

C. Transmittal: Package each submittal individually and appropriately for transmittal and handling.

1. Collate multiple-page submittals into sets and staple or bind each set as appropriate prior to transmittal to the Architect.

2. Transmit each submittal using a transmittal form acceptable to the Architect containing the following information:

a. Date.

b. Project title and number.

c. Contractor name and address.

d. The number of each shop drawing, product data and sample submitted.

e. Notification of deviations from Contract Documents.

f. Other pertinent data.

3. Architect will return submittals received from sources other than Contractor without review.

D. Submission:

1. Submit only complete submittal information required by each specification section for each item submitted.

a. Submittals not complying with specified procedural requirements will be returned to the Contractor without review.

b. Submittals not required by the specifications will be returned to the Contractor without review.

c. Partial or incomplete submittals will be returned to the Contractor without review.

d. Multiple submittals will be returned to the Contractor without review.

1. 2. Stagger submittals to correspond to the chronological sequence of construction.

a. Early submittals will be returned to the Contractor without review for later re-submittal.

b. Out-of-sequence submittals will be returned to the Contractor without review.

E. Distribution:

1. Distribute copies of shop drawings, product data and other required submittals to Contractor, Project site file and project record documents file, and to subcontractors, supplier and fabricator, as applicable.

2. Distribute samples to manufacturer, distributor, supplier or subcontractor, as applicable.

F. Record Submittals: Maintain at the project site one complete set of approved submittals.

Approved submittals are transmitted to the Owner at project closeout in conformance with the requirements of Section 01 77 00.

1.4 SUBMITTALS

A. Submittal log: Within 30 calendar days of the Notice to Proceed, prepare and submit a log using form acceptable to the Architect listing required submittals by reference to Specification Section number and submittal date coordinated with submittal and construction schedules specified in Section 01 32 00.

B. Subcontract List: Within 30 calendar days of the Notice to Proceed, prepare and submit a written summary using form acceptable to the Architect 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.

C. Prior to making first submittal, submit the following for review by Architect:

1. Proposed submittal transmittal form.
2. Impression of the Contractor's approval stamp to be used on submittals.
3. Proposed submittal log format.

1.5 SEQUENCING

A. Do not perform any portion of the Work requiring submittal and review until the Architect has reviewed and returned the respective submittal. Perform such work in compliance with returned submittals.

1.6 SCHEDULING

A. Schedule preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Allow enough time for submittal review, including time for resubmittal, as follows. Time for review shall commence on Architect's receipt of complete submittal.

1. Initial Review: Allow 15 business days for review of each submittal.
   a. Allow additional time if processing must be delayed to permit coordination with subsequent submittals.

a.

   b. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Allow 15 business days for processing each resubmittal.
3. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Submit each submittal to Architect. Architect will return at least one copy to Contractor.
   a. Submit at least 2 sets of samples, 3 sets of product submittals (5 if it involves an engineering trade), and 3 sets of shop drawings (5 if it involves an engineering trade.

b. Architect keeps one sample and returns one sample.

c. Architect keeps one product submittal or shop drawing "as submitted" one copy "as

reviewed," and returns one to the GC.

d. If an engineering trade is involved, the 2 additional copies are used for the engineering trade. The Architect keeps one copy "as submitted" and transmits the remaining copies to the engineer, which keeps one copy for their records and returns the rest the Architect keeps one copy "as reviewed" by the engineer, one copy "as reviewed" by the architect, and returns one copy to the GC.

2. Architect will return one copy to the Contractor.

3. Mark up and retain one returned copy as a Project Record Document.

B. Product data: Collect data for each element of construction and type of product or equipment specified.

1. If information must be specially prepared for submittal because standard printed data is not suitable for use, submit information as a Shop Drawing, not as Product Data.

2. Include the following information, as applicable:

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

b. Manufacturer's product specifications.

c. Manufacturer's schematic drawings, including wiring diagrams and controls. Show required dimensions and clearances.

d. Compliance with recognized trade association standards.

e. Compliance with recognized testing agency standards.

f. Printed performance characteristics and capacities.

3. Clearly identify applicable materials, products, model numbers and options on each copy of each submittal. Delete information not applicable to Project.

C. Shop drawings: Prepare Project-specific information, drawn accurately to scale, showing materials, dimensions, material thickness, methods of assembly, attachments, relation to adjoining work, and all other pertinent data and information in detail.

1. Do not base shop drawings on reproductions of Contract Documents or standard printed data.

1.

a. Copies of Architect's electronic CAD files will not be provided to Contractor for Contractor's use in connection with preparing shop drawings or other submittals.

b. Copies of the Contract Documents or standard printed data marked to show Shop Drawing information are not acceptable and will be returned to the Contractor without review.

2. Include the following information, as applicable:

a. Dimensions.

b. Identification of products.

c. Fabrication and installation drawings.

d. Roughing-in and setting diagrams.

e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.

f. Shopwork manufacturing instructions.

g. Templates and patterns.

h. Schedules.

i. Notation of coordination requirements.

j. Notation of dimensions established by field measurement.

3. Identify details by reference to sheet and detail numbers shown on the Drawings.

4. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

D. Samples:

1. Submit physical units of materials or products of sufficient size and quantity to clearly illustrate kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.

2. Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Label each sample to indicate the Project name, Contractor, manufacturer, brand, quarry, job number, color, type, and similar required information. Label shall be solidly attached or adhered to the samples .

   a. Prepare Samples to match Architect's sample where so indicated.

   b. Attach label on unexposed side. Samples received without labels will be returned to the Contractor without review.

3. If variation is inherent in material or product, submit at least 3 sets of paired units that show variations.

4. Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity.

2.2 INFORMATIONAL SUBMITTALS

A. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations.

1. Include list of assumptions and other performance and design criteria and a summary of loads.

2. Include load diagrams if applicable.

1. 3. Provide name and version of software, if any, used for calculations.

4. Submit calculations signed and sealed by a California-licensed structural engineer for the material or assembly specified to demonstrate compliance with provisions of the Contract Documents and the requirements of the authorities having jurisdiction.

B. Test reports:

1. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

2. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

3. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

4. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

5. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

C. Certificates and certifications: Review certificates and certifications before submitting to Architect to ensure they are properly worded, notarized and signed by an officer or other individual authorized to sign documents on behalf of the Contractor, subcontractor, manufacturer, supplier, fabricator, or distributor.

1. Product certificates: Prepare written statements on manufacturer's letterhead

certifying that product complies with requirements.

2. Welding certificates: Prepare written certification that welding procedures and personnel comply with requirements.
   a. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms.
   b. Include names of firms and personnel certified.
3. Manufacturer certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
4. Installer certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
5. Material certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

D. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

E. Qualification statements: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

A.

F. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents.
   1. Note corrections and field dimensions.
   2. Mark with review stamp before submitting to Architect.

B. Review stamp:
   1. Provide a uniform review stamp containing, at a minimum, the following information:
      a. Name of company.
      b. Status of review.
      c. Date.
      d. Initials of reviewer.
   2. Stamp and initial submittals as follows:
      a. Stamp and initial the first page of every product data submittal.
      b. Stamp and initial every sheet of each shop drawing submittal.
      c. Stamp and initial the back of every sample submitted for review.
   3. By stamping and submitting each submittal, the Contractor represents that the Contractor has determined and verified the following:
      a. Compliance with the requirements of the Contract Documents.
      b. Field measurements.
      c. Quantities.

d. Dimensions.

e. Specified performance criteria.

f. Installation requirements.

g. Catalog number and similar information.

h. Materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to performance of the Work.

i. Coordination of the requirements of the item submitted with the overall project.

J. Additional information relative to Contractor's sole responsibility for means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

C. Submittals that do not correctly bear Contractor's approval stamp and will be returned to the Contractor without review.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal for conformance with the information given and the design concept expressed in the Contract Documents, will make

A.

marks to indicate corrections or modifications required, and will return each submittal to the Contractor for distribution.

B. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken as follows:

1. "REVIEWED": Fabrication, manufacture and/or construction may proceed. The work generally is in compliance with the Contract Documents.
2. "REVIEWED - ADDITIONAL INFORMATION REQUIRED": Fabrication, manufacture and/or construction may proceed. The work generally is in compliance with the Contract Documents. Additional information unavailable prior to fabrication, manufacturer and/or construction, including but not limited to manufacturing reports, must be submitted before work can be accepted
3. "FURNISH AS CORRECTED": Fabrication, manufacture and/or construction may proceed providing the Work is in compliance with the Architect's notations and the Contract Documents.
4. "REVISE AND RESUBMIT": No work shall be fabricated, manufactured and/or constructed. Additional submittal required. This submittal will not be permitted on the site.
5. "REJECTED": No work shall be fabricated, manufactured and/or constructed. New submittal required. This submittal will not be permitted on the site.

C. Review of separate item will not constitute review of an assembly in which item functions.

D. Submittals containing substitutions for specified materials, products, equipment, manufacturers, model numbers, components, assemblies, color, texture, finish, pattern, characteristics, elements or other properties will be rejected.

3.3 RESUBMISSION REQUIREMENTS

A. Revise initial shop drawings, when required, and resubmit as specified for initial submittal. Indicate on drawings changes made, other than those requested by Architect, clearly by clouding or similar acceptable method.

B. Submit new product data and samples as required for initial submittal.

C. Submit revised calculations as required for initial submittal.

D. Identify resubmittal with the original submittal number followed by a sequential revision number.

END OF SECTION

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Specifications format and conventions.
2. Abbreviations and acronyms used throughout the Contract Documents.
3. Definitions used throughout the Contract Documents.

1.2 ABBREVIATIONS AND ACRONYMS

A. General:

1. Certain abbreviations and acronyms contained in the Contract Documents are defined specifically for these specifications.

2. Where abbreviations and acronyms are not defined, they mean the recognized name of the standard, regulation or organization indicated in either

a. "Encyclopedia of Associations: National Organizations of the U.S." published by Gale/Cengage Learning or

b. "National Trade and Professional Associations of the United States" by Columbia Books.

B. Defined Abbreviations:

1. deg.: Means degree.
2. O.C.: Means on-center.

C. Defined Acronyms:

1. AA: Aluminum Association
2. AAMA: Architectural Aluminum Manufacturer's Association
3. AHJ: Authority (Authorities) Having Jurisdiction
4. AISI: American Iron and Steel Institute
5. ANSI: American National Standards Institute
6. ASTM: American Society for Testing and Materials
7. AWS: American Welding Society
8. CSF: Cold-Formed Steel
9. DSA: Division of the State Architect
10. FSI: Flame Spread Index
11. HDG: Hot Dip Galvanized
12. IOR: Inspector of Record
13. MFMA: Metal Framing Manufactures Association
14. MSG: Manufacturer's Standard Gage
15. NOMMA: National Ornamental Metals Manufacturer's Association
16. SC: Service Condition

1.

17. SCAQMD: South Coast Air Quality Management District
18. SDI: Smoke Developed Index
19. SSMA: Steel Stud Manufacturing Association
20. SSPC: The Society for Protective Coatings
21. SWG: Standard Wire Gage
22. TCNA: Tile Council of North America

1.3 DEFINITIONS

A. General:

1. Basic Contract Document definitions are included in the Conditions of the Contract.

2. Certain other terms, phrases and words, and their derivatives contained in the Contract Documents are defined specifically for these specifications in either this Section or within the appropriate specification section where a specific term is used.

3. Where terms, phrases, words and their derivatives, and abbreviations are not defined, their ordinary meanings indicated in "Webster's Third New International Dictionary of the English Language, Unabridged", copyright 1986, are assumed to apply as the context of usage requires.

4. Words implied, but not stated, are inferred as the context of usage requires.

5. Terms, phrases, words used in the neuter gender include the feminine and the masculine the masculine gender includes the feminine and neuter and the feminine gender includes the masculine and neuter. Similarly, the singular includes the plural, and the plural the singular, whenever the context requires.

6. Underlined, bold, or capitalized words do not signify, mean, imply, or convey any special or unusual meaning nor do they signify, mean, imply, or convey that words not underlined, bold, or capitalized have any less meaning.

B. Defined Terms:

1. Aboveground: Means situated completely on or above the final surface of the ground or finish floor of grade-level floor construction. Other terms, including "above grade", and similar terms, have the same meaning as "aboveground". Locations that do not meet the definition above for "aboveground" are considered "below ground" or "below grade", and similar locations.

2. Appearance: Means the characteristic visible aspect of an object specifically its color, sheen, and texture.

3. Approved: Means recognized by the Architect, in writing, to be in conformance with the requirements of the Contract Documents. Other terms, including "approve", "approval", and similar terms, have the same meaning as "approved".

a. Approvals are restricted to limitations of the Architect's responsibilities and duties outlined in the Conditions of the Contract, without any implied meaning extending the Architect's responsibility into the Contractor's area of Contractor coordination, supervision, or means and methods of construction as outlined in the Conditions of the Contract.

b. In no situation will an approval by Architect release Contractor

from responsibility to fulfill requirements of the Contract Documents.

4. Approved Substitute: Means a substitution proposed and evidenced by the Contractor to be either in compliance with or exceeding the quality of specified products, systems or methods of execution relative to appearance, convenience and practicality, including product considerations, manufacturer considerations, manufacturer's product representative considerations, installation considerations and cost considerations, and approved by the Architect for incorporation into the Work.

1.

5. As Indicated: Means indicated on the Contract Drawings.

6. As Necessary: Means essential to the completion of the Work.

7. As Required: Means either (1) as instructed by the Contract Documents or (2) essential to the completion of the Work.

8. Assembly: A composite entity composed of mutually dependent and compatible components or subassemblies that fit together to form a self-contained unit for a specific role, purpose or effect.

9. Authority (Authorities) Having Jurisdiction: Means the agencies, either individually or collectively, charged by statute with administration and enforcement of building code requirements and other regulations at the Project location.

10. Below Ground: See definition for "Aboveground".

11. Board: Means sawn timber measuring less than 2 inches in nominal thickness at the least dimension.

12. Building Information Model: Means digital computer data used by the Architect as instruments of service to produce Contract Documents, including 2-dimensional and 3-dimensional computer model and drawing files in CAD format, and spreadsheet or word processing files.

13. Cold-Formed Metal Framing: Means structural metal framing members having a base metal thickness range of between 118 mils (10-gage) and 33 mils (20-gage), and installed in transverse and axial load-bearing applications.

14. Concealed: Means embedded in concrete, masonry or other construction located or installed within furred spaces situated within walls or partitions suspended above ceilings or placed in trenches, crawl spaces, or enclosures or otherwise not visible, either outside the building or inside occupied space within the building, during normal activity when the Project is completed or that is identified as exposed on Drawings.

15. Component: One of a group of individual parts of which a subassembly, assembly or system is comprised especially a part that can be separated from or attached to the group.

16. Concealed: See definition for "Exposed".

17. Day: Basic reference to the primary unit of Contract time. If not specifically designated as a either a calendar or a business day, the generic term "day" shall be taken to mean a calendar day.

a. Calendar Day: Means a period of time occurring Monday, Tuesday, Wednesday, Thursday, Friday, Saturday or Sunday, and beginning at 00:00:00 local project time and ending at 23:59:59 local project time.

b. Holiday: Means a federally-recognized holiday listed by United States Government's Office of Personnel Management.

c. Business Day: Means a non-holiday period of time occurring Monday, Tuesday, Wednesday, Thursday or Friday, and beginning at 08:00:00 local project time and ending at 17:00:00 local project time. Events occurring after 17:00:00 will be charged to the next consecutive business day.

d. Week: Means 7 consecutive calendar days, inclusive.

e. Year: Means 365 consecutive calendar days, inclusive.

18. Defective: Means a product, system or method of execution that has failed, or that otherwise does not comply with the requirements of the Contract Documents. Other terms, including "defect", "defective work", and similar terms, have the same meaning as "defective". See definition for "failure" for a partial list of defects, which are not limited to those indicated.

1.

19. Dimension Lumber: Means sawn timber measuring between 2 and 5 inches in nominal thickness at the least dimension.

20. Directed: Means a written instruction issued by the Architect to the Contractor. Other terms, including "authorized", "permitted", "requested", and similar terms, have the same meaning as "directed".

21. Enclosure: Means a level of protective resistance to weather for interior spaces provided during the construction phase by either permanent construction or substantial temporary closures. Other terms, including "enclosed" and similar terms, have the same meaning as "enclosure".

a. Uncontrolled Enclosure: Means short-term, limited, temporary protection against wind for up to 6 months prior to completion of the permanent enclosure, as determined by the Architect.

b. Partially-Controlled Enclosure: Means medium-term, limited, temporary protection against both wind and rain for up to 12 months prior to completion of the permanent enclosure, as determined by Architect.

c. Permanent Enclosure: Means complete permanent protection against wind, temperature, humidity, atmospheric pressure, and precipitation, provided by a permanent insulated and weathertight roofing system, permanent insulated and weathertight exterior wall construction, and openings closed with permanent construction or substantial temporary closures, as determined by Architect.

22. Engineering Services: Means those services performed for the design, fabrication and installation of components and assemblies similar in material, design, complexity and extent to those indicated or required for this Project.

23. Equipment: Means a product with operational parts and controls, whether motorized or manually operated, that requires service connections including wiring, piping or similar connections.

24. Ex situ: Means either off-site or away from the position an item will finally occupy.

25. Existing Products: Means an item salvaged or recycled from the project, or from another project or facility, where indicated, and incorporated into the Work.

26. Exposed: Means an item that either does not meet the definition above for "concealed", or that is identified as exposed on Drawings.

a. Weather-Exposed: Means a floor, wall, soffit, ceiling, roof or similar surface that is exposed to unconditioned wind, temperature,

humidity, atmospheric pressure or precipitation, except

1) ceilings or roof soffits enclosed by walls or by beams that extend a minimum of 12 inches below such ceilings or roof soffits

2) walls or portions of walls within an enclosed roof area when located a horizontal distance from an exterior opening equal to twice the height of the opening and

3) ceiling or roof soffits beyond a horizontal distance 10 feet from the outer edge of the ceiling or roof soffits.

27. Exterior: See definition below for "interior".

28. Fabricate: Means to specifically assemble, or make out of selected materials, in order to meet individual requirements for the Project. Other terms, including "fabrication", "fabricator" and similar terms, have the same meaning as "fabricate".

29. Factory finished: Means finished off the Project site under controlled environmental conditions, requiring no additional finish at the Project site except for minor touchup of areas damaged during delivery, storage, handling and installation. Other terms,

including "shop-applied", "prefinished", and similar terms, have the same meaning as "factory finished".

30. Failure: Means the inability of a product, system or method of execution to perform its intended function as designed.

a. Incipient Failure: Means initial or nascent non-catastrophic failure of a product or system, or a method of execution leading to such a failure, including

1) excessive material loss due to abrasion resulting from normal traffic

2) cracking, flaking, spalling, or eroding in excess of specified requirements

3) peeling or delaminating from substrate

4) staining of adjacent surfaces caused by migration of materials, components or accessories

5) buckling, deflection or other structural performance exceeding specified limits

6) performance either exceeding maximum specified performance requirement limits or falling below minimum specified performance requirement limits

7) stresses transferred from supporting framing members to other items not engineered to support or resist loads

8) material fatigue, including deterioration, cracking or brittleness, identified by inspection, data analysis or other means of detection

9) loosening, weakening or permanent damage to fasteners, attachments and other components and

10) vibration or noise caused by thermal or structural movement, wind, and rattle or flutter.

b. Catastrophic Failure: Means discernable failure impossible to acceptably remedy or correct in place, or that necessitates remedial

repair, in each case as determined by the Architect, including

1) buckling, deflection or other structural performance necessitating remedial repair

2) permanent deformation of any material or component

3) breakage or fallout from an assembly of any material or component

4) air infiltration or water leakage

5) material adhesive or cohesive failure, including tearing

6) corrosion, staining or other deleterious effects due either to physical contact of dissimilar metals or to water runoff passing over dissimilar metals

7) loss of waterproofing integrity, allowing the intrusion of water, oils, gasoline, grease, salt, chemicals, acids or other fluids to outside surface of substrate and

8) chalking or color changes relative to a control sample of the original application beyond those described in manufacturer published information.

31. Furnish: Means to supply and deliver an item to the Project site in an operable condition, ready for unpacking, assembly, and installation.

32. Heavy Timber: Means sawn timber measuring 5 or more inches in nominal thickness at the least dimension.

33. Include: Means inclusion without limitation, in the largest encompassing sense. Other terms, including "such as", and similar terms, have the same meaning as "include".

34. Indicate: Means expressed by graphic representations or in written form on the Contract Drawings, or elsewhere in the specifications, without limitation of location, unless specifically noted. Other terms, including "shown", "noted", "scheduled", and similar terms, have the same meaning as "indicated".

35. In situ: Means in the position an item will finally occupy.

36. Install: Means to handle, unload, store, unpackage, assemble, erect, construct, place, anchor, apply, connect, work to dimension, complete, finish, cure, adjust, clean, protect and similar operations at the Project site, in final position, and in operable and useable condition.

37. Installer: Means the Contractor or other entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor to perform a particular construction operation at the Project site, including preparation, erection, installation, application, construction, re-installation and similar operations required for execution of the Work.

38. Instructions: Means written directions, diagrams, recommendations, precautions, specifications and similar instructions published by a product supplier, manufacturer or fabricator.

39. Interior: Means conditioned space or pertaining to conditioned space that is completely enclosed by floor, wall, and ceiling or roof construction, and solid doors or fenestration systems. Ventilated unconditioned spaces are not interior spaces.

a. Semi-Exterior: Means an unconditioned or semi-heated space, or pertaining to unconditioned or semi-heated space, that is completely enclosed by floor, wall, and ceiling or roof construction, and solid

doors or fenestration systems through which thermal energy may be transferred to or from interior spaces, other semi- exterior spaces, or the exterior. Ventilated unconditioned spaces are not semi- exterior spaces.

b. Exterior: Means a space that does not meet the definition above for either an "interior" or a "semi-exterior" space.

40. LEED: Means U.S. Green Building Council (USGBC) Leadership in Energy & Environmental Design rating system.

41. Lightgage Metal Framing: Means non-structural metal framing members having a base metal thickness of 30 mils (20-gage) or less than , and installed in non-load- bearing interior construction assemblies supporting plaster or gypsum board.

42. Manufacture: Means to produce standard, custom or proprietary units generally utilizing a mass-production method. Other terms, including "manufactured", "manufacturer", and similar terms, have the same meaning as "manufacture".

43. Match: Means provide a portion of the Work using the same product, system or execution method identical in dimension, finish, color, texture, and work results to one of the following, as determined by the Architect.

a. Another portion of the Work.

b. Existing conditions adjacent to new Work.

c. A design reference sample in the Owner's or Architect's possession.

d. An approved sample, range of samples, mockup or sample panel.

44. Material: Means a basic substance, often a commodity, used in construction or to manufacturer products and other items used in construction

45. Partially-Controlled Enclosure: See definition above for "enclosure".

46. Permanent Enclosure: See definition above for "enclosure".

47. Permanent Deformation: Means displacement or change in dimension of a material or component after an applied load has been removed and the specimen has relaxed for specified period of time.

48. Product: Means components or assemblies of components purchased for permanent incorporation into the Work, whether purchased specifically for the Project or taken from previously purchased stock, which have not been previously incorporated into another project or facility. Other terms including "manufactured units", "equipment", "accessories", and similar terms, have the same meaning as "products".

49. Provide: Means to furnish and install, complete and in-place, ready for operation and use. Whenever the terms "furnish", "install" or "provide" are not explicitly stated, the term "provide" is implied.

50. Regulation: Means a law, ordinance, statute, or lawful order issued by authorities having jurisdiction, and rules, conventions, or agreements within the construction industry that prescribe performance of the Work.

51. Related Trades: Means those installers, applicators, erectors, constructors and fabricators whose work will come into contact with, will penetrate, is directly adjacent to, or is otherwise integral to or materially impacted by the work of a given scope.

52. Samples:

a. Design Reference Sample: Means samples of appearance (color,

texture, sheen and finish), pre-approved by Architect.

b. Sample: Means samples of appearance (color, texture, sheen and finish), submitted to Architect for review and approval.

c. Field sample: Means physical examples illustrating proposed finishes, coatings, or finish such as concrete, brick, or stone, installed or applied in the field for review by Architect.

d. Sample Panel: Means scaled-down pre-production samples incorporating full- scale details of architectural features, finishes, textures, transitions and repair techniques for review by Architect.

e. Mock-up: Means full-size assemblies erected for review of construction, coordination of the Work specified in several sections, testing, operation, training of the trades and similar activities, and aesthetic or other for review by Architect.

53. Section: Means a numbered and titled portion of these Specifications.

54. Selected Products: Means materials, products, components and accessories selected by the Contractor from among specified materials, products, components and accessories, or from approved substitution requests, for inclusion into the project. Other terms including "selected materials", "selected manufactured units", "selected equipment", "selected components", "selected accessories", "selected mixes", and similar terms, have the same meaning as "selected products".

55. Shall: Means "has an obligation or duty".

56. Similar: Means a portion of Work that matches the whole or part, as indicated, of another portion of the Work, but has a different geometric configuration.

57. Submit: Means for the Contractor to prepare and present written or graphic evidence to the Architect for approval, unless otherwise stated.

58. Substitution: Means an unspecified product, system or execution method proposed by a Bidder or Contractor for incorporation into the Work.

59. Suitable: Means suitable for the purpose indicated or intended by the Contract Documents, as determined by the Architect. Other terms including "reasonable", "proper", "correct", "necessary", and similar terms, have the same meaning as "suitable".

60. Symmetrical: Means a portion of Work that matches either itself or the whole or part of another portion of the Work, as indicated, the geometric configuration of which is reflected about a centerline or axis of a surface or a space, or rotated around a point in space.

61. System: Means a group of independent but interrelated materials, products or assemblies comprising a unified whole for the purpose of performing a specific role, purpose or effect.

62. Timber: Means the wood of trees cut and prepared for use as building material.

63. Uncontrolled Enclosure: See definition above for "enclosure".

64. Underground: Means a location that does not meet the definition above for Above Ground (Above Grade).

65. Work Result: Means the results of applying particular skills and techniques to construction materials, products, assemblies and systems.

a. A work result may pertain to either several manufactured

products (e.g., exterior insulation and finish system) or a single product (e.g., a chalkboard).

b. A work result could also involve only labor and equipment (e.g., a trenching).

1.4 REFERENCE STANDARDS

A. General: Work specified by reference to a standard or specification published by a government agency, technical association, trade association, professional society or institute, testing agency, or other organization must either meet or exceed the minimum standards of quality for materials and workmanship established by the designated standard or specification.

1. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity.

2. Unless the Contract Documents indicate otherwise, in case of conflict between referenced documents and Contract Documents, or between referenced documents, the document having the most stringent requirements shall apply. Refer requirements that are different but apparently equal, and uncertainties as to which quality level is more stringent, to the Architect for a decision before proceeding with the affected work.

3. Where both a standard and a brand name are specified for a product in the Project Manual, the proprietary product named shall conform to or exceed the requirements of the specified reference standard. The listing of a trade name in a Project Manual shall not be construed as warranting that such product conforms to the respective
reference standard.

B. Applicability:

1. The applicable edition of a reference standard or specification shall be the latest date of issue 30 days before bids are received, when bids are requested or on the effective date of the Agreement if there is no bid, except:

a. Where a specified publication date follows the title of a referenced standard or specification in the body text of the Contract Documents.

b. Issues listed in governing building code and regulations supersede the above requirements.

2. Provisions of any referenced standards or specifications, whether or not specifically incorporated by reference in the Contract Documents, may not change the duties and responsibilities of the Owner, the Architect, or Contractor, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor to assign to any of them any responsibility, duty or authority for safety precautions or procedures, or to supervise or direct the performance of the Work.

PART 2 - PRODUCTS

2.1 COPIES OF STANDARDS

A. Copies of applicable referenced standards and specification are not bound in the Project Manual.

B. Where copies of standards are needed for superintendence and quality control of the Work, obtain a copy or copies directly from the publication source and maintain copies in an orderly manner at the Project Site, available to the Contractor's personnel,

Subcontractors, Owner and Architect during normal business hours.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 43 00

QUALITY ASSURANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Administrative and procedural requirements for quality assurance and quality control.

2. Required testing and inspecting services necessary to verify compliance with requirements specified or indicated.

1.2 DEFINITIONS

A. Quality-assurance services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and to 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, performed to evaluate whether actual products incorporated into the Work and completed construction comply with Contract Document requirements. Services do not include construction contract administration activities performed by Architect.

C. Mockups: Full-size, physical assemblies constructed on-site and used to verify selections made under sample submittals, to demonstrate aesthetic effects and qualities of materials and execution, and to review construction, coordination, testing, or operation. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory mockups: Full-size, physical assemblies constructed at a testing facility to verify performance characteristics.

E. Preconstruction testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work in order to verify performance or compliance with specified criteria.

F. Product testing: Tests and inspections performed by a testing agency qualified to conduct product testing, and acceptable to authorities having jurisdiction, in order to establish product performance and compliance with industry standards.

G. Source quality control testing: Tests and inspections performed at the source, i.e., at the plant, mill, factory, or shop.

H. Field quality control testing: Tests and inspections of the installation of Work, and of completed Work, performed on-site.

I. Testing agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program.

J. 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.

1.3 CONFLICTING REQUIREMENTS

A. 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 uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. 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.

1. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.
2. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

A. Qualification statements: Provide a list of 5 projects of similar design and complexity inspected within the past 5 years by the testing agency.

B. Certificates: Submit copies of permits, licenses, certifications, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

C. Inspection reports: Prepare and submit certified written reports that 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 reinspection.

1.5 QUALITY ASSURANCE

A. Testing agency qualifications: An NRTL, NVLAP or independent agency, and individuals, with the experience and capability to conduct testing and inspecting

indicated, as documented in compliance with ASTM E 548, and acceptable authorities having jurisdiction.

B. Manufacturer's technical representative qualifications: An authorized representative of manufacturer 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.

C. Laboratory mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 2 through 16.

1.6 QUALITY CONTROL

A. Quality control services:

1. Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

a. 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.

b. Contractor shall pay for re-testing until the application demonstrates compliance with specified requirements.

2. Where quality control 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.

b. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

c. Submit a certified written report of each quality-control service to the Architect.

d. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

3. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

B. Testing and inspections:

1. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility.

a. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction.

b. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

3. Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspection, for construction that replaced Work that failed to comply with the Contract Documents.

C. Testing Agency Responsibilities: Testing agencies shall

1. cooperate with Architect and Contractor in performance of duties

2. provide qualified personnel to perform required tests and inspections

3. notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services

4. determine the location from which test samples will be taken and in which in-situ tests are to be conducted

5. conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements

6. submit certified written report of each test, inspection, and similar quality-control service to Architect through Contractor

7. refrain from releasing, revoking, altering, or increasing Contract Document requirements, or approving or accepting any portion of the Work and

8. refrain from performing any Contractor duties.

D. Manufacturer's field services: Where specified, engage a manufacturer's qualified technical representative to inspect field-assembled components, materials and systems, and equipment installation, including service connections. Report results in writing as specified or indicated.

E. 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. Preliminary design mix proposed for use for material mixes that require control by testing agency.

6. Security and protection for samples and for testing and inspecting equipment at Project site.

1.7 SEQUENCING

A. 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.

1.8 SCHEDULING

A. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (NOT USED) PART 3

- EXECUTION

3.1 SPECIAL TESTS AND INSPECTIONS

A. Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction and as follows:

1. To verify manufacturer maintains detailed fabrication and quality control

procedures and to review the completeness and adequacy of those procedures to perform the Work.

2. To promptly notify Architect and Contractor of irregularities and deficiencies observed in the Work during performance of its services.

3. To submit certified written report of each test, inspection, and similar quality-control service to Architect, through Contractor, and to authorities having jurisdiction.

4. To submit final report of special tests and inspections at Substantial Completion that includes a list of unresolved deficiencies.

5. To interpret tests and inspections and to state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

6. To retest and reinspect corrected work.

3.2 PROTECTION

A. Protect construction exposed by or for quality-control service activities in place. Remove protection when no longer needed.

B. Restore damaged and patched areas to match adjacent areas in compliance with Section 01 73 29, as determined by the Architect.

C. Remove and replace materials components that cannot be satisfactorily cleaned or repaired, as determined and directed by the Architect, at no cost to the Owner.

D. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 45 26

CONTRACTOR QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Supplemental requirements for quality control of the Work.

1.2 SUPPLEMENTAL REQUIREMENTS

A. Contractor quality control program

1. Establish a quality control program to perform sufficient inspections and tests of all items of Work, including that of all subcontractors, to ensure conformance with Contract Document requirements for materials, workmanship, construction, finish, functional performance and identification.

a. Quality control program shall ensure Work complies with the requirements of the Contract Documents.

b. Controls shall be adequate to cover all construction operations.

2. Apply, install, connect, erect, use, clean, adjust, and condition articles, materials and equipment in compliance with their manufacturer's instructions, unless more restrictive or stringent requirements are specified in the Specifications. If product manufacturer instructions are in conflict with the Contract Documents, notify Architect for clarification before proceeding.

B. Contractor assistance

1. Cooperate with firm or individual performing required tests, inspections and similar services, and provide reasonable auxiliary services as requested. Notify individual or firm sufficiently in advance of operations to permit assignment of personnel.

2. Required auxiliary services include, but are not limited to, the following:

a. Providing access to the work to be tested or inspected and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

d. Providing the individual or firm with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

e. Providing security and protection of samples and test equipment at the Project site.

1.3 QUALITY ASSURANCE

A. Installer's qualifications: Where the Specifications dictate a certain level of experience or expertise from the subcontractor/installer by requiring a minimum number

of years of experience in the successful installation of a product or a minimum number of successful installations for the product specified, it shall be the Contractor responsibility to verify the installer's competence and track record before signing a subcontract to perform the affected work.

1.4 ADMINISTRATIVE STAFF
1.1

A. Provide a competent and adequate staff for administration, coordination, supervision, and superintendence of the Work.

1. Key staff members shall be full time employees, stationed at the site.

2. Do not change key members of this staff without consent of the Owner, unless such staff members prove to be unsatisfactory to the Contractor and cease to be in his employ. If the Contractor intends to change a key staff member, he shall give the Owner written notice at least 15 days prior to the intended change.

B. Project staff shall include, but not be limited to, the following:

1. Project Manager: Person with responsibility for prosecution of the Work, and who has authority to act in matters for coordination, direction, and technical administration of the Work. Provide Owner with name of project manager prior to commencement of the Work.

2. Superintendent: Person in attendance at Project site during performance of the work. Superintendent shall represent Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

3. Additional staff:

a. Provide services of coordinating engineer for HVAC, Plumbing, Fire Protection, and Electrical Work and responsible for the following:

1) Coordination of the mechanical and electrical work with the work of other trades.

2) Review of mechanical and electrical shop drawings.

3) Resolution of conflicts and interferences between trades.

4) Directing adjustments in the work as required to comply with the Contract Documents.

5) Commissioning of mechanical and electrical systems.

C. Coordinating engineer shall have previous experience in coordinating these areas of work on projects similar in material, design, complexity and extent to this Project.

PART 2 - PRODUCTS (NOT USED) PART 3

- EXECUTION

3.1 EXAMINATION

A. Prior to installation of any material, product, component, system, assembly or equipment, inspect existing supports and adjacent construction to receive items to be installed and arrange for correction of defects in the existing workmanship, material or conditions that may adversely affect work to be installed.

3.2 INSTALLATION

A. Installation of materials, products, components, systems, assemblies or equipment will constitute an acceptance of existing conditions as being in proper condition to receive such items and a waiver of claim that existing conditions are defective as pertains to warranty requirements.

B. Where Specifications require a product to be installed under the supervision or inspection of the material manufacturer or its representative, manufacturer or its representative shall also, without exception, inspect the work in place and issue a letter to Architect verifying that this procedure was followed.

END OF SECTION

SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Temporary utilities.
2. Support facilities.
3. Miscellaneous temporary construction aids.
4. Security and protection facilities installation.

1.2 SYSTEM DESCRIPTION

A. Design requirements: Provide design and engineering for construction facilities and temporary controls in compliance with the requirements of the authorities having jurisdiction.

B. Use charges:

1. Include cost or use charges for temporary facilities and controls in the Contract Sum.
2. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

1.3 SUBMITTALS

A. At least 2 business days before preconstruction conference, and before beginning construction of temporary facilities, submit the following:

1. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
   a. Indicate proposed activity in each portion of the Work area and identify the areas of limited use or non-use.
   b. Indicate proposed vehicle access route(s) to and from the site and expected frequency of use on adjacent streets.
2. Shop drawings: Submit large scale dimensioned shop drawings of site fence showing gate(s) and site signs.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect

each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials, facilities and equipment utilized for temporary facilities and controls shall be selected by the Contractor, unless otherwise specified.

B. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained heaters with thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and drainage: Provide temporary utilities to lawfully remove effluent. Connect temporary sewers as directed by authorities having jurisdiction.

C. Water service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and humidity control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric power service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone service:

1. Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.

2. Provide additional dedicated telephone lines for each facsimile machine in each field office.

3. At each telephone, post a list of important telephone numbers including police and fire departments Contractor's home office, Architect's office and Owner's office.

4. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

J. Electronic communication service: Provide temporary electronic communication service, including electronic mail in field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary paved areas: Construct and maintain temporary paved areas adequate for construction operations. Locate temporary paved areas in same location as permanent paved areas. Extend temporary paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary paved areas with permanent paved areas.

2. Prepare subgrade and install subbase and base for temporary paved areas according to Division 31.

3. Recondition base after temporary use, including removing contaminated material, regarding, proof rolling, compacting, and testing.

C. Traffic controls:

1. Determine the routing of construction vehicles before starting work, based on restrictions indicated on the Drawings and the safeguards and procedures necessary to carry out the work.

2. Maintain all-weather temporary access to the site and to designated truck unloading area or areas, available to all trades.

3. Be responsible for controlling construction traffic within and adjacent to the site.

4. Provide entrances, lifts and safeguards required or necessary to the progress of the work, and effectively control such traffic to provide minimum hazard to the work and all persons.

5. Route construction equipment, trucks, and similar vehicles via existing public streets to and from the site as approved by the authorities having jurisdiction.

6. Obtain and pay for permits and inspections necessitated by the use of public streets, sidewalks, curbs, and paving. Post guarantees and bonds that may be required, and repair and make good any damages thereto, acceptable to the authorities having jurisdiction.

7. Construct and maintain temporary walks and bridges for pedestrians. Keep streets adjacent to the site open to vehicular and pedestrian traffic.

8. Maintain constant access for Law enforcement agencies, fire and ambulance service.

9. Furnish, install and maintain for proper control of traffic and safety of all concerned.

a. Provide necessary barricades, suitable and sufficient lights, reflectors, and danger signals.

b. Provide warning and closure signs, directional and detour signs.

c. Provide additional measures as necessary.

10. On a 24-hour basis, indicate restricted and dangerous conditions existing on or adjacent to the site.

a. Illuminate barricades, danger signals, warning signs and obstructions at night.

b. Keep warning lights burning from one hour before sunset until one hour after sunrise.

D. Parking: Provide temporary parking areas for construction personnel.

E. Project identification and temporary signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

F. Waste disposal facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

G. Lifts and hoists:

1. Provide facilities necessary for hoisting materials and personnel.

2. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Temporary stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

I. Temporary use of permanent stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 MISCELLANEOUS TEMPORARY CONSTRUCTION AIDS

A. Furnish, install and maintain miscellaneous temporary construction aids required for proper execution of the Work, such as stairs, ladders, ramps, railings, canopies, scaffolds and hoists, chutes, barricades, enclosures, platforms, swing staging and walks.

B. Locate in and about the Project as is practicable and where they will not interfere with the progress of the Work. Relocate when necessary during construction and remove promptly when no longer needed.

C. Provide openings where required for moving in large pieces of equipment. Close openings after the equipment is in place. Restore finishes to match adjacent surfaces, as approved by the Architect.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary erosion and sedimentation control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

C. Storm water control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rains.

D. Tree and plant protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Noise control: Execute the work to minimize noise.

F. Pest control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues

at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

G. Site enclosure fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

2. Obtain and pay for required permits and inspections.

3. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

H. Security enclosure and lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

I. Barricades, warning signs, and lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary enclosures:

1. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

2. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

K. Temporary Fire Protection:

1. Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

2. Provide temporary standpipes and hoses for fire protection.

a. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed.

b. Match hose size with outlet size and equip with suitable nozzles.

3.6 OPERATION, TERMINATION, AND REMOVAL
3.1

A. Supervision: To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance:

1. Maintain facilities in good operating condition until removal.

2. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion.

1. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility.

2. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

3. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

4. At Substantial Completion, clean and renovate permanent facilities used during construction period.

END OF SECTION

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SECTION 01 60 00 PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements governing the following.

1. Contractor's selection of products for use in the Project.
2. Basis of design and comparable products.
3. Product handling.
4. Products warranties.

1.2 DEFINITIONS

A. Products: Items purchased for incorporation 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 and current as of date of the Contract Documents.

2. New products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless stated otherwise. Products salvaged or recycled from other projects are not considered new products.

3. "Basis of design" products: Products designated by the words "basis of design," and followed by a specific manufacturer's product name, make, model number or other designation, which are intended 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 other named manufacturers.

4. Comparable "Or equal" products: Products submitted through the submittal process, or indicated as a product substitution, that have been demonstrated by the Contractor to be in compliance with, or exceeding the quality of the specified products relative to type, function, dimension, in-service performance, physical properties, appearance and other characteristics.

B. Warranties:

1. Manufacturer's warranty: Pre-printed written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.3 QUALITY ASSURANCE

A. Quality requirements: In every instance the quantity or quality level shown or specified is the minimum to be provided or performed.

1. Within specified tolerances the actual installation may comply exactly with the minimum quantity or quality specified, or may exceed that minimum within reasonable limits.

2. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements.

3. Refer instances of uncertainty to the Architect for decision before proceeding.

B. Compatibility: When the Contractor is given the option of selecting between 2 or more products for use on the Project, Contractor shall verify that product selected will be compatible with other products previously selected, even if previously selected products were also options.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is inconspicuous.

2. Equipment nameplates:

a. Provide a permanent nameplate on each item of service-connected or power- operated equipment.

b. Locate on an easily accessible surface that is inconspicuous in occupied spaces.

c. The nameplate shall contain the following information and other essential operating data:

1) Name of product and manufacturer.

2) Model and serial number.

3) Capacity.

4) Speed.

5) Ratings.

1.4 HANDLING

A. Deliver, store and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with the product manufacturers written instructions.

B. Delivery:

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 ensure compliance with the Contract Documents and to ensure 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 so that they will not endanger Project structure.

3. Store products subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

4. Periodically inspect to assure products are undamaged and are maintained under required conditions.

5. Comply with product manufacturer written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage.

7. Off-site storage of materials and products must be in a bonded and insured warehouse and subject to other lender restrictions as outlined in Lender's Underwriting Guidelines.

1.5 WARRANTY

A. General: 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.

B. Special warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's standard form: Modified to include Project-specific information and properly executed.

2. Specified form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.

3. Refer to Divisions 2 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

A. Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

B. Provide products that are the best of their respective kind and are of one manufacturer for each specific purpose, insofar as practicable.

C. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

D. 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.

E. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

F. Where products are accompanied by the term "as selected" or "to be determined", Architect will make selection.

G. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

H. In agreeing to the terms and conditions of the Contract, the Contractor has accepted the responsibility to schedule and verify the specified products will be available when needed to comply with the accepted construction schedule, and to place orders for all required materials in a timely manner to meet the accepted construction schedule and without causing delay in the Work.

I. Hazardous materials:

1. Certify that all materials incorporated into the Work are free from asbestos, radioactive waste, hazardous waste and any other material detrimental to human health, safety and conform to all codes for health, safety, ADA or environmental regulations and conform to the Specifications for the work.

2. Notify Owner, and request Owner's permission, before incorporating into the Project any materials specified by the Contract Documents which Contractor knows or has reason to know are contaminated by asbestos, radioactive waste, hazardous waste or any materials detrimental to human health and do not conform to all codes for health, safety, ADA or environmental regulations.

2.2 PRODUCT SELECTION

A. General requirements: The Contract Documents and the requirements of the authorities having jurisdiction govern product selection. Procedures governing product selection include the following.

1. When both the specified process and the Contractor's guarantee of the results are specified, if in the Contractor's judgment the process may not produce the required result, the Contractor shall offer for review an alternative process that he will guarantee.

2. For products specified only by reference standards, select any product meeting specified standards produced by any manufacturer.

3. Where Specifications name a single product and manufacturer, provide the product named.

4. Where Specifications name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.

5. Where Specifications name one or more products, and indicate the option of selecting equivalent products by stating "or equal," "equal to," "or approved equal," "equivalent to" or "or approved substitute" before or after specified product, submit a substitution request for any comparable product not specifically named.

6. Where Specifications name one or more products, and catalog numbers and specific brands or trade names not followed by the designation "or equal" are used in conjunction with material or equipment required by the Specifications, no other comparable products or substitutions will be permitted.

7. Where Specifications indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer.

8. Where Specifications indicate a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

9. Where Specifications indicate a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

B. Basis-of-design:

1. Where 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-name manufacturer's products or comparable products may require modifications to the original design.

2. If such alternatives are proposed by Contractor and are approved by the Owner and Architect, Contractor shall assume all costs required to make necessary revisions and modifications to the design.

C. Visual matching:

1. Where Specifications require matching an established sample or samples of a given color range, the Architect's decision will be final as to whether or not a proposed product matches satisfactorily.

2. Where no visual match can be satisfactorily made, even though the product selected conforms to other specified requirements, comply with provisions of the Contract Documents concerning substitutions for selection of a matching product in another product category, or for non-compliance with specified requirements. Architect may reject products based solely on lack of visual match.

D. Visual selection specification: Where Specifications include the phrase "To be selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.

1. Standard range: Where Specifications include the phrase "manufacturer's standard palette" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.

2. Full range: Where Specifications include the phrase "custom colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (NOT USED)

SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Construction layout.

REQUIREMENTS

2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

1.2 SUBMITTALS

A. Qualification statements: Provide a list of 5 projects of similar design and complexity surveyed within the past 5 years by the surveyor or civil engineer.

1.3 QUALITY ASSURANCE

A. Surveyor Qualifications: California-licensed surveyor or civil engineer who is legally qualified to practice in jurisdiction where Project is located and has a minimum of 5 consecutive years experience in the surveying of projects similar in design, complexity and extent to this Project.

PART 2 - PRODUCTS (NOT USED) PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing conditions: Existence and location of site improvements, utilities, and other construction indicated as existing are based upon information provided to the Architect by the Owner.

1. Prior to beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

2. Verify location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping and underground electrical services.

3. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Acceptance of conditions: 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. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Examine roughing-in for mechanical and electrical systems to verify actual locations of
1. connections before equipment and fixture installation.

3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Survey of existing conditions:

1. Prior to beginning the Work, employ a California-licensed surveyor or civil engineer to make a survey of existing adjacent structures and improvements.

2. Establish precise elevations at fixed points to act as benchmarks.

3. Clearly identify benchmarks and record existing elevations.

B. Existing utility information: Furnish information to local utility 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 requirements of the authorities having jurisdiction.

C. Field measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product.

1. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

2. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

3.3 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, promptly notify Architect.

B. General: Engage a California-licensed surveyor or civil engineer to lay out the Work using accepted surveying practices.

1. 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.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

6. 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 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.

1. 1. Transfer survey markings and elevations for use with control lines and levels.

2. Level foundations and piers from two or more locations.

E. Record log: Maintain a log of layout control work.

1. Record deviations from required lines and levels.

2. 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.

3. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. 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.

2. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

3. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of 2 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.

3.5 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 8 feet in spaces without a suspended ceiling.

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.

A. E. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.

F. 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.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

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.

H. 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.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. 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 materials more than 7 days during normal weather or 3 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.

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: Burying or burning waste materials on-site will not be permitted.

A. Washing waste materials down sewers or into waterways will not be permitted.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

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: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 01 43 00.

3.8 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.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction.

1. Restore damaged substrates and finishes.

2. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched and broken glass or reflective surfaces.

END OF SECTION

SECTION 01 73 29

CUTTING AND

PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Procedural requirements for cutting into existing construction to provide for installation of other components or performance of other construction, and for subsequently patching as required to restore surfaces to their original condition.

1.2 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit the installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after the installation of other Work.

1. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.

2. Cutting and patching performed during erection or installation process is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching."

C. Selective demolition: Removal of a portion of an existing structure.

1. Selective demolition often includes removing major structural elements to provide for the enlargement and alteration of the structure.

2. Selective demolition may require the performance of cutting and patching as a part of the Work.

D. Demolition: Total removal of an existing structure, with little or no regard to salvaging materials or construction items.

1.3 SUBMITTALS

A. Where approval to proceed with cutting and patching is required, submit a proposal describing procedures at least 10 business days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform the Work.

4. Indicate dates when cutting and patching will be performed.

5. List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original

1. structure.

B. Obtain Architect's approval of cutting and patching proposal before cutting and patching.

1.4 QUALITY ASSURANCE

A. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. 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.

C. Do not cut and patch miscellaneous elements or related 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.

D. Do not cut and patch construction in a manner that results in visual evidence of cutting and patching.

1. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities.

2. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Submit cutting and patching proposal and obtain Architect's approval before cutting and patching the following categories of work:

1. Structural steel.

2. Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of work.

3. Structural concrete.

4. Piping, ductwork, vessels and equipment.

5. Primary operational systems and equipment.

6. Waterproofing, membranes and flashings.

7. Noise and vibration control elements and systems.

8. Control, communication, conveying, and electrical wiring systems.

1.5 WARRANTY

A. Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless otherwise indicated, or directed by the Architect, use materials for finishing or filling-in cut and patched areas that are identical to existing materials.

B. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces, as determined by the Architect.

C. Use materials for cutting and patching that will result in equal or better in-place functional performance than existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, surfaces, and conditions under which materials will be cut or patched

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 PREPARATION

A. Protect adjacent surfaces from staining and damage by masking, covering them with impermeable coverings securely taped in place, or other appropriate form of protection, as required.

B. Provide temporary support of Work to be cut.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 CUTTING AND PATCHING

A. Employ skilled workers to perform cutting and patching.

B. 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.

1. Use hand or small power tools designed for sawing and grinding, not hammering and chopping.

a. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces.

b. Temporarily cover openings when not in use.

2. Cut or drill finished surfaces from the exposed or finished side into concealed surfaces.

3. Cut concrete and masonry using a cutting machine, such as an abrasive saw or a diamond- core drill.

4. Comply with requirements in applicable Division 31 Sections where excavation and backfilling is required by cutting and patching operations.

5. 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.

C. 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 possible. Provide materials and comply with installation requirements specified in other Sections.

1. Test and inspect patched areas after completion to demonstrate integrity of installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

a. b. Restore damaged pipe covering to its original condition.

3. Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space.

a. Provide an even surface of uniform finish, color, texture, and appearance.

b. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

4. Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Patch exterior building enclosure components in a manner that restores enclosure to a weathertight condition.

6. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

3.4 CLEANING

A. Upon completion of installation, clean all surfaces to remove dust and other foreign materials from the facing.

1. Remove completely paint, mortar, oils, putty and items of similar nature.

2. Clean piping, conduit and similar features before painting or other finishing is applied.

B. Restore damaged areas to match adjacent areas as approved by the Architect.

C. Remove and replace materials and components that are damaged, loose, chipped, broken, have been stained, corroded, or that do not match adjacent surfaces or cannot be satisfactorily cleaned or repaired, as determined and directed by the Architect.

END OF SECTION

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SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

CLOSEOUT PROCEDURES

A. Section includes: Administrative and procedural requirements for Final Inspection and Contract closeout.

1.2 DEFINITIONS

A. Designated portion: A completed area such as building lobby or toilet rooms, or a completed assembly such as the exterior wall.

B. Punch list: List of items remaining to be completed or corrected prior to project completion.

1.3 SUBMITTALS

A. Submit 3 copies of punch list.

1. Indicate areas disturbed by Contractor that are outside the limits of construction.
2. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction.
3. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

B. Closeout submittals: Submit the following to the Owner, through the Architect.

1. Warranties and bonds.
2. Operation and maintenance data.
3. Project record documents.
4. Keys and keying schedules.
5. Tools, spare parts and maintenance materials.
6. Certificate of Occupancy.
7. Certificate of insurance for products and completed operations.

8. Certificates of inspection for vertical transportation systems, fire and life safety systems, and mechanical and electrical work as evidence of compliance with the requirements of the authorities having jurisdiction.

9. Contractor's affidavit of payment of debts, and claims and release of liens duly executed before delivery to Architect.

10. Final statement of accounting to the Architect, showing all adjustments to the Contract Sum.

PART 2 - PRODUCTS (NOT USED) PART 3 - EXECUTION

3.3.1

1

EXAMINATION

A. Prior to requesting inspections by the Architect, inspect the Project to verify Work has been completed in compliance with the Contract Documents and any authorized modifications made thereto, and is ready for the requested inspection.

B. Correct incomplete conditions before proceeding with inspections.

3.2 PREPARATION

A. Submit a written certification to Architect that Project, or designated portion of Project, is substantially complete.

B. Architect will not review partial areas and partial assemblies.

3.3 FINAL CLEANING

A. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:

1. Remove labels that are not permanent.

2. Clean transparent materials, including mirrors. Remove excess glazing compounds. Replace chipped or broken glass.

3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.

4. Vacuum carpeted surfaces and wax resilient flooring.

5. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures, lamps, globes, and reflectors.

6. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas remove stains, spills, and foreign deposits. Rake grounds to a smooth, even- textured surface.

3.4 SUBSTANTIAL COMPLETION

A. Preliminary procedures: Before requesting inspection for determining date of Substantial Completion, complete the following:

1. Prepare punch list of items remaining to be completed and corrected, the value of items on the list, and reasons why Work is incomplete.

2. Advise Owner of pending insurance changeover requirements.

3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

4. Prepare and submit warranties and bonds, record documents, operation and maintenance manuals, damage or settlement surveys, and similar final record information.

5. Deliver tools, keys, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

7. Complete startup testing of systems. Submit test/adjust/balance records.

8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools and similar elements.

1. 9. Advise Owner of changeover in heat and other utilities.

10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

11. Complete final cleaning requirements, including touchup and otherwise repair to exposed finishes to eliminate visual defects.

B. Inspection: Submit written request to Architect for Substantial Completion inspection.

1. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.

2. Architect will prepare Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect,

which must be completed or corrected before Certificate of Substantial Completion will be issued.

C. Reinspection:

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

3.5 FINAL COMPLETION

A. Preliminary procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest-control final inspection report and warranty.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance.

1. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.

2. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

3. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

3.6 OWNER OCCUPANCY

A. Prior to Owner occupancy of Project or designated portion of Project, obtain Certificate of Occupancy from the authorities having jurisdiction and complete final cleaning in compliance with Section 01 73 00.

B. Owner will occupy the Project under provisions stated in Certificate of Substantial Completion.

A. C. Contractor shall complete work listed for completion or correction within designated time.

3.7 DEMONSTRATION

A. Instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all installed systems, products, components and pieces of equipment in compliance with Section 01 78 23.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

OPERATION AND MAINTENANCE DATA

1. Administrative and procedural requirements for preparing emergency, operating and maintenance manuals.

2. Instruction of Owner's personnel in the maintenance of products and materials and in the operation of equipment and systems.

1.2 MANUAL REQUIREMENTS

A. Organize manuals into an orderly sequence based on Project Manual table of contents.

1. Bind emergency, operating and maintenance data in heavy-duty, commercial-quality 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, sized to receive 8-1/2-by-11-inch paper with a clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

2. Provide title page enclosed in transparent plastic sleeve. Include the following information:

a. Subject matter included in manual.

b. Name and address of Project.

c. Name and address of Owner.

d. Date of submittal.

e. Name, address and telephone number of Installer and maintenance service agent.

f. Name and address of Architect.

3. Provide a typed table of contents for each emergency, operating and maintenance manual, cross-referenced to Specification Section number in Project Manual, with each system, subsystem, and equipment included in manual listed, identified by product name and indexed to the content of the volume.

a. Provide a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system.

b. If possible, assemble instructions for subsystems, equipment and components of one system into a single binder.

4. Provide heavy paper dividers with plastic-covered tabs for each section. Mark tab to identify system or equipment.

5. Provide transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

6. Attach punched and reinforced binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual.

a.

c. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

7. Identify each binder on the front and spine with the typed or printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and name of Contractor. Indicate volume number for multiple-volume sets.

1.3 SUBMITTALS

A. Submit 2 copies of proposed manual or manuals to Architect for review and approval at least 10 business days prior to request for final inspection or acceptance. Show general manual arrangement, contents and proposed method of binding and covering.

B. Architect will forward submitted manuals to Owner for review by Owner's operating and maintenance personnel and return manuals with review comments.

C. Correct or modify each manual to comply with Architect's comments.

D. Submit 3 copies of each corrected manual or manuals within 10 business days of receipt of Architect's comments.

PART 2 - PRODUCTS

2.1 EMERGENCY MANUALS

A. Assemble complete emergency information for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Provide instructions and procedures for stopping and shutting down each system, subsystem, piece of equipment, and component for the following types of emergencies:

1. Earthquake.
2. Fire.
3. Flooding.
4. Gas leak.
5. Water leak.
6. Power failure.
7. Water outage.
8. Equipment failure.

C. Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier and manufacturer to maintain warranties.

D. Provide operating instructions for conditions outside normal operating limits and required sequences for electric or electronic systems.

2.2 OPERATION MANUALS

A. Assemble complete operation and maintenance information indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Provide equipment descriptions, operating standards, procedures and logs, wiring and control diagrams and license requirements. Include the following:

1. Product name and model number.
2. Manufacturer's name.
1. 3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Describe the sequence of operation and diagram controls as installed. Include the following:

1. Start-up, break-in, and control procedures.
2. Stopping and normal shutdown instructions.
3. Routine, normal, seasonal, and weekend operating instructions.
4. Required sequences for electric or electronic systems.

D. For piped systems, provide diagram of piping as installed with color-coding where required for identification.

2.3 MAINTENANCE MANUALS

A. Product maintenance manual:

1. Assemble complete product maintenance information indicating care and maintenance of each product, material and finish incorporated into the Work. Organize manual into a separate section for each product, material, and finish.

2. Provide source information, product information, maintenance procedures and repair materials and sources. Include the following:

a. Product name and model number.
b. Manufacturer's name.
c. Color, pattern, and texture.
d. Material and chemical composition.
e. Reordering information for specially manufactured products.

3. Describe manufacturer's recommendations and inspection procedures, types of cleaning agents, methods of and schedule for cleaning, and maintenance and repair instructions.

4. Provide lists of repair materials and local sources of materials and related services.

B. Systems and equipment maintenance manual:

1. Assemble complete system and equipment maintenance information for each system, subsystem, and piece of equipment not part of a system. Organize manual into a separate section for each system, subsystem and piece of equipment.

2. Provide source information, system and equipment information and manufacturers' maintenance documentation. Include the following:

a. Source information.

b. Maintenance procedures.

c. Maintenance and service schedules.

d. Drawings and diagrams for maintenance.

e. Nomenclature of parts and components.

f. Recommended spare parts for each component part or piece of equipment with source

a. information.

g. Maintenance service contracts.

3. Describe essential maintenance procedures including test and inspection procedures, troubleshooting procedures, disassembly instructions and adjusting instructions.

a. List maintenance, service and lubrication requirements, required lubricants for equipment and separate schedules for preventive and routine maintenance and service with standard time allotment.

b. Provide local sources of maintenance materials and related services.

c. Include copies of maintenance agreements with name and telephone number of service agent.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Where emergency, operating and maintenance manuals contain manufacturers' standard printed data, include only those sheets pertinent to installed system, product, component or piece of equipment.

1. Mark each sheet to identify each product, component or piece of equipment incorporated into the Work.

2. Identify data applicable to the Work and delete references to information not applicable.

3. If data includes more than one item in a tabular format, identify each item using appropriate references from the Contract Documents.

B. Prepare drawings supplementing manufacturers printed data to illustrate the relationship of component parts of equipment and systems, and to illustrate control sequence and flow diagrams.

1. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

2. Do not use original Project Record Documents as part of operation and maintenance manuals.

3.2 DEMONSTRATION

A. Prior to final inspection or acceptance, instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all installed systems, products, components and pieces of equipment.

1. Schedule training with the Owner with at least 7 days' advance notice.

2. Train Owner's personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.

3. The Owner, Contractor and subcontractors must all be present for training of Owner's personnel.

B. Operating and maintenance manual shall serve as the basis of instruction. Review contents in detail with Owner's designated operating and maintenance personnel in order to explain all aspects of operations and maintenance.

C. Engage a factory-authorized service representative to train Owner's maintenance personnel in the

A. proper operation and maintenance of each system, subsystem and piece of equipment installed.

END OF SECTION

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SECTION 01 78 36

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

WARRANTIES AND BONDS

A. Section includes: Administrative and procedural requirements for specified warranties, bonds and service and maintenance contracts.

1.2 WARRANTY REQUIREMENTS

A. Organize warranty documents into an orderly sequence based on the Project Manual table of contents.

1. Bind warranties and bonds in heavy-duty, commercial-quality 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, sized to receive 8-1/2-by-11-inch paper with a clear plastic sleeve on spine to hold label describing contents and with pockets

inside covers to hold folded oversize sheets.

2. Provide title page enclosed in transparent plastic sleeve. Include the following information:

a. Name and address of Project.
b. Name and address of Owner.
c. Date of submittal.
d. Name, address and telephone number of Contractor.
e. Name and address of Architect.

3. Provide a typed table of contents, cross-referenced to Specification Section number in Project Manual, with the following complete information for each item:

a. Product name or assembly description.
b. Installer name address and telephone number.
c. Scope of warranty.
d. Beginning date of warranty, bond or service and maintenance contract.
e. Duration of warranty, bond or service and maintenance contract.
f. Information for proper procedure to be followed in case of failure, and for instances that may affect the validity of warranty or bond.
g. Name, address and telephone number of responsible party for Contractor.

4. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify product or installation.

5. Identify each binder on the front and spine with the typed or printed title "WARRANTIES AND BONDS," Project name, and name of Contractor. Indicate volume number for multiple-volume sets.

1.3 SUBMITTALS

A. Submit 2 original, written and signed warranties for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

1. For equipment, or component parts of equipment put into service during construction, submit documents within 10 business days after final inspection and acceptance.

2. For items whose acceptance is delayed materially beyond date of Substantial Completion, provide updated submittal within 10 business days after acceptance, listing date of acceptance as start of warranty period.

B. Submit 2 original, written and signed warranties within 15 business days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

PART 2 - PRODUCTS

2.1 DISCLAIMERS AND LIMITATIONS:

A. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

B. Owner reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work, or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

2.2 OWNER'S RECOURSE

A. Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty

periods be interpreted as limitations on obligations, rights, or remedies.

B. Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

PART 3 - EXECUTION

3.1 REPLACEMENT OF WORK

A. Upon determination that work covered by a warranty has failed, replace or rebuild the affected work to an acceptable condition complying with the requirements of Contract Documents.

B. Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of that work through a portion of its anticipated useful service life.

C. When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

D. When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

3.2 WARRANTY FORM

A. Submit warranties on the form attached to this Section.

B. This requirement applies to Contractor and all subcontractors.

END OF SECTION

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SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements for preparation, maintenance and delivery of project Record Documents, including Record Documents include Record Drawings, Record Specifications and Record Product Data.

1.2 SUBMITTALS

A. Deliver record documents to the Architect within 30 days of substantial completion. Submit the following:

1. One set of marked-up record blue- or black-line prints.
2. One copy of project's specifications, including addenda and contract modifications.
3. One copy of each product data submittal.

B. Accompany submittal with transmittal letter, in duplicate, containing date, Project title and number, Contractor's name and address, title and number of each record document, certification that each document as submitted is complete and accurate, and signature of Contractor or its authorized representative.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Maintain one set of blue- or black-line record prints of the contract drawings and shop drawings at the project site.

1. Mark record prints to show the actual installation where installation varies from that shown originally. Dimensions shall be accurate to within one-inch
2. Document concealed elements difficult to identify or measure and record later.
   a. Record data within 24 hours of completion of the work being recorded.
   b. Record and check the markup before enclosing concealed installations.
3. Mark contract drawings or shop drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Use a fine felt or nylon tip pen with waterproof red ink for marking. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Legibly mark to record actual construction of the following:
   a. Depths of various elements of foundation in relation to first floor level.
   b. Horizontal and vertical location of underground utilities and

appurtenances referenced to permanent surface improvements. Cut-off points and point of connections of utilities.

c. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.

d. Field changes of dimension and detail.

a.

e. RFI numbers, contract modification numbers, alternate numbers, change order numbers, and similar identification, where applicable.

f. Details not on original Contract Drawings.

6. Do not permanently conceal any work until required information has been recorded.

B. Identify and date each Record Drawing with the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Organize record prints and newly prepared record drawings into manageable sets.

2. Bind each set with durable cover sheets containing the following visible identification:

a. Project name.

b. Date.

c. Designation "PROJECT RECORD DRAWINGS."

d. Name of Architect.

e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Document concealed products and installations difficult to identify or measure and record later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record name of manufacturer, supplier, installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Mark Product Data to indicate the actual product installation where installation varies from that indicated in Product Data submittal.

1. Document concealed products and installations difficult to identify or measure and record later.

2. Include significant changes in products delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

PART 3 - EXECUTION

3.1 DOCUMENT MAINTENANCE

A. Maintain one copy of the following in Contractor's field office at the site:

1. Contract Drawings, including the Building Department stamped set.
2. Specifications and Addenda.
3. Reviewed shop drawings.
4. Bulletins and change orders, field change authorization and notice of clarification, and other modifications to Contract.
5. Field test records.

B. File record documents apart from construction documents and maintain in clean, dry, legible condition.

1. Do not use record documents for construction purpose.
2. Make record documents available for review by the Owner and Architect during regular business hours.

C. Record documents will be subject to a monthly review by the Architect prior to approval of each progress payment.

END OF SECTION

SECTION 02010 - SUBSURFACE EXPLORATION

Contract drawings, Division 0, Conditions of the Contract, and Division1, General Requirements, apply to the Work of this Section

PART 1 - GENERAL

1.01 SUMMARY

A. A soils investigation report has been prepared for the site of this Work.

B. Availability: The soils investigation report may be inspected at the office of the Landscape Architect, and copies may be obtained from the Soils Engineer at the cost of reproduction and handling upon request accompanied by full payment.

C. Use of Data: This report was provided only for the Architect's use in design and is not a part of the Contract Documents. The report is available for information, but is not a warranty of subsurface conditions.

1.02 QUALITY ASSURANCE

A. Soils Engineer will be retained by the Owner to observe performance of work in connection with work included in this Contract.

B. Adjustment of Work: Readjust all work performed that does not meet technical or design requirements, but make no deviations from the Contract Documents without specific written approval from the Architect.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 02200 – SITE PREPARATION AND EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Division 1 apply to this Section. Provide and perform site preparation and earthwork, complete site clearing, excavation, filling, backfilling, and compaction, over excavation and placement of engineered fill below floor slabs and footings, imported fill material as required, subgrade preparation for on-grade concrete, gravel fill under floor slabs, rough grading in asphaltic concrete paving areas, control of surface and ground water, testing and inspection of work of this section, clean up and disposal.

1.2 QUALITY ASSURANCE

A. Professional Observation: Required for all work of this Section. The Soils Engineer shall have the following duties:
1. Observe the stripping and clearing of vegetation and deleterious materials.
2. Observe the over excavation to determine that the depth of excavation and bottom of the subgrade are suitable.
3. Observe the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished subgrade, observe proof rolling, and delineate areas requiring additional excavation.
4. Observe the compaction of scarified soils.
5. Perform visual observation to evaluate the suitability of on-site and imported soils for fill placement; collect and submit soil samples for laboratory testing.
6. Perform field density and compaction testing to determine the percentage of compaction achieved during placement of fills.
7. Observe and probe foundation bearing materials to confirm that suitable bearing materials are present at the design grades.
8. Observe the backfill of utility trenches.
9. Observe the construction of the subgrade and base for exterior paving.

B. Preconstruction Conference: Contractor shall conduct a preconstruction conference prior to starting work of this section, to develop a program for quality control of the work. The requirements for observation of the work by the Soils Engineer, scheduling of the work to be observed, any additional observation requirements, and planned construction procedures, will be discussed. Minutes of the conference shall be kept, and copies distributed, with an additional copy to the Soils Engineer.

C. Source Quality Control: Obtain approval by the Soils Engineer of imported fill material before material is brought to site, and same approval of excavated material for use in fills or backfills prior to placing. Imported material shall be tested for toxic substances by an independent testing laboratory approved by the University.

1.3 SUBMITTALS

A. Provide certification, signed by an authorized representative of an approved testing laboratory, that proposed imported fill material and other earthwork materials to be brought to the site, are free from toxic substances, and are in conformance with applicable state and local regulations.

1.4 PROJECT SITE CONDITIONS

A. Protection: Provide and maintain protection to retain earth banks and to protect adjoining grades and structures from caving, sliding, erosion, or other damage. Provide suitable protection against all bodily injury. Construct all bulkheads and shoring to requirements of State and Local codes and regulations. Shore vertical banks or slope banks back as required for stability and safety. Erect temporary barricades located at least 5-feet away from the top of slopes, and provide temporary berms as required to prevent slope erosion from water.

B. Digital Photographs and Videos: Required prior to starting work of this Section.

C. Utilities: Perform work adjacent to public utilities in accordance with procedures outlined by the utility company. For work adjacent to the Owner's utility lines, excavate by hand until the utility is uncovered or sufficient clearance is defined for machine work.

D. Drainage: Collect and dispose of surface and subsurface water encountered in the course of construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide approved imported material as required if the quantity of approved site and excavated material is insufficient to complete the work.

B. Earthwork Materials: Approved excavated or imported granular soil such as silty sand having an expansion index of 20 or less, and containing not more than 20 percent by weight of material passing the No. 200 sieve, free from trash, roots, organic material, clay lumps, and rocks over 6" size.

C. Gravel Fill Material: From approved source, 90 percent to 100 percent passing a 3/4" sieve, 0 percent to 10 percent passing a No. 4 sieve, and 0 percent to 3 percent passing a No. 100 sieve.

D. Sand: ASTM D2488, with not more than 3 percent passing No. 200 sieve.

PART 3 - EXECUTION

3.1 COMPACTION CONTROL

A. Unless otherwise specified hereafter, compaction densities shall be not less than the following. Moisten or aerate material to specified moisture content, then uniformly compact the fills and backfills in maximum 8" thick loose layers to 90 percent of the maximum dry density determined by ASTM D1557. This is the minimum compaction; average shall be at least 92 percent. Flooding or jetting is not allowed. In areas to be landscaped only, fills may be placed in 12" layers and compacted to 85 percent of maximum dry density.

3.2 MOISTURE CONTENT CONTROL

A. Material to be compacted shall be brought to uniform moisture content varying no more than zero percent below or 3 percent above optimum moisture content. Obtain approval by the Soils Engineer of the

moisture content before performing further grading operations. Mix, dampen, or dry soils as required to achieve specified moisture content.

3.3 SITE CLEARING

A. Coordinate with the Demolition Contractor for the demolition and removal of the existing piles and pile caps, grade beams and asphalt paving and base course from areas to receive the new building as shown on the drawings as indicated. Asphalt paving may be pulverized and blended with site soils to be used for engineered fill material, provided the specified results of compaction and grading are obtained.

3.4 REMOVAL AND REPLACEMENT OF UNSUITABLE SOILS

A. General: As indicated in the soils report, unsuitable soils conditions may be encountered in the area of the building to depth of approximately 6'-0". If any of the following conditions occur, the provisions of this paragraph shall apply.
   1. Dissimilar native materials are encountered across the building footprint.
   2. Incompetent zones are encountered.
   3. The subgrade becomes disturbed during construction.
   4. Creation of a level pad requires a cut/fill transition within the building pad.
   5. The Soils Engineer determines that field conditions require procedures specified herein.

B. In the event that any of the above conditions occur, the following procedures shall be performed.
   1. After removal of existing paving, remove all uncontrolled fill soils, all upper loose, firm, porous or disturbed natural soils from areas to receive footings, slabs, walks and paving to a distance of 5 feet beyond edges of same.
   2. Soils shall be removed to a depth that will provide not less than 2 feet of compacted soil below building slabs and 5 feet beyond, and 18 inches below exterior paving, walks, and new asphalt paving
   3. After excavating, the exposed soils shall be inspected to verify removal of all unsuitable deposits. Remove all rocks larger than 8" in largest dimension.
   4. The exposed soils shall be scarified to a depth of 6", moisture added as required and recompacted to not less than 90 percent of the maximum dry density at optimum moisture content in accordance with ASTM D1557. Fill shall be placed in loose lifts not exceeding 8" in thickness and compacted to 90 percent as defined above. Compaction shall be accomplished continuously over the entire area. Sufficient passes shall be made to ensure that specified density is obtained.

3.5 EXCAVATION AND BACKFILLING FOR FOUNDATIONS AND STRUCTURES:

A. Foundation Soils: Excavate for foundations to sizes indicated, clean, and leave in condition recommended by Geotechnical Investigation Report. Prior to placement of forms, reinforcing, or concrete, obtain approval of Soils Engineer and building department as required, for proper conditions and suitable bearing materials.

B. Perform excavation to the dimensions and elevations indicated on drawings, with additional space allowed as required for the installation and stripping of forms, and inspection of the various types of work, except where approval may be given to deposit certain miscellaneous concrete directly against earth banks.

C. Provide lateral support for excavations within and adjacent to structures, foundations and slabs-on-grade to prevent caving, earth movement or loosening of subgrade materials.

D. Adverse Subsurface Conditions: Notify Project Engineer should unsuitable bearing soil or other adverse subsurface conditions be found which are not indicated by the drawings or specifications.

E. Unauthorized Excavation: If excavations are carried below the elevations indicated without written authorization, provide satisfactory construction to correct the fault as approved, at no additional contract cost.

F. Backfill Beside Foundations:
1. Backfilling against concrete shall not be done until concrete has attained its 28-day compressive strength, unless specifically approved otherwise.
2. Moisten or aerate backfill material as required to attain specified moisture content. Place backfill material adjacent to structures and compact in a manner that prevents wedging action or eccentric loading upon or against the structures. Step or serrate slopes bounding or within areas to be backfilled to prevent sliding of the fill. Do not place material on surfaces that are muddy. Do not use equipment for backfilling operations or for the formation of embankments against structures that will overload the structure.

3.6 EXCAVATION AND BACKFILLING FOR UTILITIES

A. Trenching and excavating for underground piping, conduits, and related items are performed under other sections. Conform trenching operations to the following requirements:
1. Trenches: Excavate trenches to widths required for proper laying of pipe, with banks as nearly vertical as practicable. Bring bottoms of trenches to the required depths, all accurately graded to provide uniform bearing on undisturbed soil for entire length of each section of pipe, except where it is necessary to excavate for pipe bells or for pipe bedding specified in other sections.
2. Methods: Machine excavation method may be used down to rough elevations. Perform fine grading and trimming by hand method.
3. Trench Backfilling: Conform to Paragraph "Compaction" except compact all backfill to at least 95 percent of maximum dry density where the trenches are located in paved areas or under building or structures. Take precautions in placing and compaction of backfill to avoid damaging pipes, ducts, conduits, and structures. The upper 12 inches of trench backfill materials shall consist of on-site soil material, compacted as specified.

3.7 SUBGRADE PREPARATION FOR CONCRETE

A. Prepare subgrade for concrete items placed directly on earth by excavating, filling, and grading as required and as specified, and bring to optimum moisture content. Excavate the existing subgrade to a depth of 12 inches, moisture condition, and recompact to 90 percent. Finish the subgrade within 0.10-foot tolerance when tested along a 10-foot straightedge in any direction at any location. Compact to density specified for fills, and maintain moisture content until concrete is placed.

3.8 ASPHALTIC CONCRETE PAVING AREAS

A. Bring areas to required elevations and grades by clearing and preparation, cutting, filling, and grading, as shown and specified herein. Allow for thickness of subsequent materials. Excavate the existing subgrade to a depth of 12 inches, moisture condition, and recompact to 90 percent. Final fine grading and compaction is specified as a part of the paving operations. Coordinate with Section 02510 requirements.

3.9 LANDSCAPE AREAS

A. Bring to nominal 0.10-foot below required grades except where topsoil fill occurs, and finish with smoothly curving contours at grade changes and slopes, as approved. Grade to allow for thickness of topsoil fill. Avoid excessive compaction in all areas.

3.10 GRADING

A. After completion of construction, and immediately prior to final acceptance, all surfaces not covered by landscaping, paving, or other materials shall be raked clean and uniformly graded to elevations shown on drawings, with smoothly curving contours.

3.11 DISPOSAL

A. Clean up and remove all trash, debris, waste, and surplus and rejected earthwork materials from the site to a legal disposal area. Conform to pertaining laws, codes, and regulations, obtain and pay for required hauling and dumping permits, and pay all dumping charges. Perform trucking and material handling in a careful manner to prevent spillage and dusting or damage to surfaces and structures. Remove planks used to protect surfaces subject to public traffic at finish of each day's operations. Maintain public streets and sidewalks in broom clean condition.

3.12 PROTECTION

A. Protect newly graded areas from traffic, erosion, and settlement. Repair and reestablish damaged or eroded slopes, elevations, or grades and restore surface construction prior to acceptance.

3.13 FIELD QUALITY CONTROL:

A. Refer to Division 1 for additional requirements, specifically Section 01400.

B. Testing: Testing Laboratory will take test samples and perform materials, moisture content, compaction densities, and other tests to the extent and by the methods directed by the Soils Engineer.

C. Professional Certificates: Upon completion, Soils Engineer will furnish written certificates that earthwork and compaction densities conform to requirements herein.

END OF SECTION 02200

SECTION 02230 - SITE CLEARING

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.

1.2 SUMMARY

A. Section Includes:

1. Removing existing vegetation.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Temporary erosion- and sedimentation-control measures.

B. Related Sections:
1. Division 1 Section "Mobilization and Temporary Controls" for temporary utility services, construction and support facilities, security and protection facilities**,** and temporary erosion- and sedimentation-control measures.
2. Division 1 Section "Field Engineering" for field engineering and surveying.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically 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 and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

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, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other 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.

1.5 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 videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.6 PROJECT 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 until directed by Architect.

C. Utility Locator Service: Notify utility locator service, Underground Service Alert (DigAlert) or other approved service, for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. 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.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

H. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 2 Section "Earthwork."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 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 erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. After completion of construction, remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and stockpile in areas approved by Architect.

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 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.4 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches (150 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within protection zones.
3. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.5 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.

3.6 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.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 02230

SECTION 02300 - EARTHWORK

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.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete slabs.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
8. Excavating well hole to accommodate elevator-cylinder assembly.

B. Related Sections:

1. Division 1 Section "Construction Progress Documentation " for recording pre-excavation and earth moving progress.
2. Division 1 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Division 2 Section "Site Clearing" for site stripping, grubbing, stripping topsoil, and removal of above- and below-grade improvements and utilities.
4. Division 2 Section "Dewatering" for lowering and disposing of ground water during construction.
5. Division 2 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
6. Division 2 Section "Drilled Piers" for excavation of shafts and disposal of surplus excavated material.
7. Division 2 Section "Subdrainage" for drainage of landscaped areas.
8. Division 2 Section "Lawns and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
9. Division 2 Section "Exterior Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.
10. Division 3 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
11. Divisions 2, 15, and 16 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
12. Division 14 Section Hydraulic Freight Elevators for excavating well hole to accommodate elevator-cylinder assembly.

1.3 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 sub base 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.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. 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.

I. 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.

J. 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.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Warning Tape: 12 inches (300 mm) long; of each color.

C. Material Test Reports: For each on-site 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.

D. Seismic survey report from seismic survey agency.

E. 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.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

1.6 PROJECT 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 Architect.

C. Utility Locator Service: Notify utility locator service, Underground Service Alert (DigAlert) or other approved service, for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 1-“Temporary Facilities and Division 2 - "Site Clearing," are in place.

E. Do not commence earth moving operations until plant-protection measures specified in Division 2 Section "Tree Protection and Trimming" 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

2.1 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 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: As specified in the Soils Report.
2. Plasticity Index: As specified in the Soils Report.

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 soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

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 (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

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 (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) 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 (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). 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 (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been poured, , 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 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand 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. Cut and protect roots according to requirements in Division 2 Section "Tree Protection and Trimming."

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit

C. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. 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 Division 2 Section "Tree Protection and Trimming."

3.7 EXCAVATION FOR ELEVATOR CYLINDER

A. Drill well hole plumb in elevator pit to accommodate installation of elevator-cylinder assembly. Coordinate with applicable requirements for diameter and tolerances in Division 14 Section "Hydraulic Freight Elevators."

B. Provide well casing as necessary to retain walls of well hole.

3.8 SUBGRADE INSPECTION

A. Notify IOR and Soils Engineer when excavations have reached required subgrade.

B. If IOR and Soils Engineer determine that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Soils Engineer, without additional compensation.

3.9 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 (17.2 MPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 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.

3.11 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 and 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.

3.12 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 Division 3 Section "Cast-in-Place Concrete ."

D. Trenches under Roadways: Provide 4-inch- (100-mm-)thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm)of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 3 Cast-in-Place Concrete

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

3.13 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 satisfactory soil material.
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.

3.14 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.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) 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, and pavements, scarify and recompact top 24 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 90 percent.
2. Under walkways, scarify and recompact top 24 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 90 percent.
3. Under turf or unpaved areas, scarify and recompact top 24 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 90 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 90 percent.
5. For flexible asphalt concrete pavement for parking, compact aggregate base and asphalt concrete at 95 percent.

3.16 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 required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm)
2. Walks: Plus or minus 1 inch (25 mm)
3. Pavements: Plus or minus 1/2 inch (13 mm)

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 2 Section "Subdrainage."

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.

2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final subgrade.

3.18 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 (150 mm) or less in compacted thickness in a single layer.
4. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 90 percent- of maximum dry unit weight according to ASTM D 1557. For flexible asphalt concrete pavement for parking, compact aggregate base and asphalt concrete at 95 percent.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 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. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
2. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 90 percent of maximum dry unit weight according to ASTM D 1557.

3.20 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.

3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

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. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 75 feet (30 m) or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.

F. 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.

3.21 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 Architect; 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.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 02300

SECTION 02319

BASE COURSE

PART 1 - GENERAL

1.1 SUMMARY

A. Provisions of Division 01 apply to this section. Section

B. Includes:

1. Installation of base material.

C. Related Sections:

1. Section 02310: Grading.

2. Section 02315: Excavating, Backfilling and Compacting.

3. Section 02550: Asphalt Concrete Paving.

1.2 SUBMITTALS

A. Prior to import, Contractor shall submit written certification to OAR that crushed Miscellaneous Base (CMB) does not contain Polychlorinated biphenyls (PCB) above laboratory detection limits when tested in accordance with EPA Method 8082.

B. Crushed aggregate base (CAB) shall consist of native rock from pre-evaluated commercial source. The Contractor shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by OAR prior to importing the material.

C. Product Data: Submit material source, technical information and test data for base materials. Gradation and quality certifications shall be dated within 30 days of the submittal.

D. Sample: Submit Sample of proposed base course material.

1.3 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.1 UNTREATED BASE MATERIALS

A. The following base materials shall conform with the requirements of Standard Specifications for Public Works Construction: Section 200 - Rock Materials.

1. Crushed Aggregate Base.

2. Crushed Miscellaneous Base.

B. Materials generated on site shall not be used as a base course material.

2.2 MATERIAL APPROVAL

A. Base material shall be inspected by the IOR for gradation and material content prior to installation. The owner may choose to have additional tests performed by a geotechnical engineer, retained by the Owner, before installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install base course material in layers not exceeding 4 inches in thickness, unless required otherwise. Grade and compact to indicated levels or grades, cut and fill, water and roll until the surface is hard and true to line, grade and required section. Provide a relative compaction of at least 95 percent, unless otherwise required.

B. Grade base course to elevations indicated on Drawings, ready to receive surfacing, in accordance with Section 02310: Grading.

3.2 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.3 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION 02319

SECTION 02550 - ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:

1. Paving parking areas.

C. Related Sections:

1. Section 02310: Grading.
2. Section 02319: Base Course.
3. Section 02560: Seal for Asphalt Concrete Paving.
4. Section 02315: Excavating, Backfilling and Compacting.

1.2 SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of paving and accessories.

B. Product Data: Manufacturer's technical data for materials and products.

1.3 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction.

1.4 PROJECT CONDITIONS

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

B A copy of the soils report is available for examination in the office of the Engineer during regular office hours of the Engineer.

PART 2 - PRODUCTS

2.1 BITUMINOUS MATERIALS

A. Provide materials of the class, grade, or type indicated on the Drawings, conforming to relevant provisions of Section 203 - Bituminous Materials of the Standard Specifications for Public Works Construction.

2.2 HEADERS AND STAKES

A. Headers: Redwood, Construction Heart Grade, size 2 x 6, unless otherwise indicated.

B. Stakes: 2 x 4 redwood or 2 x 3 Douglas fir, Construction Grade. C. Nails:

Common, galvanized, 12d minimum.

PART 3 - EXECUTION

3.1 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Density of compacted backfill on both sides of header shall be equal to the density of adjacent undisturbed earth.

C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of 2-12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

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

F. Provide additional stakes and anchorage as required to fasten headers in place.

3.2 CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

A. Thickness of Surfacing: Unless otherwise indicated on Drawings or specified, install bituminous surfacing to a compacted thickness per specification for public works construction.

B. Provide surfacing material over base course as specified in Section 02319: Base Course.

C. Surfaces of the walls, concrete, masonry or existing bituminous surfacing indicated to be in direct contact with installed bituminous surfacing shall be cleaned, dried and uniformly coated with an asphaltic emulsion film.

D. Thicken edges of bituminous surfacing that do not abut walls, concrete, or masonry, and edges joining existing bituminous surfaces. Remove headers at existing bituminous surfacing where new bituminous surfacing is to be installed. Thicken

edges an additional 2 inches and taper to the indicated or specified thickness 6 inches back from such edges.

E. At stairways, join surfacing to first tread or riser below first tread, at an elevation below first riser equal to height of risers of stairway.

F. Provide adequate protection for concrete, planting areas and other finish Work adjacent to areas indicated to receive bituminous surfacing.

G. Placing:

1. Do not install bituminous surfacing when atmospheric temperature is below 40 degrees F; or when fog or other unsuitable weather conditions are present. Temperature of mixture at time of installation shall not be lower than 260 degrees F in warm weather or higher than 320 degrees F in cold weather.

2. Where 2-inch or 3-inch thick surfacing is indicated or specified, install surfacing in one course. Where surfacing is indicated or specified 4 inches or more in thickness, except for thickened edges, install bituminous surfacing in courses of approximately equal thickness, each course not exceeding 2-1/2 inches in thickness unless otherwise required by the Architect.

H. Stakes or Screeds: Provide grade or screed stakes spaced not more than 15 feet apart in flow lines with grades of less than one percent. Continuous screeds may be provided instead of stakes.

I. Spreading: Install bituminous surfacing in a manner to cause least possible handling of mixture. In open areas and wherever practicable, install by mechanical means with a self-propelled mechanical spreader. In confined or restricted areas, install mixture with hot shovels and rakes, and smooth with lutes.

J. Joints: Provide vertical joints between successive runs. Install joints true to line, grade, and cross section. Lapped joints are not permitted.

K. Rolling:

1. Finish roll with a self-propelled tandem roller weighing at least 8 tons. Break down roll with a self-propelled roller weighing between 1-1/2 tons and 8 tons.

2. Roll in a manner that preserves flow lines and the established finished grades. Break down roll in areas adjacent to flow lines parallel to flow lines. Break down roll after bituminous surfacing is installed without shoving or cracking of mixture under roller. Continue finish rolling until surfacing is unyielding, true to grade, and meets requirements for specified smoothness. Areas inaccessible to finish roller may be finish rolled with breakdown roller or tamped with hot tamping irons and smoothed with hot smoothing irons or hand roller.

3. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth to properly compact.

4. Compacted bituminous surfacing shall be provided with a bulk specific gravity of at least 2.31 when tested in accordance with ASTM D 1188.

3.3 TOLERANCE

A. Smoothness: Surface of bituminous surfacing after rolling, shall be even, smooth and uniform in texture with no voids or rock pockets, free of roller marks or other irregularities, and not varying by more than 0.03 foot, except at local depressions or raised areas as indicated, when a 10 foot straightedge is placed on surface.

B. Grade: Finished grade shall not vary more than 0.02 foot above or below required grade. Variations within prescribed tolerance shall be compensating so that average grade and cross-section are provided.

3.4 TESTING

A. After first coat of surface seal has been installed and cured, flood test completed bituminous surfacing in presence of the IOR. Repair areas of standing water or puddles and flood test locally; install surface seal and retest as necessary.

3.5 SURFACE SEALING

A. After bituminous surfacing has passed flood test, clear and allow to dry and provide one more coat of surface seal as specified in Section 02786: Seal for Bituminous Surfacing.

B. Where indicated, provide multiple coats of surface seal to existing bituminous surfacing.

C. Where new bituminous surfacing joins existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

3.6 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.7 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION 2550

SECTION 02580 – SEAL FOR ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Divisions 1 Specification Sections, apply to this Section.

B. Related Work Specified Elsewhere:

1. Section 02550: Asphalt Concrete Paving.

2. Section 02580: Pavement Marking.

C. Summary of Work: This Section includes the following:

1. Surface sealer over bituminous surfacing.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product information and application procedures for bituminous surfacing.

1.3 QUALITY ASSURANCE

A. Comply with the Standard Specifications for Public Works Construction, current edition.

B. Agitate bulk materials during transport.

1.4 MAINTENANCE

A. Extra Materials: Provide 10 gallons in unopened containers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide one of the following surface seals:

Product Name	Manufacturer
Guard-Top	Industrial Asphalt
Over Kote	Diversified Asphalt Product
Park Top	Western Colloid Products
Sure Seal	Asphalt Coating Engineering
Super Drive Top.	SAF– T Seal. Inc.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Thoroughly wash surfaces with water to remove dirt, debris, excessive oil and grease, or other foreign matter.

3.2 APPLICATION

A. Install seal coat in strict accordance with manufacturer's written directions and recommendations.

B. Install 2 coats of surface seal to new bituminous surfacing. First coat shall be installed before flood testing. Clean surface and allow to dry before installing second coat. Second coat shall be installed after bituminous surfacing has passed flood test.

C. Where new bituminous surfacing is installed adjacent to existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

D. Where existing bituminous surfacing is indicated to be patched and sealed, install 2 coats of surface seal after patching. Refer to Section 02711: Bituminous Surfacing.

3.3 PROTECTION OF SURFACES

A. Protect sealed and unsealed surfaces from damage and traffic during performance of the Work of this section and until surface seal has thoroughly set and cured. Do not permit traffic of any kind for at least 24 hours after completion of installation.

B. Protect the Work of this section until Substantial Completion.

3.4 TESTING

A. Owner reserves the right to obtain samples, perform tests to ensure compliance with the Specifications, and to review weight slips and invoices of materials delivered to the Project site.

3.5 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION 02560

SECTION 02580 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Divisions 1 Specification Sections, apply to this Section.

B. Related Work Specified Elsewhere:

1. Section 02560: Seal for Asphalt Concrete Paving.

C. Summary of Work: This Section includes the following:

1. Parking stripes, markings and accessibility symbols, as indicated.
2. Athletic court markings.
3. Playground markings.
4. Fire lane “No Parking.”
5. Curb marking and red curbs.

1.2 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings, indicating location, extent, color and texture of markings.

B. Material Samples: Submit color Samples.

1.3 PROJECT CONDITIONS

A. Do not install markings when adverse weather conditions are forecasted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint: Water emulsion-based Dura-Strip paint as manufactured by TMT-Pathway, or equal.

PART 3 - EXECUTION

3.1 PAVEMENT MARKINGS

A. Application of Paint:
1. Prior to application of paint, allow the pavement to properly cure. Clean and prepare in accordance with paint manufacturer's written recommendations.
2. Provide mechanical equipment to install paint in a uniform, straight or curved pattern, without holidays and other defects.
3. Do not permit traffic until paint has completely cured.
4. Install 2 coats in thickness recommended by manufacturer.

B. Marking Width and Color: Unless indicated otherwise, marking width and color are as follows:

	Width	Color
1. Parking stall lines	4 inches	White
2. Traffic markings	4 inches	Yellow
3. Striping:		
a. General	4 inches	Yellow
b. ADA	4 inches	Blue
4. ADA emblem	2 inches	White on blue background

3.2 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.3 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION 02580

SECTION 02630 STORM DRAINAGE

PART 1 - DESCRIPTION

1.01 SCOPE

A. The Contractor shall provide all labor and equipment necessary and required to install all of the storm drainage facilities in accordance with the Contract Documents. Work shall include, but not be limited to:

1. Installation of drainage system(s) consisting of manholes, drain inlets, catch basins, pipe, end sections, outlet control structure(s), and all necessary and required accessory items and operations, including connection(s) to existing drainage facilities.

2. Installation of building leader drains at building downspouts, where indicated on plans or as described herein, consisting of all pipe, fittings and required accessory items and operations, including connections to the proposed and/or existing drainage system. All downspouts at the front of building within 5’-0” of a sidewalk shall have leader drain connection to the storm piping.

3. Where shown, installation of underdrains consisting of all pipe, fittings and required accessory items and operations, including connections to the proposed and/or existing drainage system.

1.02 WORK SPECIFIED UNDER OTHER SECTIONS

A. The following related work is specified under other Sections:
1. Division 2: Excavation Support and Protection
2. Division 2: Earthwork
3. Division 2: Cement Concrete Pavement
4. Division 2: Asphalt Concrete Paving

1.03 OTHER REQUIREMENTS

A. In addition to the requirements specified herein, the Contractor shall comply with the requirements as specified on the Drawings.

PART 2 - CONSTRUCTION DETAILS

2.01 GENERAL

A. The Contractor shall install all drainage structures and pipe in the locations shown on the Drawings. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.

B. The installation of all drainage structures and pipe shall conform to the requirements of all Authorities having jurisdiction.

2.02 TRENCH EXCAVATION AND BACKFILL

A. The provisions of the Article of these Specifications entitled "Earthwork" shall govern all work under this Section.

2.03 STORAGE AND HANDLING

A. Storage - Storage of storm drain pipe and appurtenances on the job shall be in accordance with the manufacturers' recommendations.

B. Handling - All storm drain pipe and appurtenances shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in handling the pipe and appurtenances.

2.04 DAMAGE

A. General - Pipe and/or appurtenances which are defective from any cause, including damage caused by handling, shall be unacceptable for installation and shall be replaced by the Contractor at no cost to the Owner.

Pipe and/or appurtenances that are damaged or disturbed through any cause prior to acceptance of the Work, shall be repaired, realigned or replaced by the Contractor at the Contractor's expense.

B. Minor Imperfections in Concrete Pipe - Concrete pipe with damage which is the result of minor imperfections in manufacture which do not affect the structural integrity of the pipe may be repaired in the field. Repairs shall be sound, properly finished and cured and shall conform to the requirements of these Specifications.

2.05 PIPE INSTALLATION

A. Laying Pipe - Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with the details as shown on the Drawings and the Article of these Specifications entitled "Trench Excavation and Backfill". Pipe shall be laid upgrade unless otherwise directed by the Owner's Field Representative.

Concrete pipe with lift holes shall be laid with the lift holes on top of the pipe. After the pipe is installed, the lift holes shall be sealed with suitable concrete plugs to the satisfaction of the Owner's Field Representative. No lift holes will be permitted in pipes twenty-four (24) inches in diameter or smaller.

Bell and spigot pipe shall be laid with the bell end upgrade; tongue and groove pipe shall be laid with the groove end upgrade. Trimming of the pipe will not be allowed.

Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to the placing of a length of pipe, the end of the previously laid length shall be carefully and thoroughly wiped smooth and cleaned to obtain an even and close-fitting joint.

No length of pipe shall be laid until the proceeding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

B. Pipe Extensions - Where existing pipe is to be extended, the same type of pipe shall be used unless otherwise specified.

C. Full Lengths of Pipe - Only full lengths of pipe are to be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

D. Pipe Entrances to Structures - All pipe entering structures (e.g. manholes, drain inlets, catch basins, etc.) shall be cut flush with the inside face of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.

Only full sections of pipe shall be used where entering a structure which will be exposed to view, such as headwalls, end sections, etc.

E. Bedding and Backfilling - The type of materials to be used as bedding and backfill and the method of placement shall conform to the requirements of the Article of these Specifications entitled "Trench Excavation and Backfill" and as shown on the details of the Drawings.

F. Protection During Construction - The Contractor shall protect the installation at all times during construction. Movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be done at the Contractor's risk.

At all times when pipe laying is not in progress, all open ends of all pipes shall be closed by approved temporary watertight plugs. If water is in the trench when work is resumed, the plugs shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has been eliminated.

The Contractor shall furnish a sufficient pumping plan and shall provide and maintain at his own expense satisfactory drainage wherever needed in the trench and other excavations during the progress of the Work and at its completion for final inspection. No pipe or other structure shall be laid in water and water shall not be allowed to flow or rise under any concrete or other masonry. All water pumped or bailed from the trench or other excavation shall be conveyed in proper manner to a suitable point of discharge. The flow in all sewers, drains and watercourses encountered on the Work and in gutters along the sides of or across the Work shall be entirely provided for, both temporarily and permanently, as required, by the Contractor at his expense. All offensive water shall be removed from the Work at once.

G. Tolerance - Pipe shall be laid accurately to the line and grade shown on the Drawings. Allowable tolerances shall be one-half (1/2) inch on grade and one (1) inch on line in any section of pipe between structures. No adverse grades shall be allowed. Deviations from these tolerances shall be a basis for rejection of the line of pipe. Any line which has been rejected shall be rebuilt to the correct line and grade by the Contractor at his own expense.

H. Perforated Foundation Drain Piping – shall receive one blanket of Typar filter fabric, 30" wide coved over top of pipe and backfilled with 18" nominal #57 stone prior to general soil backfilling of trench.

2.06 PIPE JOINTS

A. Pipe shall be joined as specified herein:

1. Jointing Corrugated Polyethylene Drain Pipe - Corrugated external polyethylene couplers as provided by the pipe manufacturer shall be used. The joints shall be installed according to the manufacturer's specifications and as approved by the Civil Engineer.

2. Reinforced Concrete Pipe - ASTM C990-92.

3. PVCP Pipe – ASTM D 3034, SDR-35

2.07 STRUCTURES

A. General Requirements - All drainage structures shall be built in accordance with the details and at the locations shown on the Drawings and as specified herein. Where a specific material of construction is indicated, no substitution will be allowed unless authorized in writing by the Architect. Where more than one type of material of construction is indicated, the Contractor shall have the option of constructing the structure of any one of the materials specified. Precast concrete structures shall require shop drawing review by the Architect.

Cast-in-place concrete and/or masonry shall not be laid when the temperature is below 40 degrees F., or when indications are for lower temperatures within 24 hours, unless protection of concrete and masonry is established. In this event, the Contractor shall take measures to prevent concrete and masonry from being exposed to freezing temperatures for a period of not less than five (5) days after installation. Any damage to the structure because of freezing shall be corrected by the Contractor at his own expense.

All cast-in-place concrete and masonry shall be installed by personnel experienced and skilled in this work.

Manholes, drain inlets and catch basins are to be constructed as soon as the pipe laying reaches the location of the structures.

In constructing manholes, drain inlets and catch basins, the Contractor shall accurately locate each structure and set accurate templates to conform to the required line and grade. Any structure which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at the Contractor's expense.

The Contractor shall use extreme care in the handling of precast concrete structures due to carelessness in handling or due to any of the Contractor's operations shall be repaired or replaced by the Contractor at his own expense.

Unless otherwise specified, all structures shall be constructed on concrete foundations. All foundations shall rest on firm soil of uniform bearing. If the soil beneath the foundation is unsuitable, the Contractor shall remove this unsuitable material as directed by the Soils Engineer and replace it with an approved properly compacted granular material conforming to the requirements of the Article of these Specifications entitled "Trench Excavation and Backfill" to the bottom elevation of the structure.

B. Masonry Structures (Where shown on civil plans and where permitted) - The first course of masonry shall be embedded in the concrete foundation immediately after the foundation has been poured. Brick masonry units shall be thoroughly wetted before laying.

All masonry shall be laid in a full bed of mortar, and all vertical and horizontal joints shall be filled solid with mortar. Vertical joints on each succeeding course shall be staggered. Joints shall be not less than three-eighths (3/8) inch or more than one-half (1/2) inch wide. Joints on the inside of the structure shall be neatly struck and pointed.

Where circular concrete block structures are specified or ordered to be constructed, they shall be designed and laid so that the interior surface of the structures are cylindrical for the straight sides and, except for shallow structures as specified below, the top sections shall be conical for the top courses, with no offsets, gradually diminishing in size to receive the castings of the types and sizes shown and/or specified. Concrete block units shall be designed so that only full length units are required to lay any one course. Cut block will not be allowed.

Corner units for rectangular concrete block structures must be "L" shaped with an inside return side equal to half the length of the normal unit. Units shall be designed so that only full length units are required to lay any one course.

Unless otherwise specified, the interior surface of the walls of masonry structures shall be painted upon completion with three (3) coats of neat cement grout without sand, applied with an interval of at least 24 hours between applications. The exterior surface of the walls of masonry structures shall be plastered with a one-half (1/2) inch coat of 1:2 cement mortar.

C. Cast-in-Place Concrete Structures - Cast-in-place concrete structures shall be constructed of Class "A" concrete with reinforcing as shown in detail on the Drawings and as specified herein.

Material and construction requirements shall be as specified under the Article of these Specifications entitled "Site Concrete".

D. Precast Concrete Structures - Precast concrete structures shall be installed only after shop drawings have been approved. All precast concrete structures shall be designed and fabricated for an H-20 design load.

The base of the precast concrete structures shall be set on a foundation pad of crushed stone eight (8) inches in compacted thickness. Foundations of all precast concrete structures shall rest on firm soil of uniform bearing. If soil beneath the foundation is unsuitable, the Contractor shall remove the unsuitable material as directed by the Soils Engineer and replace it with an approved properly compacted granular backfill material conforming to the requirements of the Article of these Specifications entitled "Trench Excavation and Backfill" to the bottom elevation of the crushed stone pad.

After pipes have been installed, all openings shall be properly sealed with non-shrinking cement mortar grout as directed. Grout around pipes which protrude through the walls of the structure and on all joints shall contain "Antihydro", or other approved additive, to insure watertightness. Cement grout shall contain one (1) part cement to two (2) parts sand by volume and additive in accordance with manufacturer's recommendations. Mortar shall be applied to the bottom one-third (1/3) of the opening before the pipe is inserted.

The precast concrete top section shall be set sufficiently below finished grade to permit a maximum of four (4) and a minimum of two (2) courses of eight (8) inch brick to be used as risers

to adjust the grade of the casting. Manhole frames shall be set on a grout pad as specified herein above.

E. Shallow Circular Structures - For shallow circular structures, the top conical section shall be replaced by a flat reinforced concrete slab with the proper size opening to accommodate the specified casting. The minimum thickness of the reinforced concrete slab shall be six (6) inches and shall be designed for an H-20 design load. In general, and unless otherwise specified or directed by the Site Engineer, the flat slab top shall be used for circular structures whose depth from pipe invert to finished grade is five (5) feet or less.

F. Inverts - Smooth invert channels shall be constructed in all manholes and in all drain inlets and catch basins which do not have sumps, to insure a smooth flow of water through the structure.

Invert channels for precast concrete structures shall be constructed of concrete; invert channels for masonry structures may be constructed of concrete or brick.

Extreme care shall be taken by the Contractor to construct invert channels to the shape, elevations and dimensions shown, specified or ordered by the Site Engineer.

When a curve in the invert channel or some other condition prevents the use of channels as shown on the Drawings, then such channels shall be constructed in accordance with the directions of the Civil Engineer/Architect.

When pipes entering and leaving a manhole are of different diameters, the invert channel shall be constructed so as to provide a smooth transition from the inflow pipe(s) to the outflow pipe.

The invert channel shall be carried up to the elevations shown on the Drawings. Channels shall slope smoothly and evenly from the inflow pipe(s) to the outflow pipe.

Split pipe for channels will be considered only in those instances where the drain line is of concrete pipe and the major inflow pipe and outflow pipe is of the same size and alignment.

Invert channels shall be built for future extensions where shown on the Drawings.

G. Frames and Covers/Grates - Frames and covers/grates for drain structures shall be of the types and sizes indicated on the Drawings. Frames shall be well bedded in mortar and shall be set accurately to the correct alignment and grade. In areas to be paved, frames shall be set by using four (4) points of reference, set 90 degrees apart, to insure accurate setting to proposed pavement grade.

Where drain inlets and/or catch basins are to be placed on curb lines or at edge of pavements, sufficient length of proposed curb or edge of pavement adjacent to the structure shall be established prior to construction of the drain inlet and/or catch basin to insure that the structure is correctly located and oriented.

H.

I. Steps - Steps shall be installed in all manholes. Steps shall also be installed in all drain inlets and catch basins greater than four (4) feet in depth unless otherwise specified.

Steps shall be set securely in place during the construction of the wall for masonry structures and during fabrication of the wall section for precast concrete structures.

2.08 CONNECTIONS TO EXISTING FACILITIES

A. General Requirements - The Contractor shall make all required connections of the proposed drainage facilities into existing drainage facilities, where and as shown on the Drawings.

B. Compliance with Requirements of Owner of Facility - Connections made into existing drainage facilities shall be done in accordance with the requirements of the owner of the facility and the jurisdiction. The Contractor shall be required to comply with all such requirements, including securing of all required permits and paying the costs thereof. The cost of making the connections in accordance with the requirements of the owner of the existing facility shall be included in the Contract Sum.

2.09 ALTERATION, RECONSTRUCTION AND/OR CONVERSION OF EXISTING STRUCTURES

A. General Requirements - The Contractor shall alter, reconstruct and/or convert existing structures where as shown on the Drawings. In general, alterations shall be made with the same type of material used in the original construction unless otherwise indicated on the Drawings.

B. Adjustment to New Grade and Alignment - All castings on existing drainage structures that are to remain shall be adjusted to new grade and alignment. When such adjustment is required the castings shall be carefully removed and the walls of the structures reconstructed as required. The castings shall be cleaned and reset in a firm mortar bed to the new grade and alignment. Existing castings which are broken, damaged or otherwise unfit for incorporation into the new work shall be replaced under the Contract Sum.

C. Structures to be Converted - Structures which are to be converted (e.g. manholes to drain inlets or catch basins, drain inlets or catch basins to manholes) shall conform as closely as possible to the design of the proposed structure. Sufficient masonry shall be removed from the existing structure to insure that the walls can be rebuilt to conform to the proposed construction. Furnishing and installation of new castings for the converted structures shall be included in the Contract Sum.

D. Removal of Portions of Wall of Existing Structures - In all cases of alteration, reconstruction and/or conversions of existing structures, existing walls shall be removed to a point where the existing walls will provide sound and adequate foundation for the construction of the new walls.

E. Reconstruction and/or Rebuilding of Existing Invert -Where new pipes are to be installed into an existing structure, the existing invert shall be reconstructed and/or rebuilt as directed to accommodate installation of the new pipes and provide for proper transition of flows into and out of the structure.

F. Damage to Existing Structure and/or Pipe - The Contractor shall exercise extreme care during such alteration, reconstruction and/or conversions so as not to damage any portions of the structure and/or pipe shown to remain. Any such damage shall be repaired by the Contractor at his own expense.

G. Structures to be Cleaned - Upon completion of alteration, reconstruction and/or conversion of existing structures, all structures shall be cleaned of any accumulation of silt, debris or foreign matter of any kind and shall be kept clean of such accumulation until final acceptance of work.

2.10 RELOCATION AND/OR ABANDONMENT OF EXISTING FACILITIES

A. The Contractor shall not abandon, disconnect, obstruct or in any other way interfere with the operation of an existing storm drain facility until such time as adequate permanent or temporary substitute facilities have been constructed and placed in operation.

2.11 LEADER DRAINS

A. General Requirements - The Contractor shall make all required connection(s) of the building leader drain(s) into the on-site drainage system whether shown or not on the Drawings. Work shall include making the leader drain connection(s) into the on-site drainage system, furnishing and installing all leader drain pipe form the on-site drainage system to the building leader drains. The connection(s) shall be made with proper fittings and/or adapters compatible with the building leader drains providing watertight connection(s) and shall be done at no additional cost to the Owner. Connect all downspouts to subterranean storm water collection pipe system, whether shown specifically on drawings or not.

B. Coordination with Building Plumbing Contractor - The Contractor will be required to coordinate his work with the work of the building plumbing contractor to determine the exact location(s) and elevation(s) of the point(s) of entry into the building(s) prior to construction.

C. Connection into On-Site Drainage System - Leader drain connection(s) to the on-site drainage system shall be made at structure(s) or into the pipe where and as shown on the Drawings at every roof leader and downspout on exterior building walls. Pipe connections shall be made with proper size and type tee and/or wye fittings supplied by the pipe manufacturer.

2.12 UNDERDRAINS

A. General Requirements - The Contractor shall install all underdrains where and as shown on the Drawings.

B. Pipe Installation - A minimum of four (4) inch layer of approved underdrain filter material shall be placed and compacted in the bottom of the trench as a bedding for the pipe. Underdrain pipe of the type and size specified shall be embedded firmly in this bedding material to the line and grade shown on the Drawings.

Unless otherwise specified, perforated pipe shall be laid with the perforations down and the pipe sections shall be jointed securely with the appropriate fittings or bands. Upgrade ends of pipe underdrains shall be closed with suitable plugs.

C. Backfilling - After the pipe installation has been inspected and approved, underdrain filter material shall be hand-shoveled around and over the pipe to such a depth that, after compaction, it extends a minimum of four (4) inches above the underdrain pipe. The surface of the underdrain filter material shall then be compacted with a vibrating pad compactor, and the remainder of the filter material shall be placed in lifts not more than six (6) inches in thickness with each lift thoroughly compacted with a mechanical vibrating pad compactor. The height of filter material over all pipe shall be as indicated on the Drawings.

D. Geotextile Fabric - Geotextile fabric shall be placed where and as shown in detail on the Drawings. Ends and sides of fabric shall be lapped a minimum of twelve (12) inches.

E. Pipe Connections and Changes in Alignment - Pipe to pipe connections and changes in pipe alignment shall be made only with prefabricated fittings to be supplied by the manufacturer of the pipe (e.g. tees, wye branches, etc.).

2.13 CLEANING AND REPAIR

A. The Contractor shall clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing storm drains or streams. All debris shall be removed from the system.

After the system has been cleaned, the Contractor shall thoroughly inspect the system and all repairs shown to be necessary shall be promptly made by the Contractor.

All work of cleaning and repair as specified herein and as required by jurisdiction inspectors shall be done at the Contractor's expense.

2.14 FINAL TESTS AND INSPECTIONS

A. Upon completion of the Work and before final acceptance by the Owner, the entire drainage system shall be subjected to an inspection in the presence of the Owner's Field Representative. The Work shall not be considered as complete until all design and jurisdiction requirements for line, grade cleanliness, and workmanship have been met.

PART 3 - MATERIALS

The materials to be used in the construction shall be those indicated on the Drawings and specified herein. The Contractor shall supply to the Architect, prior to installation, certificates of compliance for the materials used. The Contractor shall also submit shop drawings and catalog cuts of all storm drain items and appurtenances (pipe, fittings, joints, castings, steps, precast concrete structures, etc.) to the Architect for approval prior to ordering.

3.01 STORM DRAIN PIPE, FITTINGS AND JOINTS

A. Corrugated Polythylene Drain Pipe and Fittings (CPDP) - shall have a smooth interior and conform to the requirements of AASHTO Designation M-294. Pipe shall be Hi-Q Pipe as manufactured by Hancor or approved equal or as indicated on drawings with same requirements.

B. Underdrains - Pipe, Fittings and Filter Materials

1. Perforated Polyvinyl Chloride Pipe (PPVCP) - shall conform to the requirements of AASHTO Designation M-278, and shall be Perforated Highway Underdrains and Fittings as manufactured by Carlon or approved equal.

2. Filter Material - shall be approved crushed aggregate meeting the requirements of ASTM Designation C-33, size No. 57.

3. Filter Fabric - shall be Mirafi 140N or approved equal.

C. Polyvinyl Chloride Pipe and Fittings For Gravity Lines (PVCP)

1. Shall conform to the requirements of ASTM Designation D-3034 for SDR-35 extra strength pipe and fittings. Pipe shall have integral wall bell and spigot joints. Assembly shall be by means of push-on joints using flexible elastomeric seals conforming to ASTM Designation D-3212.

   All fittings and accessories shall be furnished by the pipe manufacturer. Joint lubricant shall be as recommended by the pipe manufacturer.

2. PVC pipe shall have common profiles for inter-changeability between rough-barrel dimensions, couplings, ends, and elastomeric gaskets to facilitate future repairs. When assembled, the pipe shall have only one gasket per bell and spigot end, and/or two gaskets per coupling.

3. Sewer pipe shall be furnished in standard 3.96m or 6.10m (13' or 20") lengths, unless otherwise detailed or required on the Approved Plans.

5. Follow the Manufacturer's recommendations for the minimum allowable radius for the size of pipe used.

6. All pipe, fittings, and couplings shall be clearly marked in accordance with ASTM D3034, F679, and F794, respectively.

6. All pipe shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

3.02 STRUCTURES

A. General - Where material requirements specified hereinafter conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction shall govern.

B. Brick - shall conform to the "Specifications for Sewer and Manhole Brick (made from Clay or Shale)", AASHTO Designation M-91, Grade MS.

C. Concrete Block - shall be solid block and shall conform to the "Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes", ASTM Designation C-139.

D. Precast Concrete Structures - Prior to fabrication, the Contractor shall submit four (4) sets of plans of the proposed precast concrete structures to the Site Engineer for approval along with design criteria and certification by the manufacturer that the structure will support the design load. Unless specified otherwise, precast concrete structures shall be designed for an H-20 design load.

   Precast concrete manhole sections shall conform to ASTM Designation C-478. Joints for manhole sections shall conform to ASTM Designation C-443.

   The minimum compressive strength of the concrete used for all precast structures shall be 4,000 psi. Where steps are required in structures, steps shall be installed during the casting of the structures, aligned as specified herein. Joints in the structures shall be tongue and groove joints, formed in such a manner so that a watertight rubber seal can be applied.

No precast concrete structure shall be fabricated or delivered to the job site until it has been reviewed by the Architect. All structures shall have an identifying number and manufacturer's name on each section.

When precast concrete structures are to be used, the Contractor shall bear all responsibility for the proper locations and sizes of all openings to receive the pipe. The review of shop drawings by the Architect shall not relieve the Contractor of his responsibility in this matter. Should field revisions to the structure be necessary due to improper location of openings or unforeseen field conditions such as line and/or grade changes, deletion of structures, relocation of structures, or addition or deletion of lines to be connected into the structures, then the Contractor will be required to make all necessary and required revisions to the satisfaction of the Architect and at no additional cost to the Owner.

E. Manhole Frames and Covers - shall be as specified on the Drawings. Castings shall be gray cast iron, American made by a nationally recognized casting manufacturer conforming to the requirements of AASHTO Designation M-105, Class 30 and shall be true to pattern in form and dimensions as specified, free from pouring faults, sponginess, cracks, blowholes and other defects that affect their strength and other characteristics for the intended use. All surfaces have a workmanlike finish.

All component parts shall fit together in a satisfactory manner and frames and covers shall be of a design that will prevent rocking or rattling under traffic. Frames and covers that are warped or rocking shall be rejected and shall be removed and replaced.

Unless otherwise specified, the word "STORM" shall be integrally cast on the cover in raised letters and centered. Letter size shall be two (2) inches.

If directed, and at no additional cost to the Owner, castings shall be coated with an asphalt paint which shall result in a smooth coating and not be tacky or brittle.

F. Drain Inlet and Catch Basin Frames and Grates - shall be as specified on the Drawings and in accordance with the following requirements and shall be American made by a nationally recognized casting manufacturer:

1. Cast Iron - shall be gray cast iron castings conforming to the requirements of AASHTO Designation M105, Class 30. All requirements of workmanship and material as specified for manhole castings shall apply herein. If directed, and at no additional cost to the Owner, castings shall be coated with an asphalt paint which shall result in a smooth coating and not be tacky or brittle.

All component parts of the frames and grates shall fit together in a satisfactory manner and frames and covers shall be of a non-rocking design so as to prevent rocking or rattling under traffic. Frames and grates that are warped or rocking shall be rejected and shall be removed and replaced by the Contractor.

G. Concrete and Reinforcing - shall conform to the requirements as specified under the Section of these Specifications entitled "Site Concrete".

H. Mortar - shall be composed of one (1) part Portland cement and two (2) parts sand by volume. Material requirements shall be as follows:

1. Portland Cement - shall conform to the requirements of AASHTO Designation M-85.

2. Mortar Sand - shall conform to the requirements of AASHTO Designation M-45, except that aggregate shall be no coarser than #8 sieve size.

3. Water - shall be clean and shall not contain any oil, acid, alkali, salts, vegetable matter, organic matter or other deleterious substances. When possible, water shall be from a municipal system.

Hand mixing of mortar will be permitted only when the amount of mortar to be used makes machine mixing undesirable. When hand mixing is used, the ingredients must first be thoroughly mixed dry in a tight box. The proper quantity of clean water shall then be gradually added, and the materials shall be hoed or worked until a uniform mixture is secured. Admixtures may not contain calcium chloride.

No greater quantity of mortar is to be prepared than is required for immediate use, and it shall be worked over constantly with hoe or shovel until used. No mortar shall be retempered, and none shall be used more than one and one-half (1-1/2) hours after mixing. All mortar which remains upon stopping work shall be discarded.

I. Steps - Steps in drainage structures shall be as specified herein and on the details of the Drawings and shall meet the requirements for steps and ladders as specified under ASTM Designation C-478.

1. Malleable or Ductile Cast Iron - shall be designed for a minimum design live load of a single concentration of 300 pounds. Material shall be of Iron, Class 25A, in accordance with ASTM Designation A-48 or Malleable Iron, Grade 35018 in accordance with ASTM Designation A-47.

2. Plastic Coated Steel - shall be No. 4 deformed reinforcement bar meeting the requirements of ASTM Designation A-615, Grade 60 which shall be coated with polypropylene plastic meeting the requirements of ASTM Designation D-2146 for Type II, Grade 49108.

All steps shall be true to pattern, form dimensions, and free from defects which would affect their strength. Steps having defects filled with putty or cement of any kind shall be rejected.

END OF SECTION

SECTION 02751 - CEMENT CONCRETE PAVEMENT

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.

1.2 SUMMARY

A. Section Includes:

1. Driveways
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

B. Related Sections:

1. Division 2 Section "Earthwork".

2. Division 2 Section "Pavement Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

3. Division 3 Section "Cast-in-Place Concrete" for general building applications, site walls and other structural elements of concrete.

1.3 REFERENCES

A. Organization and Trade Standards
1. Standard Specifications for Public Works Construction, latest edition, as adopted by local jurisdictional authority, including amendments.
2. Regional Standard Drawings, current edition, with all local agency amendments.

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.5 SUBMITTALS

A. Mix Design/Materials List:

1. Submit concrete mix design prepared by a certified batch plant or laboratory, selected by Contractor and acceptable to Owner, for review and approval.

2. Accompanying mix design, submit materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. For the following, from manufacturer:
   a. Cementitious materials.
   b. Steel reinforcement and reinforcement accessories.
   c. Admixtures.
   d. Curing compounds.
   e. Joint fillers.

B. Other Action Submittals:

1. 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 for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:

1. Exposed Aggregate: 10-lb (4.5-kg) Sample of each mix.
2. Wheel Stops: 6 inches (150 mm) long showing cross section; with fasteners.

D. Material Test Reports: For each of the following:

1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

E. Shop Drawings: Show locations and layout of isolation (expansion) joints and contraction (control) joints.

F. Mock-up
1. Prior to installing any concrete paving, construct, at an approved location on-site, an individual mock-up showing each concrete paving finish specified and shown on drawings. Mock-up shall include sealant joint preparation. Each finish shall be 4' x 4' minimum. Obtain Architect's approval of mock-up.
2. All concrete paving shall match approved mock-up.
3. Remove mock-up after completion of work and dispose off-site.

1.6 QUALITY ASSURANCE

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

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.

C. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

D. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

1.7 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials or 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. General
1. All improvements shall be constructed per the referenced standards, the contract documents, and as specified in this section.
2. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, the more stringent criteria shall apply.

2.2 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 (30.5 m) or less. Do not use notched and bent forms.

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.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

B. Plain-Steel Wire: ASTM A 82/A 82M.

C. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs. Provide polyethylene closed-end sleeve or approved alternate at expansion joint dowels

D. Where deformed bar reinforcing not shown, provide welded wire fabric, flat sheet stock, 12x12-W2.8x2.8 or approved equivalent, per ASTM A-185, at all concrete paving conditions.

E. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

F. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), 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.

G. 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.

H. Zinc Repair Material: ASTM A 780.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, gray portland cement Type II, low alkali, produced in the United States. Supplement with the following:

a. Fly Ash: ASTM C 618, Class C.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:

1. Aggregate Sizes: [**3/4 to 1 inch (19 to 25 mm)**] [**1/2 to 3/4 inch (13 to 19 mm)**] [**3/8 to 5/8 inch (10 to 16 mm)**] <**Insert dimensions**> nominal.
2. Aggregate Source, Shape, and Color: <**Insert requirements**>.

D. Water: Potable and complying with ASTM C 94/C 94M.

E. 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/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) 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.

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

a. Axim Italcementi Group, Inc.; Caltexol CIMFILM.
b. BASF Construction Chemicals, LLC; Confilm.
c. ChemMasters; Spray-Film.
d. Conspec by Dayton Superior; Aquafilm.
e. Dayton Superior Corporation; Sure Film (J-74).
f. Edoco by Dayton Superior; BurkeFilm.
g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; VaporAid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.
k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation, Inc.; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Basis of Design - Provide Burke Aqua Resin, with fugitive dye, and complying with ASTM C309, Type 1-D at all natural color concrete curbing and non-paving applications.

2. Products: Basis of Design - Provide Scofield Lithochrome Colorwax curing compound, VOC compliant formulation, at all integral colored concrete paving.

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

a. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
b. ChemMasters; Safe-Cure Clear.
c. Conspec by Dayton Superior; D.O.T. Resin Cure.
d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
e. Edoco by Dayton Superior; DSSCC Clear Resin Cure.
f. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; AQUA KURE - CLEAR.

i. L&M Construction Chemicals, Inc.; L&M CURE R.
j. Meadows, W. R., Inc.; 1100-CLEAR SERIES.
k. Nox-Crete Products Group; Resin Cure E.
l. SpecChem, LLC; PaveCure Rez.
m. Symons by Dayton Superior; Resi-Chem Clear.
n. Tamms Industries, Inc., Euclid Chemical Company (The); TAMMSCURE WB 30C.
o. TK Products, Division of Sierra Corporation; TK-2519 WB.
p. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.

4. Cure and Sealing Compound
   a. Products: Basis of Design - Provide Burke Spartan-Cote WB, complying with ASTM C309, Type 1-A and B, at natural color exterior concrete paving.

2.6 PAVING BASE

A. Where shown on drawings, provide crushed aggregate base per Section 200-2.2.1 of the Standard Specification for Public Works Construction “Greenbook”.

2.7 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Expansion Joint Material: W. R. Meadows or equal, Sealtight Fiber filler, full depth of slab, matching profile, 1/2 inch thickness or as shown on drawings.

C. Expansion Joint Material - Radius Conditions: W. R. Meadows or equal, Sealtight Ceramar flexible foam resilient filler, full depth of slab, 3/8 inch thickness or as shown on drawings.

D. Joint Cap: W. R. Meadows or equal, SealTight Snap Cap, size required for expansion material.

E. See Division 2, “Pavement Joint Sealant” for sealant use after removal of Snap Cap.

2.8 PAVEMENT MARKINGS

A. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.

   1. Color: White, Yellow, Blue or as indicated.

B. Pavement-Marking Paint for painted lines and markings for accessible and disabled parking and site access:

   1. Color: Blue in color equal to Color No. 15090 per Federal Standard 595B.

   2. Width: Painted lines and markings on pavement shall be 3” minimum wide.

   3. Parking spaces for disabled shall be marked according to CBC Section 1129B.3.

   4. Tactile warning lines shall be in conformance to CBC Section 1133B.8.3, 1133B.8.4 and 1133B.8.5.

C. Glass Beads: AASHTO M 247, Type 1.

2.9 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete, 2500-psi (17.2-MPa) minimum compressive strength, 4-1/2 inches (115 mm) high by 9 inches (225 mm) wide by 72 inches (1820 mm) long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.

1. Dowels: Galvanized steel, 3/4 inch (19 mm) in diameter, 10-inch (254-mm) minimum length.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M) and Public Works Construction Standard Specifications (Green Book), 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 meet or exceed requirements.

B. Product Characteristics: Paving/flatwork/ramps/stairs:
1. Compressive Strength: 3250 psi. Strength selected for durability. Concrete is non-structural, and does not require special inspection.
2. Combined Aggregate Grading:
   a. Class C per Standard Specification for Public Works Construction “Greenbook” Section 201-1.3.2
   b. Aggregate shall be non-reactive per ASTM C 289, and shall comply with ASTM C33, Table 3, Class 4M.
3. Cement Content: 560 pounds per cubic yard concrete
4. Slump: 4 inch maximum
5. Finish:
   a. Broom finish natural concrete paving.
   b. Broom finish integral color concrete paving.
6. Water-Cement Ratio: 0.55 maximum.
7. Integral Color Admixture: Scofield Chromix or equal.
8. Surface Retarder: Scofield Lithotex Top Surface Retarder or equal.

C. Product Characteristics: Curbing, gutters, related drainage components.
1. Compressive Strength: 3250 psi
2. Combined Aggregate Grading:
   a. Class C per Standard Specification for Public Works Construction “Greenbook” Section 201-1.3.2
3. Cement Content: 520 pounds per cubic yard concrete
4. Slump: 4 inch maximum
5. Finish: Per Section 303-5.5.2 of Standard Specifications for Public Woks Construction, “Greenbook,” and with flatwork finishes as defined in this Section and per Drawings.

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.

1. Use water-reducing admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage by weight of cementitious materials other than portland cement according to ACI 301 (ACI 301M) requirements for concrete exposed to deicing chemicals. As follows:

1. Fly Ash or Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperatue is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 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 (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Division 2 Section "Earthwork."

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

3.2 PREPARATION

A. Verify sub-grade, base material, conduit, and all other embedded items are properly located in relation to concrete paving. Secure all embedded items against displacement during pour.

B. Verify all grades for pitch and fall prior to pouring pavements.

C. Verify that all cross-fall and ramp criteria comply with all accessibility regulations, including Title 24 requirements.

D. Verify compaction of existing subgrade complies with criteria specified in Division 2, “Earthwork.”

E. Notify inspector 48 hours prior to placing concrete. Obtain inspectors approval of subgrade, forming and embedded items prior to placing.

F. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 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. Coat forms with approved bond breaker, suitable for use on integral colored concrete without staining or discoloration. Place sand bed over existing paving receiving new concrete paving.

3.4 STEEL REINFORCEMENT

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. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

3.5 JOINTS

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. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

4. 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. Provide expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.

2. Provide where paving is adjacent to walls, bollard or column penetrations, light pole, utility box or footings.

3. Provide at pavement plazas and fields, approximately 20 feet on center each way, and as necessary to limit area to a maximum of 400 square feet.
4. Extend joint fillers full width and depth of joint and terminate not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
5. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
6. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together
7. Tool all edges adjacent to expansion material with maximum 1/8 inch radius tool..
8. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint and provide bondbreaker tape at surface of joint material cover cap.
9. Provide sealant and backer rod assembly per Division 2, “Pavement Joint Sealants” when provided, if not see Division 7, “Joint Sealants” and as shown on drawings

D. Contraction (Control) 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, to match jointing of existing adjacent concrete paving:

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 (6-mm) 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 (75 mm) 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 (3-mm) 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 (75 mm) 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.
4. Provide at curbs, curb and gutter assemblies, and cross gutters at 20 feet on center maximum. Where concrete pavement occurs adjacent to curb, align curb and pavement joints.
5. Provide at pavement plazas and fields, approximately 10 feet on center each way, and as necessary to limit area to a maximum of 100 square feet.
6. Provide at pavement areas at all re-entrant corners and at changes in direction.
7. Provide control (weakened plane) joints by saw cutting method, hand held jointing tools, or by use of SOF-CUT equipment. Use of zip-strip not acceptable.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 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 (ACI 301M) 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 (ACI 301M) 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, dowels 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 bleed water 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.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

L. Cold-Weather 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 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) 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.

M. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) 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, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water 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. 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.

2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:

1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).

1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.

2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread [**25 lb/100 sq. ft. (12 kg/10 sq. m)**] [**40 lb/100 sq. ft. (19.5 kg/10 sq. m)**] [**60 lb/100 sq. ft. (29 kg/10 sq. m)**] <**Insert rate of application**> of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
4. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.Retain first paragraph below for rock-salt finish. Avoid this finish if water may be trapped and frozen in pitted surface. Revise weight of salt and procedure according to texture desired. Verify weight of salt on Project mockup if necessary.

3.9 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. x h (1 kg/sq. m 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.

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 (300-mm) 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 (300 mm) 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 that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

4. Cure all integral color concrete with Lithochrome curing wax, applied as directed by Scofield. Do not permit overspray onto natural colored concrete.

3.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Level: 3/16 inch plus or minus, at any point, measured along a 10 foot straight edge.
2. Adjacent surfaces: 1/8 inch maximum difference at any point between adjacent concrete pours or between paving and adjacent paving materials.
3. Joint Alignment: 1/16 inch deviation from adjacent joint.
4. Line: 1/4 inch, plus or minus, deviation from a straight line in any 10 foot length, non-cumulative.
5. Final elevations shall comply with grades as shown on drawings, to a tolerance of plus or minus 0.25 inch.
6. Tolerances do not permit violation of dimensions or grade and slopes relationships required by code or jurisdictional authority. Adjust work as required to comply with such requirements.

3.11 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).

3.12 WHEEL STOPS

A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.

B. Securely attach wheel stops to paving with not less than two galvanized-steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.13 FIELD QUALITY CONTROL

A. Flood Test
1. Provide flood test of all gutters and paving as directed by Architect.
2. Where ponding occurs, or where drainage rate is less than that established by original design, replace all defective concrete. Remove concrete to the nearest joint line.

B. Appearance
1. Remove and replace concrete not matching approved mock-up, concrete not complying with specified tolerances, and concrete with the following defects.
   a. Inconsistent texture.
   b. Irregular or misaligned direction of texture.
   c. Concrete with spalled or raveled control or expansion joints.
   d. Concrete exhibiting splotching or discoloration in surface including discoloration due to "carbonation".
   e. Concrete exhibiting cracking, including shrinkage cracking, where cracks are located between joint pattern.

2. Use of patching mortar for repair of edge defects is subject to acceptance of final color and texture by Architect. Use of patching mortar not acceptable for repair of defective exposed aggregate finished concrete.

C. Testing Services: Testing 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 100 cu. yd. (76 cu. m) 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/C 143M; 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/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; 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.

D. 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 (3.4 MPa).

E. 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.

F. 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.

G. 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.

H. Concrete paving will be considered defective if it does not pass tests and inspections.

I. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

J. Prepare test and inspection reports.

3.14 REPAIRS 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. Use of patching mortar for repair of edge defects is subject to acceptance of final color and texture by Architect. Use of patching mortar not acceptable for repair of defective exposed aggregate finished concrete.

C. 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.

D. 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.

E. 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.

END OF SECTION 02751

SECTION 02870
SITE FURNISHINGS

PART 1 – QUICK CRETE

1.1 SUMMARY

A. Provide:
1. (QR30SP) 30” Diameter SRC Sphere Bollards with anchor bolt attachment method.

2. QR8BR) 8” Diameter by 30” High Litecrete (GFRC) Removable Bollards with two piece galvanized steel anchoring attachments with locking hasp. Bollard to not exceed 75 pounds with steel plate and pipe.

3. All dimensions, features (reveals, details) and radii to be within a ¼’ tolerance from specified product.

1.2 REFERENCES

A. Architectural Precast Association (APA).

B. ASTM

1.3 SUBMITTALS

A. Product Data: Submit product data for manufactured materials and products.

B. Shop Drawing

1. Show in-place location, fabrication details, plans, elevations, anchorages, reinforcement, connection details and methods, dimensions, finishes, relationships to adjacent materials, and erection and placement.

C. Samples: Nominal size 6” sq. by appropriate thickness, of each type of unit and finished facing shown and specified for approval of quality, color, and texture of surface finish. Submit prior to fabrication.

D. Mix Design(s): Proposed concrete mix design for each type and color of concrete mix.

E. Test Reports: Compressive Strength. Supply 12 test results from the last year showing the required results of 5000 PSI.

1.4 QUALITY ASSURANCE

A. Fabricator’s Qualifications: Firm shall have a minimum of five (5) years experience in producing units similar to those required for this Project, with sufficient production capacity to produce and deliver required units without causing delay in Work.

1. Fabricating plant shall be a member of one of the following:
a) Architectural Precast Association (APA).
b) Precast/Prestressed Concrete Institute (PCI), Group A1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver units to the Project site in such quantities and at such times to ensure continuity of installation.

B. Deliver on a truck owned by the manufacturer. Truck to have a crane or a forklift for placement. Driver to be trained to use applicable equipment. Placement where possible. Contractor to place product not reachable by manufacturer's equipment.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Approved Fabricators:
1. Quick Crete Products Corp. P.O. Box 639 Norco, CA 92860. (909)737-6240 (main office), (909) 737-7032 (fax) www.quickcrete.com
2. Fabricators not listed as approved shall request approval. Approval request must be sent to the owner 30 days before bid opening. Request must include drawings, color samples, and an actual product for review by owner. Approved Fabricator must be able to produce 20 units a week within 2 weeks of receiving a purchase order. Approved Fabricator must ship on company owned trucks equipped with a crane or forklift for off-loading product.

2.2 MATERIALS

A. Concrete Materials:
1. Portland Cement: ASTM C 150, Type I(white) or III (gray), to achieve desired finish colors. Use only one brand, type, and color from the same mill.
2. Aggregates: ASTM C 33, gradation may differ to achieve desired finish characteristics. Select coarse and fine aggregate colors and screen sizes to match approved sample(s). Verify that adequate supply, from one pit or quarry, for each type of aggregate is available for the entire Project. If possible obtain entire aggregate supply prior to starting Work, or have aggregate supply held in reserve by aggregate supplier.
3. Water: Potable. Clean, clear, and free from deleterious amounts of salts, acids, alkali's, organic materials, oils, detergents, or other matter that may interfere with color, curing, or strength of concrete.
4. Admixtures: Select to be compatible in specified mix.
   a) Air Entraining: ASTM C 260.
   b) Water Reducing: ASTM C 494, Type A,B,C,F. or G.
   c) Coloring Agent: ASTM C 979, compatible with other concrete materials.

B. Formwork:
1. Provide forms with acceptable form facing materials that are non-reactive with concrete or form release agents and will produce required finish surfaces.
2. Construct and maintain forms to produce precast concrete units of shapes, lines, and dimensions indicated, within specified tolerances.

C. Reinforcing Materials:
1. Reinforcing Bars: ASTM A 615, Grade 40

2.3 MIXES

A. Design mixes for each type of concrete specified may be prepared by an independent testing agency or by architectural precast manufacturing plant personnel at precast fabricator's option.

B. Proportion mixes by either testing agency trial batch or field test data methods in accordance with ACI 211.1, using materials to be used on the project, to provide normal weight concrete with properties as follows:

1. Compressive Strength: 5,000 psi when tested in accordance with ASTM C 39.
2. Maximum water cement ratio 0.47 at point of placement.

3. Add air-entrainment admixture to result in air content at point of placement complying with ACI 533 requirements.
4. List other admixtures and recommended quantities.

2.4 FABRICATION

A. General:
1. Fabricate precast concrete units with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances as specified in ACI 533, unless more stringent requirements are shown or specified.
2. Fabricate units straight, smooth and true to size and shape, with exposed edges and corners precise and square, unless otherwise indicated.

B. Reinforcement: Comply with CRSI "Manual of Standard Practice" and ACI 318 recommendations. Reinforce architectural precast concrete units to resist handling, transportation stresses, and to comply with specified performance criteria.

C. Comply with ACI-533 requirements for measuring, mixing, transporting, and placing concrete.

D. Consolidate concrete using equipment and procedures complying with ACI 533.

E. Discard units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by the Owner and meet specified requirements.

F. Fabrication Tolerances: Fabricate to tolerances listed in ACI-533.

2.5 FINISHES

A. Finish exposed surfaces or units to match Owner's reference sample:

1. Color and Texture to be selected by the Landscape Architect.
2. Surface finish free from pockets, sand streaks, honeycomb, with uniform color and texture. Bugholes less than 1/4 inch in diameter are acceptable only on heavier blasted finishes. <u>Bugholes not acceptable on smooth, light sandblast or acid etch finishes.</u>

B. Seam lines to be stoned neatly to minimize appearance. Products with wide seam lines could be subject to rejection.

2.6 SEALERS

A. All surfaces to be sealed with three coats of a water based acrylic sealer, which has graffiti-resistant qualities. Must be non-sacrificial so most graffiti can be cleaned with lacquer thinner and not require resealing.

2.7 SOURCE QUALITY CONTROL

A. Inspect and test architectural precast concrete in accordance with ACI 533.

B. Defective Work: Discard units that do not conform to requirements as shown or specified. Replace with units which meet requirements.

2.8 GUARANTEE

A. Fabricator to provide a one-year guarantee against manufacture's defect

PART 1 - BENCH SPECIFICATIONS

1.1 DESCRIPTION
A. Section includes information, materials, and options for products manufactured by Victor Stanley, Inc. All specifications are subject to change. Contact manufacturer for details.

1.2 SUBMITTALS
A. Specifications Drawing: Detail drawing of product including overall dimensions and options.
B. Samples: Various component samples available upon request.
C. Qualifications: Installer must submit evidence of a successful installation history with comparable materials and designs specified.

1.3 DELIVERY, STORAGE, and HANDLING
A. Delivery: Deliver products to site in manufacturer's original, unopened containers and packaging. Upon delivery, examine packages immediately to ensure all products are complete and undamaged.
B. Storage: Store products in a protected, dry area in manufacturer's unopened containers and packaging.
C. Handling: Protect product's finish from damage during handling and installation.

1.4 COORDINATION
A. Coordinate with site work and other appropriate sections of the specifications to maintain proper provisions of the work specified.
B. All site furnishings shall be laid out in the field and approved prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

A.Victor Stanley, Inc.
P.O. Drawer 330
Dunkirk, MD 20754 USA
Toll Free: (800) 368-2573 (USA & Canada)
Tel: (301) 855-8300 Fax: (410) 257-7579
E-mail: *sales@victorstanley.com*
Web site: http://www.victorstanley.com

2.2 BENCH
A. Type: Model FBF-50 from the Street Sites Series ™
B. Patents Pending.

2.3 MATERIALS
A. 1/4" x 1-1/2" (6.35mm x 38.1mm) horizontal solid steel slats 3/8" x 1 (9.53mm x 25.4mm) solid steel bracing; 1-7/8" (47.63mm) tubular steel cross-members

2.4 OPTIONS
A. Standard lengths: 4ft (1.2 meters), 6ft (1.8 meters), & 8ft (2.4 meters) (custom lengths available)
B. Armrest(s)
C. Mounting: Standard in-ground or surface.
D. Standard Colors: VS Bronze, VS Black, VS Green, VS Tavern Square Green, VS Teal,VS Blue, VS Burgundy, VS Red, VS White, VS Gray (custom colors available, including RAL range, at a small additional cost)

2.5 FINISHES
A. All fabricated metal components are steel shotblasted, etched, phosphatized, preheated, and electrostatically powder-coated with TGIC polyester powder coatings. Products are fully cleaned and pretreated, preheated and

coated while hot to fill crevices and build coating film. Coated parts are fully cured to coating manufacturer's specifications. The thickness of the resulting finish coat averages 8-10 mils (200-250 microns).

B. In high salt abusive climates, hot dip galvanizing before powder coating is available. Hot dip galvanizing will provide greater protection in salty climates but yields a slightly less smooth coating finish. Most fabricated metal components and castings can be hot dip galvanized, lids cannot, please contact manufacturer for details.

PART 3 EXECUTION

3.1 INSTALLATION

A. Standard in-ground: It is not recommended to locate footing(s) until bench is in place.
This Victor Stanley, Inc product must be permanently affixed in the ground.
Consult your local codes for regulations.

B. Standard surface: Clearance for 3/8" (9.53mm) anchor bolts (anchor bolts not provided by Victor Stanley, Inc.) It is not recommended to locate anchor bolts until bench is in place. This Victor Stanley, Inc. product must be permanently affixed to the ground. Consult your local codes for regulations.

3.2 PROTECTION

A. Protect products prior to installation by having them remain in the manufacturer's packaging and container.

1.1 PART 1 GENERAL Model: DYN-36, TRASH RECEPTACLES

1.1 DESCRIPTION

A. Section includes information, materials, and options for products manufactured by Victor Stanley, Inc. All specifications are subject to change. Contact manufacturer for details.

1.2 SUBMITTALS

A. Specifications Drawing: Detail drawing of product including overall dimensions and options.
B. Samples: Various component samples available upon request.
C. Qualifications: Installer must submit evidence of a successful installation history with comparable materials and designs specified.

1.3 DELIVERY, STORAGE, and HANDLING

A. Delivery: Deliver products to site in manufacturer's original, unopened containers and packaging. Upon delivery, examine packages immediately to ensure all products are complete and undamaged.
B. Storage: Store products in a protected, dry area in manufacturer's unopened containers and packaging.
C. Handling: Protect product's finish from damage during handling and installation.

1.4 COORDINATION

A. Coordinate with site work and other appropriate sections of the specifications to maintain proper provisions of the work specified.
B. All site furnishings shall be laid out in the field and approved prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Victor Stanley, Inc.
P.O. Drawer 330
Dunkirk, MD 20754 USA
Toll Free: (800) 368-2573 (USA & Canada)
Tel: (301) 855-8300 Fax: (410) 257-7579
E-mail: sales@victorstanley.com
Web site: http://www.victorstanley.com

2.2 LITTER RECEPTACLE

A. Type: Model DYN -36 from the Dynasty Series™
B. Patents pending

MATERIALS

A. 1/4" x 1-1/2" (6.35mm x 38.1mm) vertical solid steel bars; 1/4" x 2-1/2" (6.35mm x 63.5mm) solid steel top band; 1/4" x 2" (6.35mm x 50.8mm) solid steel support bars; leveling feet with a 3/8" (9.53mm) diameter threaded steel shaft
B. 36-gallon (136 liter) capacity high density plastic liner [weight not to exceed 6 lbs. (2.72 kg)]
    a. Victor Stanley, Inc., plastic inner liners are molded on tooling designed for and owned by Victor Stanley, Inc. They offer maximum capacity and strength with lightweight construction using critical molded ribs, integral handholds, and high strength materials. This minimizes handling difficulty and facilitates easy emptying and storage while affording long service life.

2.3 OPTIONS

A. Lids: Shipped with standard tapered formed lid; available with optional S-2A formed dome, S-2A formed dome with stainless steel ashtray, S-3 formed dome, S-3 formed dome with stainless steel ashtray, and DS-32 formed dome with self-closing door
B. Standard colors: VS Bronze, VS Black, VS Green, VS Tavern Square Green, VS Teal, VS Blue, VS Burgundy, VS Red, VS White, VS Gray, VS Silver (custom colors available, including the RAL range, at a small additional cost)
C. Custom plaques and decals: Steel plaques in various sizes and pressure sensitive vinyl outdoor decals.

2.4 FINISHES

A. All fabricated metal components are steel shotblasted, etched, phosphatized, preheated, and electrostatically powder-coated with TGIC polyester powder coatings. Products are fully cleaned and pretreated, preheated and coated while hot to fill crevices and build coating film. Coated parts are fully cured to coating manufacturer's specifications. The thickness of the resulting finish averages 8-10 mils (200-250 microns).
B. In high salt abusive climates, hot dip galvanizing before powder coating is available. Hot dip galvanizing will provide greater protection in salty climates but yields a slightly less smooth coating finish. Most fabricated metal components and castings can be hot dip galvanized, lids cannot, please contact manufacturer for details.

PART 3 EXECUTION

3.1 INSTALLATION

A. 3/4" (19.05mm) square anchor bolt hole (anchor bolt not provided by Victor Stanley, Inc.)B.Mounting: It is not recommended to locate anchor bolts until receptacle is in place. This Victor Stanley Inc. product must be permanently affixed to the ground. Consult your local codes for regulations.

3.2 PROTECTION

A. Protect products prior to installation by having them remain in the manufacturer's packaging and container.

END OF SECTION

SECTION 02935 - MAINTENANCE OF PLANTING
PART 1 - GENERAL

1.01 SUMMARY

A. Section includes maintenance of planting.

B. Related Sections:

1. Division 2 Section “Amending Planting Soils” for requirements related to amending subgrade planting soils.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.
1. Pesticides and Herbicides: Include product label and manufacturer’s application instructions specific to this project.

B. Work Plan: Submit a work plan describing sub-grade preparation and maintenance procedures prior to performing work.

1. Include detailed description of methods, equipment, and accessory/supplementary materials used for each specific operation and sequence of operations.

a. Delineate methods for sub-grade preparation and maintenance procedures.
b. Include detailed description of procedures to compensate for changes in construction schedule milestones.

2. Include description of interfacing with other trades, and sequencing of related work.
3. Include schedule when sub-grade preparation operations will be performed.

a. Indicate, by day, when specific sub-grade preparations are to be performed. Note other activities affecting or affected by the work of this section, including Owner’s installation of turf sod, relative to sub-grade preparation schedule milestones.

C. Qualification Data: For qualified landscape contractor

D. Maintenance Instructions: Recommended maintenance procedures to be utilized by Owner for maintenance of plants during a complete, full calendar year. Submit before expiration of Contractor’s maintenance periods.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: A qualified contractor whose work of the specific type indicated, has resulted in successful plant establishment and maintenance.

1. Professional Membership: Member in good standing of either the Professional Landcare Network, American Nursery and Landscape Association, or other recognized organization acceptable to Owner.
2. Experience: Three years’ experience in plant installation and maintenance.
3. Field Supervision: Required to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Field supervisor assigned to the Work shall have certification in one of the following categories from the Professional Landcare

Network, or other equivalent, recognized certification process acceptable to owner.

a. Certified Landscape Technician - Exterior, with maintenance specialty area(s), designated CLT- Exterior.
b. Certified Turfgrass Professional, designated CTP.
c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.

5. Pesticide Applicator: State licensed, commercial.

B. Pre-Work Conference: Conduct conference at Project site

1.04 PROJECT CONDITIONS

A. Work Restrictions: Coordinate work of this section, including sub-grade preparation and maintenance periods with periods of planting (by others) to provide required maintenance from date of planting completion.

B. Weather Limitations: Proceed with work, including maintenance procedures only when existing and forecasted weather conditions permit work and maintenance to be performed when beneficial and optimum results may be obtained. Perform maintenance procedures during favorable weather conditions according to plant material source supplier's written instructions.

1.05 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide full maintenance by skilled, qualified personnel. Maintain as required in Part 3. Begin maintenance immediately after ach area is planted and continue until planting is established, and acceptable to Owner, but for the following period:

1. From date of planting completion until date of acceptance of maintenance responsibilities, as established by Owner.

PART 2 -PRODUCTS

2.01 PLANTING SOILS, INCLUDING AMENDMENTS

A. Refer to Division 32 Section "Amending Planting Soils" for requirements related to planting soils and amendments (including fertilizers) for sub-grade planting soils.

2.02 PESTICIDES

A. General: Pesticides, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by plant growers/supplier for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine sub-grade areas to be prepared (and planted) for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

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

1. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by Contractor's operations.

1. Protect grade stakes, flags, and other markings set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent areas.

3.03 PREPARATION

A. Limit sub-grade preparation to areas to be planted.

B. Comply with Division 32 Section "Amending Planting Soils" for requirements related to amending (including fertilizing) and otherwise preparing, sub-grade for planting.

1. Reduce elevation of planting soil to allow for soil thickness of sod.
2. Legally dispose of waster material, including grass, vegetation, and turf, off Owner's property.

C. Moisten prepared area immediately before planting commences if soil is dry. Water thoroughly and allow surface to dry before planting commences. Do not create muddy soil.

D. Before planting commences, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finishing grading.

3.04 TURF MAINTENACE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

3. Subsequent to turf sod grower/supplier's inspection and approval of turf sod conditions, perform (or provide for) mechanical rolling of turf sod when well-rooted, approximately two weeks after installation.

a. Perform rolling with "ride-on" type double-drum roller, as recommended by turf sod grower/supplier.

B. Watering: Where sprinkler/irrigation systems are not operational, install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist, as recommended by turf grower/supplier.

1. Schedule watering to prevent wilting, pudding, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

C. Mow turf as soon as growth is tall enough to cut, as recommended by turf grower/supplier. Do not excessively delay mowing to the extent of being detrimental to growth and health of turf. Do not mow when grass is wet. Schedule Initial and subsequent mowings at intervals as recommended by turf growers/supplier.

D. Turf postfertilization: Apply fertilizer at intervals, under conditions and rate, as recommended by turf growers/supplier.

3.05 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Landscape Architect:
1. Healthy, well-rooted, uniform, even appearance, free of weeds, undesirable vegetation, and surface irregularities.

B. Reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.06 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work, Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply in accordance with manufacturer's written recommendations.

3.07 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by sub-grade preparatory work and continuing maintenance procedures from paved and adjacent areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas. B. Erect

temporary fencing or barricades and warning signs as required to protect planted areas from traffic and damage from other contractor's operations. Maintain fencing and barricades throughout maintenance period and remove when directed or permitted by Landscape Architect.

3.08 RENOVATION

A. Renovate planting damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish planting where settlement or washouts occur or where minor re-grading is required.

2. Install new planting soil as required.

B. Remove diseased or unsatisfactory areas; do not bury in soil.

C. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other constructions materials resulting from Contractor's operations, and replace with new planting soil.

D. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, legally dispose of them off Owner's property.

E. Apply soil amendments and initial fertilizers required for establishing new plantings. Install new planting soil to fill low spots and meet finish grades.

END OF SECTION

SECTION 02900 - EXTERIOR PLANTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. General: Provide Exterior Plantings in accordance with Contract Documents 1. Drawings and general provisions of the Contract Documents, including General Conditions and Divisions 1 Specification Sections, apply to this Section.

B. Related Work Specified Elsewhere:

1. Grading - Refer to Drawings.
2. Section 02810 - Irrigation System

C. Summary of Work: This Section includes the following:

1. Contractor shall furnish all labor, material, equipment, and services necessary to install all landscape planting as indicated on the approved plans and as specified herein, and shall perform all other incidental work necessary to accomplish the intent of this specification and the approved plans including the following:

a. Trees, Shrubs, Vines, Ornamental Grasses, and Herbaceous Plants
b. Fertilizers, and Mulches
c. Staking, guying, tying, and trunk guards
d. Pest and disease control
e. Maintenance under contract and guarantee

2. Installation of Owner-Furnished Trees: Contractor's responsibilities include, but are not limited to, the following:

a. Review of plant material at grower and that the contractor will accept the plant material when trees are off loaded at site.
b. Delivery Schedule.
c. Shipping Cost.
d. Off Loading
e. Receivership at off loading.
f. Acceptable holding/storage yard with water and adequate protection (shade).
g. Planting.
h. Maintenance.
i. Warranty as described in specifications.

1.2 REFERENCES

A. Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. ANSI Z60.1 "American Standard for Nursery Stock"

B. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendation or suggestion shall be deemed to be mandatory under this Contract.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Condition of the Contract and Division 1 Specified Sections.

1. Product Data for each type of product indicated.

2. Label Data substantiating that planting material comply with specified requirements.
3. Schedule indicating anticipated dates and locations for each type of planting. This schedule shall be submitted within 3 calendar days after Contract Notice to Proceed. Include in this schedule anticipated dates from commencement and sequencing of planting operations, including but not limited to selections and tagging, layouts and layout approval, placement of tree, and commencement of maintenance period.
4. Plant Submittals Shall Include: Submittal sources and photographs of actual trees and all other plant materials to be used on the project for review and approval by Landscape Architect.
5. Mulch: Submittal of 3 pound bag of material for approval by Landscape Architect.
6. Planting Soil: Submittal of 3 pound bag of each type of material specified for approval by Landscape Architect.

B. Material Certificates: Chain-of-custody certificates certifying that wood products comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

B. Installer's Field Supervision: Require installer to maintain an experienced fulltime supervisor on the Project Site during times landscaping is in progress. Supervisor shall not be changed, except with consent of the Landscape Architect. Supervisor shall represent contractor in contractor's absence, and all direction given to supervisor shall be as binding as given to Contactor.

C. Nursery Stock Standards: Provide quality, size, genus, species, and variety of trees indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock".

1. Selection of plant material will be made by Landscape Architect (at Landscape Landscape Architect's discretion), who will tag plants at their place of growth before they are prepared for transplanting.

D. Measurements: Measure trees according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4 - inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree for height and spread; do not measure braches or roots tip to tip.

E. Applicable Laws: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work.

F. Verification of Dimensions and Quantities: All scaled dimensions are approximate. Before proceeding with any work, carefully check and verify all dimensions and quantities. Immediately inform Owner of all discrepancies between drawings, specifications, and actual conditions. Do not work in any area where there is a discrepancy until approval to proceed has been received from Owner.

G. Forest Certification: Except for mulch and similar recycled wood-based materials and products, provide wood products obtained from forest certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".

H. Reuse of Nursery Boxes: Containers for plant materials must be reused by plant material supplier or source for new plantings of similar type provided for the Work. Recycling plant containers by remanufacturing (or similar processes) for other uses or landfill (or similar type) disposal is not acceptable.

I. Installation of Owner-Furnished Trees:
1. Arrange and pay for delivery of Owner-furnished trees.
2. Coordinate delivery dates of Owner-furnished trees in Contractor's construction schedule.
3. Review Contract Documents and other information and notify Owner of discrepancies or anticipated problems in installation or Owner-furnished trees.
4. If Owner-furnished trees are damaged as a result of Contractor's operations, Contractor shall be responsible for repair or replacement.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site. The Contractor shall furnish standard products in manufacturer's standard containers bearing original labels showing quantity, analysis, and name of manufacturer. All containers and bags shall remain on site until work is completed.

B. Stockpiling: Soil, mulch, or amendment materials, stored on Project Site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants and erosion. All stockpiled materials shall be placed on tarpaulin, heavy polyethylene sheeting or other suitable barrier to protect paving surfaces from staining or soiling by stockpiled materials. All temporary storage means and methods shall be approved by Construction Manager and Landscape Architect.

C. Inspection:

1. Plants shall be subjected to inspection and / approval by Landscape Architect (at Landscape Architect's discretion) at the place of growth and again upon delivery and prior to planting for conformity to specification requirements as to quality, size and variety. Such approval shall not impair the right of rejection due to damage suffered in handling, transportation and/or planting. Rejected plants shall be removed immediately from the Project Site. Inspection by Landscape Architect outside the City of Torrance beyond a 90-mile radius from the Project Site shall be made at the expense of the Owner's Park Developer. A Contractor's representative shall be present at all inspections at the Contractor's expense.

2. Written requests for inspection of plant material at their place of growth shall be submitted to Landscape Architect at least 3 days prior to delivery along with submittal of photographs of plants to be inspected. The Landscape Architect may refuse inspection if in his/her judgment a sufficient quantity or quality of plants is not available for inspection. The Contractor shall, at his own expense, supply the Landscape Architect with such labor and assistance as may be necessary in the handling of material for proper inspection. 3. Tagging of trees shall be as follows: for every 20 trees planted, 22 trees will be tagged assuring appropriate replacement for (a) trees damaged prior to transplanting, and (b) trees requiring replacement under terms of the one-year warranty. 4. Reject all materials, prior to planting, that are found unacceptable, and coordinate alternate selections with Landscape Architect. Owner warrants that all Owner-furnished trees and shrubs from outside vendors will be released to Contractor in viable condition. Should Contractor take exception, if taken shall be accompanied by documentation of purported defect and or malady from a recognized authority or expert, at no additional cost to Owner.

D. Trees and Shrubs:

1. Do not prune before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun-scald, drying, sweating, whipping, and other handling and

trying damage. Do not bend trees and shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery.

2. Deliver trees after preparations for planting have been completed and install immediately. If planting is delayed for more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist. Notify Contractor and Landscape Architect three (3) days prior to delivery of trees. Do not deliver more trees and shrubs than can be planted in one day. It is not permissible to retail unplanted trees and shrubs on-site overnight.

3. Water as often as necessary to maintain root systems in a moist condition.

E. Ornamental Grasses and Herbaceous Material

1. Deliver healthy container plants. Do not prune before delivery, except as approved by Landscape Architect. Protect plant and root from sun-scald, drying, sweating, whipping, and other handling and tying damage. Provide protective covering during delivery. Do not drop ornamental grasses and herbaceous material during delivery. 2. Deliver ornamental grasses and herbaceous material after preparations for planting have been completed and install immediately. If planting is delayed for more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist. Do not deliver more ornamental grasses and herbaceous material than can be planted in one day. It is not permissible to retain unplanted ornamental grasses and herbaceous material on-site overnight.

3. Water as often as necessary to maintain root systems in moist condition.

1.6 PROJECT CONDITIONS

A. Utilities: Determine location of in-planter utilities including lighting, irrigation and drainage in planting areas; and perform work in a manner, which will avoid damage. Hand excavate, as required.

B. Waterproofing: Perform work in a manner, which will avoid damage to planter waterproofing membrane, protection board or other structural sealing materials.

C. Mechanical Lifting: The Contractor shall be responsible for lifting plant material, planting soils and other required material to planter areas for planting through exterior means or lifts as approved by the Contractor and Landscape Architect.

D. Safety: The Contractor shall be responsible for pedestrian and vehicular safety and control within the Project Site. He/she shall provide the necessary warning devices and ground personnel needed to give safety, warning and protection to persons and vehicular traffic within the area.

E. Environmental Requirements and Planting Schedule: Plant weather permits. Do not plant when the ground is frozen, excessively wet, or the soil is otherwise in an unsatisfactory condition for planting.

F. Clean-Up: Upon completion of each phase of work under this section, the Contractor shall clean and remove from the area all unused materials and debris resulting from the performance of the work. All paved areas and walks within the project site shall be left in a clean and safe condition.

1.7 WARRANTY

A. Warranty: Warrant all planting materials, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, abuse by Owner or Owner's Park Developer, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.

1. All plant material (included shrubs and groundcover cover) for a period of one year after the date of Substantial Completion.

2. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.

3. Replace planting materials that are more than 25% dead or in an unhealthy condition at end of warranty period.

4. A limit of one replacement of each plant material will be required, except for losses or replacements due to failure to comply with requirements.

1.8 PLANT MAINTENANCE

A. Maintain trees, shrubs and herbaceous plantings by pruning, cultivating, watering, weeding, fertilizing, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Restore or replace damaged tree wrappings. Maintain trees, shrubs and herbaceous plantings for the following period: 90 days following Substantial Completion.

PART 2 - PRODUCTS

2.1 TREES, SHRUBS, AND VINES

A. General: Furnish nursery-grown trees, shrubs and herbaceous plants conforming to ANSI Z60.1 with healthy roots systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasion, and disfigurement.

1. Grade: Provide trees, shrubs and herbaceous plants of sizes and grades conforming to ANSI Z60.1 for type of tree required. Trees, shrubs and herbaceous plants of a larger size may be used if acceptable to Landscape Architect, with proportionate increase in size of roots or balls or containers.

2. Species: All trees, shrubs and herbaceous plants shall be true to species and cultivar specified. Certification of cultivars by supplying nursery must be supplied in writing to Contractor and Landscape Architect.

3. Labels: Label at least 1 tree, shrub or herbaceous plant of each variety and size with a securely attached, waterproof tag bearing legible designation of botanical and common name. Field Tags by Landscape Architect shall not be removed until so directed by Contractor and Landscape Architect.

4. Single Stem Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required.

5. Branching Height: For single-stem trees branching height shall be 5’-0” and not more than *y*, tree height or as required by Landscape Architect or indicated on the Drawings. Limbing up shall not deform natural form of the tree.

6. Multiple-Stem Trees: Multiple-stem trees with multiple basal or low branched stems, and well-balanced crown, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required. Unless specified otherwise multiple-stem trees shall have 3 to 5 stems minimum.

7. Depth of Planting: The depth of planting must be checked for all trees being tagged at the nursery. If the root/trunk flare is not visible, the root/trunk (the intersection of the trunk and the buttress roots) must be located. Any tree with significant adventitious root growth or evidence of girdling roots shall be subject to rejection by Landscape Architect on a case by case basis. Any soil above the root/trunk flare shall be removed prior to digging. After the removal of any excess soil above the root/trunk flare, the tree shall be hand dug and drum laced.

8. Container Grown Material: Container grown shrubs and herbaceous plants shall be nursery grown, conforming to ANSI Z60,1. Shrubs shall be healthy, vigorous, well rooted, fully branched, symmetrical, and well formed, Container stock shall have well developed fibrous roots, so that the root mass will retain its shape and hold together when removed from the container. Container plants shall not be root bound.

9. Plugs: Plugs shall be nursery grown, conforming to ANSI Z60.1 and shall be healthy, vigorous, well rooted, fully branched, symmetrical, and well formed. Plugs shall have well developed fibrous roots, so that the root mass will retain its shape and hold together when removed from the container. Container plants shall not be root bound.
10. Substitution: Substitution by Contractor shall not be permitted.
11. Ornamental Grasses and Herbaceous Material Sources: Ornamental grasses and herbaceous material shall be provided by grower specializing in Ornamental Grass and Herbaceous plant production.
12. Sources: Unless otherwise specified all plant materials shall be from a well established Southern California region grower or nursery. Plants shall come from the following sources:
a. GENERAL NURSERIES:

Sources:

Pacific Coast Nursery
1924 Monroe SI.
Riverside, CA 92504
Tel: (951) 689-1777
Fax: (951) 689-1640

Norman's Nursery
8665 Duarte Road
San Gabriel, CA 917775
Tel: (626) 285-9795
Fax: (626) 287-2352

Tree of Life Nursery
33201 Ortega Highway
San Juan Capistrano, CA 92675
Tel: (949) 728-0685
Fax: (949) 728-0509
Or approved equal

2.2 MULCHES

A. General: Mulch to be no more than 3" Shredded Walk On Bark Mulch:
1. Sources:
R&S Soil Product, (949)-830-8884
Aguinaga Fertilizer Company
7992 Irvine Blvd.
Irvine, CA 92618
(949) 786-9558
Or Equal as approved by the City.

2.3 FILTER FABRIC BARRIERS

A. All filter fabric shall be synthetic and rot proof.
B. Non-Woven, UV stabilized, polypropylene geo-textile shall be 140 NL as manufactured by Mirafi 718-461-2200, or approved equal.

2.4 TREE BRACING

A. Stakes: Straight grained lodge pole pine free of knots, splits, checks or disfigurements. Stakes shall be 2 inch minimum nominal size in diameter and 10 feet

length, or as required by tree height. Stakes shall have a 10 inch tapered driving point.

1. Support: Supports for staking shall be (2) Cinch Ties by:
   a. VIT Co.
      2063 Wineridge Pl
      Escondido, CA 92029-1931
   b. Or equal.

B. Guy and Tie Wire: No. 10 Gauge Galvanized Wire with:
   1. Protective Rubber Collar.
   2. Galvanized Turnbuckle
   3. JI," diameter X 48" minimum length white PVC Schedule 40 Tubing
   4. 2" diameter X 24" long, 15 Gauge Iron Pipe Stake. Drive flush with grade. Drill (2). 5/16" holes ¾" from top to secure wire 2.5

2.5 LANDSCAPE EDGING

A. Aluminum Landscape Edging: 3/16" X 4", 0.072" thick with 0.135" exposed top lip, Mill Finish.
   1. Sources:
   a. Permaloc Clean - Permaloc Corporation 13505 Barry Street Holland, MI, 49424. Tel. (800) 356-9660, www.permaloc.com

   b. Sureloc Aluminum/Steel Edging, which is located at: 494 E. 64th St. ; Holland, MI 49423; Toll Free Tel: 800-787-3562; Tel: 616-392-3209; Fax: 616-392-5134; Email: info@surelocedging.com; Web: www.surelocedging.com

c. Or equal.

2.6 TRUNK GUARD:

A. Recycled content, polyethylene with ultraviolet inhibitors; 0.060-inch thick x 9-inches high x length for up to 4-inch diameter trunk.

   1. Products:
      a. Arborgard+ AG 9-4; Dimex LLC, 28305 State Route 7, Marietta, OH 45750, (800) 334-3776. (740) 374-3100.
      b. Or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plantings for compliance with requirements and for conditions affecting performance of Work in this Section.

B. Utilities and Structures located in planting areas. Verify that the locations of lighting, drainage and irrigation utilities, structures and other underground items have been clearly marked.

C. Sequencing: Do not commence planting until site fine grading, soil import, and preparation has been completed and improved by Owner. Endure all drainage swales and flow lines have been established and accepted prior to planting.

D. Inspect and approve all sprinkler work and finish grading prior to the start of shrub and ground cover planting as specified. Trees may be planted in advance of landscape

irrigation system installation, provided approval by the Landscape Architect and that adequate provision is made in advance for interim watering.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, waterproofing, drainage structures, planter structures, pavements, and other facilities, and existing trees to remain from damage caused by planting operations. This includes maintaining all protective barriers in place unless directed otherwise by Owner. Vehicles and equipment shall not be parked, serviced, permit burning or operated within drip line of existing trees or within newly planted areas.

B. Remove existing plant materials and planting soils which are designated for removal in the documents.

C. Do not remove, sever or impact root structures of existing trees to remain in the preparation of sub-grade tree pit conditions. Conflicts with existing tree roots shall be brought to the attention of the Landscape Architect who may alter the required configuration to preserve or protect tree roots as they exist

D. Test drainage structures and verify working condition. Verify acceptable condition to protection boards and other waterproofing components and notify Landscape Architect of any damage.

E. Weed Control: Before and during preliminary and finish grading, dig out all weeds and grasses by roots and dispose of off-site. Prior to planting, eliminate any weeds present in delivered plant stock. Unless otherwise instructed by Owner. Grasses not of perennial type, except for Torpedo Grass and Nut Grass, less than 2-112” high and not bearing seeds, may be turned under. Perennial weeds and grasses to be removed include, but are not limited to, the following:

a. Nut Grass
b. St Augustine
c. Puncture Vine
d. Morning Glory
e. Dog Fennel
f. Torpedo Grass
g. Common Bermuda Grass
h. Kikuyu Grass

Remove other noxious or invasive weeds.

Site shall be maintained weed-free throughout planting operations and until final acceptance by Owner. Submit a weed control program to Owner for approval with in 3 days afterward of Contract and prior to starting of work. Include all product information and frequency of weed control operations.

3.3 TREE PLANTING

A. Layout individual tree locations and areas for multiple plantings. Trees shall be staked prior to planting shrubs, grasses, and herbaceous plants in order to establish the planting structure of the site. Stake locations, adjust locations when requested, and secure Landscape Architect’s acceptance before the start of planting work.

B. After digging plant hole but prior to installing tree, install Enhanced Soil Drainage according to Planting Soil specifications.

C. Tree root-ball shall be firmly placed on compacted setting bed and established at correct location, elevation and in plumb upright condition. Use temporary guy wires to secure tree in place as required during planting soil placement, to maintain proper setting location. Tree root ball must be set at finish grade so that the original root/trunk flair is at the proper relationship to finished planting soil grade.

D. All ropes and strings must be cut, non-biodegradable material must be *removed* and burlap folded back from the top one-quarter of root-ball. Do not *remove* burlap from lower sides or under root ball. Do not use planting stock if root-ball is cracked or broken before or during planting operation.

E. Only when placement of trees has been approved by Landscape Architect may back-fill planting soil be placed in excavated areas around root ball. Do not make saucer indentations.

F. Back-fill planting soils shall be placed in uniform six to eight inch lifts. Soil must be firmed at each lift interval by hand tamping as required to settle back fill and eliminate voids and air pockets.

G. Staking and Guying: Provide staking per Drawings.

H. Water thoroughly after planting, taking care not to *cover* plant crowns with displaced wet soil. Adjust finish grades and reset plants if settlement occurs. Place mulch and repeat watering procedure.

I. Wrap the trunks of trees immediately after planting with specified trunk guard material at base of tree. Uncoil and place around base of tree. Ensure complete protection with flared end in contact with ground. For larger trunk diameters, couple multiple sections together, securely interlocking tabs as recommended by manufacturer.

3.4 SHRUB AND HERBACEOUS PLANTING

A. Layout individual shrubs, grasses and herbaceous plants for multiple planting areas only after the location of trees *have* been planted. Shrub, Grasses, and Herbaceous groupings shall be marked out on the ground to establish the zones into which these plantings are to be planted. Once the zones are established individual shrubs, grasses and herbaceous plants shall be placed according to specified spacing and layout as indicated on drawings. Stake locations, outline area, and secure Landscape Architect's approval before starting planting. Make adjustments to layout as directed by Landscape Architect.

B. Landscape Architect may request a full temporary placement of plants, still in their pots, according to plan or as directed for inspection by Landscape Architect prior to commencing with planting operation. Landscape Architect may adjust planting layout and spacing at his discretion during the planting operation.

C. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around root ball to eliminate air pockets. Do not make saucer indentations.

D. Water thoroughly after planting, taking care not to cover plant crowns with displaced wet soil. Adjust finish grades and reset plants if settlement occurs. Place mulch and repeat watering procedure.

3.5 BOX TREE PLANTING

A. All materials for box tree planting shall be on site prior to start of installation. After pavement treatment has been completed and approved by Landscape Architect, mark locations of boxes, adjust locations when requested, and secure Landscape Architect acceptance before moving boxes to final location. Review tree type with box location for approval by Landscape Architect prior to planting.

B. During planting process Contractor responsible to keep paving and other site amenities clean.

C. Tree root-ball shall be firmly placed on compacted setting bed and established at correct location, elevation and in plumb upright condition. Use stakes to secure tree in place as required during planting soil placement, to maintain proper setting location. Tree root ball must be set at finish grade so that the original root/trunk flair is at the proper relationship to finished planting soil grade. Planter soil levels shall be below top of planter box:

a. 3” below for 36” box
b. 3” below for 60” box trees and Greater

D. Only when placement of trees has been approved by Landscape Architect may planter soil be placed in areas around root ball. Do not make saucer indentations.

E. Planter soils shall be placed in uniform six to eight inch lifts. Soil must be firmed at each lift interval by hand tamping as required to settle back fill and eliminate voids and air pockets.

F. Staking and Guying: Provide staking per Drawings.

G. Water thoroughly after planting, taking care not to cover plant crowns with displaced wet soil. Adjust finish grades and reset plants if settlement occurs. Place mulch and repeat watering procedure.

3.6 MULCH PLACEMENT

A. Place shredded bark mulch at areas indicated in the drawings. Protect planting material from damage during and after installation of mulch.

B. Place aggregate mulch; refer to Section 02738, at locations indicated in the drawings. Protect planting material from damage during and after installation of mulch.

3.7 INITIAL PRUNING

A. Contractor shall prune trees and shrubs as directed by Landscape Architect and according to the Contract Documents

1. Prune, thin and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Landscape Architect, do not cut tree leaders; remove only injured or dead branches.

3.8 CLEAN-UP AND PROTECTION

A. During landscaping keep pavements clean and work area in orderly condition. Protect landscaping from damage due to landscape operations, operations by other contractors and trades and trespassers. Treat, repair or replace damaged landscape work as directed.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil. Tree boxes, Trash, and debris, and legally dispose of it off of the Owner's property.

3.10 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the warranty period the Landscape Architect and Owner will inspect all warranted work at the written request of the Contractor. The request shall be received 10 calendar days before the anticipated date for Final Inspection.

END OF SECTION 02900

SECTION 02810 - IRRIGATION SYSTEM

GENERAL

1. Permits
   a. Contractor shall obtain and pay for all permits required for irrigation installation.

2. Manufacturer's Directions
   a. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this Contract furnish directions covering points not shown in the Drawings and Specifications.

3. Ordinances and Regulations:
   a. Comply with all local, municipal and state laws, rules and regulations.
   b. Conform to applicable provisions of the latest editions of the Uniform Plumbing Code, the National Electric Code and all codes properly governing the materials and work at the project site.

4. Explanation of Drawings
   a. Due to the scale of the Drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between the irrigation system, planting, underground utilities, above ground utilities and architectural features.
   b. All work called for on the Drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the Specifications.
   c. The Contractor shall not willfully install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences, or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the City's Authorized Representative. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

5. AS BUILT DRAWINGS
   a. Record accurately on one set of black and white prints (irrigation drawings), all changes in work constituting departures from the original contract drawings. Include changes in both pressure and non-pressure lines.
   b. Upon completion of each increment of work, transfer all such information and dimensions to the prints. Record changes and dimensions in a legible and professional manner. When the drawings are approved, the Contractor shall perform all final as-built drawings.
   c. Dimension from two permanent points of reference (monuments, sidewalks, curbs, pavement). Record information on as-built drawings day-to-day as the work is installed. All dimensions noted on the drawings shall be 1/4 inch in size.
   d. Show dimensional locations and depths of the following:
      1. Connection to existing water lines.
      2. Connection to existing electrical power.
      3. Point of connection – including backflow assembly, basket strainer, master valve, flow sensor
      4. Gate valves
      5. Routing of sprinkler pressure lines (dimension max. 100' along routing and at each change of direction).
      6. Electric control valves.
      7. Routing of control wiring and flow sensor cable.
      8. Quick coupling valves
      9. Sleeves and wire splice boxes
      10. Other related equipment as directed by the City's Authorized Representative.
   e. Maintain as-built drawings on site at all times

6. CONTROLLER CHARTS
   a. As-built drawings shall be provided by the Contractor prior to the preparation of the Controller Charts. As-builts shall be drawn on 3 mil sepia mylar of same size as construction documents.
   b. The Contractor shall provide two 11 x 17 color controller charts for each controller supplied, showing the area covered by the automatic controller.
   c. The chart shall be a reproduction of the as-built system drawing. If the controller sequence is not legible when the drawing is reduced, enlarge it to a size that will be readable when reduced.
   d. Charts shall be a photocopy print or computer plot with a different transparent color used to show area of coverage for each station.
   e. When completed and approved, hermetically seal the chart between two pieces of plastic, each piece being a minimum of 10 mils thick.

7. OPERATION AND MANUALS
   a. Prepare all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two individually bound copies. Describe the material installed in sufficient detail to permit qualified maintenance personnel to understand, operate and maintain the equipment. Each manual shall include the following:
      1. Index sheet stating contractor's address and telephone number.
      2. Duration of guarantee period with guarantee forms.

8. SPARE PARTS AND EQUIPMENT
   a. Prepare and deliver to the City's Authorized representative, prior to the start of maintenance, all required spare parts, tools and equipment. Spare parts, tools, and equipment shall include the following per water meter:
      1. Operation and maintenance manuals.
      2. Automatic controller certification letter from Authorized Rainmaster Distributor for each controller installed under this contract.
      3. Two (2) keys for each automatic controller.
      4. One (1) set of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this project.
      5. A minimum of one (1) five-foot key for operation of gate valves. Provide one (1) key for each type of operating device (2" operating nut, cross handle, etc.).
      6. Two (2) quick coupler keys and matching hose swivel for each type of quick coupling valve installed.
      7. Irrigation controller manuals.
      8. Color-coded controller charts laminated between 2 pieces of 10 mil plastic – Provide two charts for each controller.
      9. "As-built" record drawing mylars of irrigation plans.
      10. Completed Irrigation Guarantee Statement.
      11. Southern California Edison billing information.
      12. Water billing and meter information.

9. QUALIFICATION OF IRRIGATION PERSONNEL
   a. Contractor and on site field superintendent shall have the following minimum qualifications:
      1. Not less than five years continuous experience in installation of commercial irrigation systems.
      2. Demonstrate completion of the manufacturer's installation certification program for the Eagle Plus Rainmaster controller.
      3. Upon City's authorized representative's request, supply a list of references listing successfully completed commercial irrigation systems.

10. GUARANTEE
    a. Submit written guarantee, in approved form, that all work showing defects in materials or workmanship will be repaired or replaced at no cost to the Builder or Developer contracted with the Landscape Contractor for a period of one (1) year from date of acceptance by the Irrigation Consultant.
    b. The guarantee form shall be written onto the Contractor's letterhead and contain the following information. (Shown as an example only)

Guarantee for Irrigation System

McMaster Park

We hereby guarantee that the irrigation system we have furnished and installed for Tonner Hills, is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect expected. We agree to repair or replace any defects in material or workmanship which may develop during the period of one (1) year from date of acceptance and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the City. We shall make such repairs or replacements within a reasonable time, as determined by the City, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of such written notice from the City, we authorize them to proceed to have said repairs or replacements made at our expense and we will pay for the costs and charges therefore upon demand.

Project Name: McMaster Park Project *Owner: City of Torrance*

Landscape Architect: Land Concern

*Tract Number(s)*_____

*Lot Number(s)*_____

Signed: _____ *Title:* _____

*Date of Signature:*_____

Address:

Telephone:

PRODUCTS

1. GENERAL PIPING
    a. Contractor shall be aware of sources of water for each water meter as they may vary within the same project. Differing sources of water may be treated with colored piping system.
    b. Recycled water pipe (Pressurized mainline and laterals) shall be extruded of an improved P. V. C. virgin pipe compound featuring high impact strength. Confirm to ASTM D-1784 or D-2241 to meet the requirements of cell classification 12454B for pipe. Compound shall have a 2,000 P. S. I. hydrostatic design stress rating. Pipe shall be purple in color.

Type: Pipe: Pacific Plastics, or approved equal.

c. Pipe materials shall be used as follows:

1. Mainlines (pressurized) 1-1/2 inch and smaller downstream of backflow unit: Schedule 40 solvent-weld PVC unless otherwise noted.
2. Mainlines (pressurized) 2 inch through 3 inch downstream of backflow unit: Class 315 solvent-weld PVC unless otherwise noted.
3. Lateral lines: Schedule 40 PVC solvent-weld PVC ¾" and above unless otherwise noted.

2. PLASTIC PIPE FITTINGS
   a. Solvent weld pipe, extruded of an improved PVC virgin pipe compound featuring high impact strength. Confirm to ASTM D-1784 or D-2241 to meet the requirements of cell classification 12454B for pipe. Compound shall have a 2,000 P.S.I. hydrostatic design stress rating.
   b. All pipe and fittings shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating P.S.I., NSF, and date of extrusion.
   c. Make solvent cement joints for plastic pipe and fittings as prescribed by the manufacturer and shall be low-volitile.
   d. All PVC fittings shall be Schedule 40 PVC and shall be injection molded of an approved PVC fitting compound featuring high tensile strength, high chemical resistance, and high impact strength. Fittings shall conform to ASTM D-1784, and meet the requirements of cell classification 12454B. Where threads are required in plastic fittings, these shall be injection molded also.

      Type: Spears or approved equal.

   e. All threaded nipples shall be standard weight Schedule 80, with molded threads.
   f. Nipples on pressurized mainline shall be Sch. 80 Thread One End (T.O.E.) with the threaded side attached to the FIPT device and the SLIP end attached to the pressure mainline with a SLIP coupling.
   g. Use 3/4 inch size Teflon tape on all threaded ends.

3. COPPER PIPE AND FITTINGS
   a. Copper Pipe shall be Type K, hard tempered, ASTM B88, with fittings of wrought solder joint type in accordance with ANSI B16.22.
   b. Solder joints with silver solder: 45 % silver, 15 % copper, 16 % zinc, 24 % cadmium and solidus as 1125 degrees F. and liquids at 1145 degrees F., conforming to ASTM B206 and FS QQB-655C.

   Type: Fittings: Nibco or approved equal.

4. BRASS PIPE FITTINGS
   a. Brass pipe shall be 85 % red brass, American National Standard Institute (ANSI), Schedule 40 screwed pipe.
   b. Fittings shall be medium brass, screwed, 125 pound class.

5. BACKFLOW PREVENTION UNITS
   a. Backflow prevention unit shall be of the brand, size and type indicated on the irrigation plans.
   b. Backflow prevention units shall be approved by the Foundation for Cross Connection Control and
   c. Hydraulic Research at the University of Southern California.
   d. Backflow prevention units shall be the reduced pressure principle (RPP) type.
   e. Backflow assemblies shall be installed using brass ells, unions and nipples.
   f. Backflow assemblies shall include a 40 mesh bronze wye strainer upstream of the unit.
   g. Backflow shall be the same size as the water meter. Where dual manifold meters are utilized, each water meter must have a backflow preventer prior to joining the mainline.

6. BASKET STRAINER
   a. Basket Strainer shall be of the brand, size and type indicated on the irrigation plans.

7. SHUT OFF VALVES
   b. Shut off valves shall be of the brand, size and type indicated on the irrigation plans.

8. QUICK COUPLING VALVES
   a. Quick coupler valves shall be of the brand, size and type indicated on the irrigation plans.
   b. Quick coupling valves shall have a red brass, two-piece body designed for working pressure of 150 P.S.I. with a 1inch FPT bottom inlet.
   c. Quick coupler valve shall have a hinge cover constructed of red brass with a leather like vinyl cover bonded to it in a permanent type of cover.
   d. Quick couplers used with recycled water shall have purple vinyl covers with the appropriate recycled water warnings in English and Spanish, as well as the international "Do Not Drink" symbol and shall have an ACME threaded key.
   e. Quick coupler valve shall be operated only with quick coupler key, designed for that purpose. Quick coupler key is inserted into the valve and a positive, water-tight connection shall be made between coupler key and valve.
   f. Locate all quick coupling valves within 12 - 18 inch of walks, curbs, header boards, or paved areas where applicable. Locate quick coupler valves inside shrub and ground cover areas when ever possible. Quick coupling valves shall be installed such that valve top will be 3 inch below the lid of the valve box.

9. MASTER CONTROL VALVES
   a. Master control valves shall be of the brand, size and type indicated on the irrigation plans.
   b. The master control valve shall be a switchable normally closed 24 VAC solenoid actuated globe pattern, spring loaded diaphragm type. The valve shall be pressure rated up to 200 P.S.I. and shall have a integral schraeder valve test port.
   c. The valve shall have a 600 pound test fabric reinforced rubber diaphragm assembly with self-cleaning stainless steel screen.
   d. The valve shall provide for all internal parts to be removable from the top without disturbing the valve installation.

10. FLOW SENSOR
   a. An irrigation main-line flow sensor shall be installed in accord with Drawings. See Drawings for location. Contractor shall be responsible for the installation, hook-ups, materials, components, connections, etc., of the flow sensors for the complete automatic operation of the system.
   b. The flow sensor shall be manufactured by CST. Install as recommended by the manufacturer and as detailed.
   c. All splices shall be performed in a dry splice type connected with an empty tube and gel pack tube of sealant.

11. FLOW SENSOR INTERCONNECT
   a. Flow sensor cable shall be of the brand, size and type indicated on the irrigation plans.
   b. Flow sensor wire may be extended to a maximum distance of 2000 ft. from the location of the assembly to which it is connected. Wire shall be installed in a 1-1/4 in. UL-listed Schedule 40 conduit.
   c. Provide a separate flow sensor cable from each flow sensor to its respective designated controller.

12. REMOTE CONTROL VALVES
   a. Remote control valves shall be of the brand, size and type indicated on the irrigation plans.
   b. The remote control valve shall be normally closed 24 VAC solenoid actuated globe pattern, spring loaded diaphragm type.
   c. The valve shall be pressure rated up to 200 P.S.I.
   d. The valve shall have a 600 pound test fabric reinforced rubber diaphragm assembly with self-cleaning stainless steel screen.

e. The body and bonnet shall be plastic and the valve shall have a stainless steel control / shut-off stem and manual operator.
f. The valve shall provide for all internal parts to be removable from the top without disturbing the valve installation.
g. Install valves in planting areas and according to the construction details. Only one valve per box will be allowed.
h. Align valve boxes at right angles to adjacent hardscape whenever possible. Where several valve boxes are located in the same area, arrange them in a uniform and orderly fashion.
i. When grouped together, allow a minimum of 12 inches between valves. The valves shall be installed in valve boxes which will have enough room on all sides of the valves to allow repair personnel to completely reconstruct the valves without removing the valve box.

13. CONTROLLER SATELLITES
    a. All materials furnished and installed shall be new and shall conform to manufacturer's installation instructions and these specifications.
    b. Controllers shall be of the brand, size and type indicated on the irrigation plans.
    c. The controller shall be installed in a stainless steel controller assembly as manufactured by John Deere Green Tech who shall provide the City with a written 5 year Limited Warranty on each complete assembly and a “Certificate of Compliance” certifying that each assembly has been properly installed on the project site.
    d. All irrigation controller and accessory project, as specified, shall be installed in Strongbox top mount stainless steel enclosures.
    e. The controller assembly shall be of a vandal resistant and weather resistant nature manufactured entirely of 304 grade stainless steel.
    f. The main housing door shall be louvered at the bottom and equipped with a tear drop shaped, hollow center thermoplastic door seal.
    g. Filter screen shall cover all louvers to deflect against water spray, insects and dust.
    h. The above described product shall be a NEMA 3R Rainproof Enclosure as listed by Underwriter Laboratories, Inc.

14. LOW VOLTAGE CONTROL WIRING
    a. Connections between the controller and remote control valves shall be made with direct burial UF type wire, installed in accordance with valve manufacturer's wire chart and specifications.
    b. Wire shall be soft drawn bare copper meeting the requirements of ASTM specification B-3 or B-8 10°C +60°C.
    c. Wire shield shall be Polyvinyl Chloride, 60°C rated conforming to UL Standards 493 and 83.
    d. Shield shall be surface marked with Paige-Electric, voltage rating, size and type, and UL file number
    e. All cables shall be tested physically and electrically in accordance with UL Standard 493 and 83 (paragraphs 28.1, 29.1 and 29.2). All reels and cartons shall bear UL labels
    f. Wiring shall be installed adjacent to the mainline whenever possible and shall never be installed above or below the pipe.
    g. Where more than one wire is placed in a trench, the wiring shall be taped together using black electrical tape at intervals of 10 feet.

Type: Paige 7001-D

    h. All splices shall be made using sealed waterproof connectors.
    i. An expansion curl shall be provided at all directional changes. Expansion curls shall be sufficient length at each splice connection at each electric control valve, so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires.
    j. Control wires shall be laid loosely in the trench without stress or stretching of control wire conductors. A two (2) foot expansion loop shall be located every 100 feet on continuous wire runs.
    k. Sizing of the lead wire shall be in accordance with irrigation drawings and manufacturer's recommendations; in no case shall the thickness of the wire be less than #14 AWG.
    l. All leads wires to be #14 AWG
    m. All common wire shall be #14 AWG.

n. Use continuous wire between controller and remote control valves. Under no circumstances shall splices exist without prior approval. Any splices allowed shall be installed in a labeled pull box.
o. All control wires shall be uniform in color. When more than one controller is installed use a different color wire for each controller.
p. All common wires and only common wires shall be white in color. When more than one controller is installed use white colored wire with a different color stripe for each controller. Green color shall not be used except for ground wire. Color of the stripe shall match the color of the control wire.

15. WIRE SPLICES
    a. Conductors shall be installed with no underground splices, unless absolutely necessary and unavoidable. Any and all underground splices that are required to be made, must be approved by the Irrigation Consultant, and shall be placed in a suitable type valve box for easy access.
    b. All wire splice boxes shall be noted on the irrigation as-built drawings.

16. VALVE BOXES
    a. Valve boxes shall be used as durable, rigid enclosures for valves or other irrigation system components requiring subsurface protection for installation or maintenance.
    b. The valve box shall be made of structural foam HDPE resin that is resistant to UV light, weather, moisture, and chemical action of soils.
    c. The standard rectangular body shall have knock-outs molded into the sides that can be readily removed. The knock-outs shall remain an integral part of the body unless removed to run pipes or wires through the valve box.
    d. The valve box shall have corrugated sides.
    e. Rectangular valve boxes shall have a grooved feature on one side, just below the lid at the top of the box, for inserting a shovel blade or other prying tool to provide easy lid removal. This is useful following compaction of the surrounding soil or after the eventual accumulation of thatch over the valve box.
    f. There shall be no hole in the valve box lid unless the bolt-hole knock-out is removed in order to use the locking bolt. Lids shall have beveled edges to minimize potential damage from lawn equipment.
    g. Lids shall be clearly marked with the words “Irrigation Control Valve” molded onto the top. Lids
    h. shall have a marking area measuring at least 6" by 2" that is suitable for branding or other means of identification.
    i. The locking bolt, washer, and clip shall be made of stainless steel.
    j. Valve box types and sizes shall be furnished and installed per the irrigation legends and details.
    k. Valve boxes and covers shall be purple in color.
    l. Identification letters or numbers shall be 2 inch high and heat branded onto the box cover. Identification shall be as indicated on the detail drawings.
    m. Heat branding shall be accomplished using branding irons specifically designed for this purpose. Heat branding shall not weaken or in any way puncture the valve box cover.

17. SPRINKLER HEADS
    a. Full circle, part circle pressure regulating spray heads and built-in check valve sprinkler heads:
        1. The sprinkler body, stem nozzle and screen shall be constructed of heavy duty plastic.
        2. The sealing device shall create no more that one (1) PSI pressure drop at maximum rated pressure and flow.
        3. The sprinkler shall have a strong stainless steel retract spring for positive pop-down. Pop-up height shall be as indicated on the irrigation drawings and no less than 6 inches.
        4. The sprinkler shall have a screen under the nozzle to protect it from clogging and for easy removal for cleaning and flushing system.
        5. The sprinkler shall be equipped with a built in pressure regulating device capable of regulating an inlet pressure of 35 - 70 PSI to 30 PSI for proper operation of the spray head. The pressure regulating device shall be constructed of stainless steel springs and heavy duty plastic parts.
        6. Pop-up sprinklers shall be equipped with a built in anti-drain valve capable of holding water within the sprinkler head from up to 8 feet of elevation change. The check valve equipped pop-up sprinkler shall be identified on the cap as being so equipped.
        7. The sprinkler shall have a matched precipitation rate (MPR) plastic nozzle with an adjusting screw

capable of regulating the radius and flow.

8. MPR nozzles - The plastic nozzles shall have matched precipitation rates across sets (8 feet, 10 feet, 12 feet, 15 feet). The spray nozzles shall have female thread configuration for use on the 1800 series sprinkler and the PA-8S plastic shrub adapter.
9. Rotary Nozzles shall have multiple arced streams and have a matched precipitation rate of 0.60 in/hr. The Rotary Nozzle shall be constructed of UV-resistant plastic. The radius adjustment screw shall be of stainless steel.
10. The Rotary Nozzles shall include a removable .02 x .02 mesh screen to protect the nozzle against clogging. The Rotary Nozzle shall have a precipitation rate matched with Rain Bird 5000/5000 PlusMPR Rotor Nozzles.

18. DRIP IRRIGATION

a. Drip emitters shall have the following component specifications:
   1. Rain Bird Xeri-Bug emitters shall be pressure-compensating over the pressure range of 15 to 50 psi (1,0 to 3,5 bars) and have a consistent flow rate of [0.5] or [1.0] or [2.0] gallons per hour over this pressure range.
   2. The emitters shall be self-flushing to minimize clogging.
   3. The emitters shall be made of UV resistant acetyl externally.
   4. The emitters shall be color-coded on the inlet side to identify flow rate. A blue inlet shall indicate an emitter with a flow rate of 0.5 gallons per hour (1,89 l/h), a black inlet shall indicate a flow rate of 1.0 gallons per hour (3,79 l/h) and a red inlet shall indicate a flow rate of 2.0 gallons per hour (7,57 l/h).
   5. Model will have 10-32 threaded inlet:

   Types: XB-10PC-1032 (Black) 10-32 Threaded inlet; 1.0 GPH (7,57 l/h)

c. Drip laterals shall be rigid polyvinyl chloride PVC 1220, (Type 1, Grade 2), Schedule 40 PVC with Schedule 40 PVC fittings.

d. Drip filtration unit shall include a Pressure Regulating Quick Check Basket Filter that combines filtration and pressure regulation in one integrated unit for protection of downstream components of drip irrigation system. Pressure regulating basket filter shall be Rainbird PRF-QKCHK-120 mesh with component specifications to include:

   1. Basket style body and jar-top cap constructed of heavy-duty glass-filled, UV-resistant polypropylene, with 150 PSI operating pressure rating.
   2. Indicator incorporated into filter cap that changes color from green to red during operation when the filter element requires cleaning.
   3. Special order 120 mesh filter screen constructed of stainless steel attached to propylene frame. Screen is serviceable for cleaning purposes by unscrewing cap from filter body and removing filter element.
   4. Normally-open in-line pressure regulating device, constructed of durable, UV resistant non-corrosive material able to accommodate an inlet pressure rating of not less than 150 PSI, with preset outlet pressure of approximately 40 PSI. Pressure regulating device allows full flow with minimal pressure loss unless inlet pressure is greater than preset level. As inlet pressure increases above preset level, internal spring compresses to reduce downstream pressure.
   5. Male threaded 1” inlet and outlet connections.

e. All drip systems shall have a Schedule 40 PVC ball type manual flush valve at each isolated zone within the system to allow water to be drawn through all piping during flush operation. Multiple flush valves may be necessary per drip valve zone, refer to plan for locations.

19. CHECK VALVES

a. Provide check valves and/or anti-drain valves as may be required by the Irrigation Consultant to prevent drainage of irrigation water from sprinkler system due to changes in elevation.

b. Anti-drain valves shall be of heavy duty virgin PVC construction with F.I.P. thread inlet and outlet. Internal parts shall be stainless steel and neoprene. Anti-drain valve shall be field adjustable against drawout from 4 to 32 feet of head.

Types: Hunter HCV or approved equal

20. MISCELLANEOUS EQUIPMENT
    a. Thrust Blocks: Thrust blocking shall be used on all gasketed type mainline. Thrust blocks shall be minimum 1 cubic foot of 470-C-2000 type 5 concrete. All PVC pipe fittings shall be wrapped with black plastic tape prior to installation of thrust blocks.
    b. Gravel: All gravel used in valve boxes shall be washed crushed gravel of approximately 3/4 inch size. No pea gravel shall be used.
    c. Identification tags with numbers are required on all valves.

Type: Christy Tags (yellow background with black lettering)

d. Swing Joint Assemblies: All sprinklers shall be installed with triple swing joints. Assembly shall be sized per the sprinkler inlet, with a 6 inch minimum lay length. 1/2" swing joints shall be made with marlex street ells. 3/4" and larger swing joints shall be made with Sch. 40 PVC street ells.

EXECUTION

1. INSPECTION SCHEDULE
    a. Contractor is responsible for notifying the Irrigation Consultant 48 hours in advance for on-site meetings and observations.
    b. As-built drawings must be submitted to the Irrigation Consultant for approval prior to site inspection; no inspection will commence without as-built drawing approval.
    c. When performing the irrigation coverage test, the contractor shall be responsible for having a two-way communication system or sufficient personnel, so that the directions from the inspection area to the controller of the system can be readily accomplished.

2. WATER SUPPLY
    a. Utilize water meter and provide connections to backflow prevention unit per the irrigation drawings and details.
    b. Connections to the existing water meter shall be at the approximate locations shown on the drawings. Minor changes caused by actual site conditions shall be made without additional cost to the City.
    c. Any R.P. backflow prevention unit shall be tested by a certified backflow prevention technician and its operation certified in writing. Landscape Contractor is to arrange and pay for all testing and certification fees. The original written certification of the backflow prevention unit is to be submitted to the Irrigation Consultant.

3. LAYOUT
    a. Lay out irrigation heads and make any minor adjustments required due to differences between site and the drawings. Any such deviations in layout shall be within the intent of the original drawings and approved by the Irrigation Consultant.
    b. Lay out all irrigation equipment using an approved staking method, and maintain the staking of approved layout.
    c. All layouts in deviation of the design intent shall be approved by the Irrigation Consultant prior to equipment installation.
    d. Before starting work on irrigation system, determine that work may proceed without disruption of activities of other trades.
    e. The contractor shall carefully check grades to ensure that the area is safe to begin work.

f. Contractor is responsible for taking all reasonable investigative actions and precautions, when working around any utility system. Underground Service Alert shall be utilized where possible.
g. Contractor shall be responsible for verification of site conditions and minor revisions as approved by the Irrigation Consultant to insure 100% irrigation coverage in all areas.

4. ASSEMBLIES
   a. Routing of irrigation lines as indicated on drawings is diagrammatic. Install lines (and various assemblies) to conform to details on plans. Whenever possible, place all irrigation gate valves, remote control valves, quick couplers, pull boxes, etc. in the shrub planting areas. Irrigation elements drawn in hardscape areas on the plans are for graphic clarity only and intended to be placed in shrub planting areas.
   b. Do not install multiple assemblies on plastic lines. Provide each assembly with its own outlet.
   c. Install all assemblies specified herein according to the respective detail drawings or specifications, using the best standard practices with prior approval.
   d. Assemble brass pipe / fittings and plastic pipe / threaded fittings, using Teflon tape applied to the male threads only.
   e. Install concrete thrust blocking per detail on all mainline with gasketed pipe.

5. LINE CLEARANCE
   a. All lines shall have a minimum clearance of 4 inches from each other and 24 inches from lines of other trades.
   b. Do not install parallel lines directly over one another.

6. TRENCHING
   a. Dig trenches and support pipe continuously on bottom of trench. Lay pipe to an even grade. Pipe shall be snaked from side to side to allow for expansion and contraction. Trenching excavation shall follow layout indicated and as noted.
   b. Refer to details for trenching and pipe installation under paving dimensions.

7. BACKFILLING
   a. Initial backfill on all lines shall be of a fine granular material, not larger than 1/2 inch diameter.
   b. Compact backfill to dry density equal to 95% compaction, conforming to adjacent grades without dips, sunken areas, humps, or other irregularities.
   c. In appropriate types of soil, the Irrigation Consultant may authorize the use of flooding in lieu of tamping.
   d. Under no circumstances shall vehicle wheels be used for compacting soil.
   e. Provide sand backfill a minimum of 4 inches over and under all piping under paved areas, and a minimum of 2 inches on all other piping.
   f. If settlement occurs and subsequent adjustments in pipe, valves, irrigation heads, turf or other plantings, or other construction are necessary, the contractor shall make all required adjustments without cost to the City.

8. FLUSHING THE SYSTEM
   a. After all irrigation pipe lines and risers are in place and connected, and prior to installation of irrigation heads, the control valves shall be opened and a full head of water used to flush out the system.
   b. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Irrigation Consultant.

9. UNDER EXISTING AND/OR PROPOSED PAVEMENT:
   a. Trenches located under areas where paving, asphaltic concrete or concrete will be installed shall be backfilled with sand and compacted in layers to 95 % compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in flush with the adjoining grade. The irrigation contractor shall set in place, cap and pressure test all piping under paving prior to paving work.
   b. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. However, no hydraulic driving will be permitted under asphalt paving.

c. Provide a minimum cover of 18 inches between the top of the pipe and the bottom non-pressure piping (laterals) installed under asphaltic concrete paving.
d. Sleeves shall be two times the diameter of lateral line, mainline, and wire bundle size, and a minimum of 2 inch size. Install separate sleeves for each use.
e. Under public roads, all mainlines and lateral piping must have a minimum cover of 36 inches from the top of the pipe to the bottom of aggregate base or per local code.
f. Secure permission from the Irrigation Consultant before cutting or breaking existing pavement. All necessary repairs and replacements shall be approved by the Irrigation Consultant and City's authorized representative at no additional cost to the City.

10. CONTROLLER
    a. The contractor shall install a new controller as specified on the irrigation drawings.
    b. Controller shall be installed in the locations indicated on the irrigation drawings and approved by the Irrigation Consultant.
    c. Contractor shall install separate sleeve conduits for phone line, control wiring, ground wire and electrical power wires as required.
    d. Controller shall be installed in shrub areas only.
    e. Install controller per local electrical code.

11. IRRIGATION HEADS
    a. Install irrigation heads as indicated on the irrigation drawings.
    b. Spacing of heads shall not exceed the maximum indicated. In no case shall the spacing exceed the maximum recommended by the manufacturer.
    c. Heads along curbs, walks, paving, etc., shall be placed 1/2 inch above finish grade.
    d. Final sprinkler head heights shall be as indicated on the irrigation detail drawings. All sprinkler heads installed adjacent to hardscape features shall be located min. 4 inches off the edge of the hardscape feature for turf and 6 inches for shrub heads.
    e. All irrigation heads shall be set perpendicular to finish grades unless otherwise indicated on the plans.

12. ADJUSTING THE SYSTEM
    a. The contractor shall flush and adjust all irrigation heads and valves for optimum performance and to eliminate over spray onto walks, roadways, buildings, walls and other structures.
    b. If it is determined that adjustments in the irrigation equipment or nozzle changes will provide proper and more adequate coverage, make all such changes or make arrangements with the manufacturer and Irrigation Consultant to have adjustments made, prior to any planting.

13. COVERAGE TEST
    a. When the irrigation system is completed, perform a coverage test in the presence of the Irrigation Consultant to determine if the water coverage for turf, planting and slope areas is complete and adequate.
    b. Coverage must be 100 % head-to-head and accepted by the Irrigation Consultant. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans or where the system has been willfully installed as indicated in the drawings, when it is obviously inadequate or inappropriate, without bringing this to the attention of the Irrigation Consultant. This test shall be accomplished before any plant material is planted (excluding trees).

14. TESTS
    a. All piping under paved areas shall be tested under a hydrostatic pressure of 150 PSI and approved watertight, prior to the paving operation. Make hydrostatic tests only in the presence of the Irrigation Consultant and Water District Inspector. No pipe shall be backfilled until it has been inspected, tested, and approved in writing. Allow 48 hours lead time for pressure testing inspections.
    b. Furnish necessary force pump and all other test equipment.
    c. Test all pressure mainlines under a hydrostatic pressure of 150 PSI for a period of four hours.
    d. All testing shall be approved prior to the installation of remote control valves, quick couplers, or other valve assemblies.

15. MAINTENANCE
    a. The entire irrigation system shall be under full automatic operation for a period of seven days prior to any planting or hydroseeding (excluding trees).

16. COMPLETION CLEANING:
    a. Upon completion of the work, make ground surface-level, remove excess materials, rubbish, debris, etc., and remove construction and installation equipment from the premises.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 033000 - CAST-IN-PLACE CONCRETE PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. Section 033713 "Shotcrete" for pneumatically placed concrete.
2. Section 321300 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

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

B. Strength Test: The average of the strengths of at least two 6 by 12 inch cylinders or at least three 4 by 8 inch cylinders made from the same sample of concrete and tested at 28 days or at test age designated for determination of specified compressive strength of concrete.

1.4 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for MR Credit 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction

3. by weight that is considered regional.

4. Product Data for IEQ Credit 4.3: For liquid floor treatments, documentation including printed statement of VOC content.
5. Design Mixtures for ID Credit 1: For each concrete mixture containing fly ash as a replacement for Portland cement or other Portland cement replacements, and for equivalent concrete mixtures that do not contain Portland cement replacements.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.
2. Include qualified strength test records if design mixture is based on field experience.
3. Include results of trial mixtures if design mixture is based on trial mixtures.
4. Design mixture to be signed and sealed by a professional Civil or Structural Engineer licensed in the State in which if Project is constructed.

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

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installers.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstop.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Vapor retarders, including sub-base materials.
10. Semi-rigid joint filler.
11. Joint-filler strips.
12. Repair materials.

D. Material Test Reports: For the following, from a qualified Testing Agency, indicating compliance with requirements:

1. Aggregates.

1.

E. ICC ES Evaluation Reports: For evidence of Building Code compliance:

1. Mechanical splices and connectors for reinforcing steel.
2. Slab punching shear resisting system.

F. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

G. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect

H. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

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

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. 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.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5. Sections 1 through 5 and Section 7, "Lightweight Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Engage a qualified independent Testing Agency to perform material evaluation tests and to design concrete mixtures.

G. Pre-installation Conference: Conduct conference at Project site.

1. Review special inspection and Testing Agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing

1.

Procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab

flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

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

B. Waterstop: Store waterstop under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Void Forms: Structurally sufficient to support weight of plastic concrete and other superimposed loads.

1. Expanded polystyrene (EPS); ASTM C 578, Type XI.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

1.
2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as- drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Dowel Bar Sleeves: Circular PVC sleeve, sealed one end, dowel bar embedment plus 1 inch in length, and 1/16 inch annular space inside diameter.

C. Deformed Bar Anchors: ASTM A 496, deformed steel wire; AWS D1.1/D1.1M, Type C.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

E. Mechanical Splices and Connectors: Comply with ACI 318 and ACI 439.3, Type I and Type II.

1. Furnish splicing and connector system with current ICC ES Evaluation Report.

F. Punching Shear Reinforcing for Slabs: Comply with ACI 318 and ACI 421.1.

1. Furnish shear reinforcing system with current ICC ES Evaluation Report

2.4 CONCRETE MATERIALS

A. Regional Materials: Provide concrete that has been manufactured within 500 miles of Project site from aggregates and/or cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

A.

1. Portland Cement: ASTM C 150, Type I or Type II. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F.

C. Normal-Weight Aggregates: ASTM C 33, Class 1N coarse aggregate, well-graded. Provide aggregates from a single source.

1. Maximum Coarse Aggregate Size: 1-1/2 inches nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330, expanded shale, pre-size before firing, 3/4-inch nominal maximum aggregate size.

E. Water: ASTM C 94/C 94M.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will 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/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

2.6 WATERSTOPS

A. Flexible PVC Waterstop: CE CRD-C572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat ribbed without center bulb.
2. Dimension: 4 inches by 3/16-inch thick, nontapered.

2.7 VAPOR RETARDER

A. Sheet Vapor Retarder: ASTM E 1745, Class A, 15 mils. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

A.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100% passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.8 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semi rigid Joint Filler: Two-component, semi rigid, 100 percent solids, epoxy resin with a Type A shore Udometer hardness of 80 per ASTM D 2240.

C. Reglets: Fabricate reglets in concrete to receive flashing from other trades of not less than 0.022-inch thick galvanized-steel sheet. See Division 07 Section “Sheet Metal Flashing and Trim”. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

D. Dovetail Anchor Slots: Provide as shown on Drawings. Hot-dip galvanized-steel sheet, not less than 0.034-inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

A.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

C. 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 and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.12 CONCRETE MIXTURES, GENERAL

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, according to ACI 301.

1. Use a qualified independent 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 cement in concrete as follows:

1. Fly Ash: 40 percent minimum.

1.

C. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

A.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete, unless otherwise indicated on Drawings.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 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. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

1.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions. Required only at Units 19 and 20.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Granular Course: Place vapor retarder over 4-inch bed of granular fill material, moisten and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4-inch.

A.

1. Fine-Graded Granular Material: Place and compact a 1/2-inch layer of fine-graded granular material over granular fill.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. 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 would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 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 l locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. If not indicated, space vertical joints in walls at 25 feet intervals and 15 feet from corners. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

1.

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 tool 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 will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

a. Perform saw-cutting before concrete starts to cool, as soon as the concrete surface is firm enough not to be torn or damaged by the blade, and before random drying-shrinkage cracks can from in the concrete slab. Joints produced by conventional dry- or wet-cut process shall be made within 4 hours in hot weather and within 12 hours in cold weather after the slab has been finished.

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.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint or use PVC dowel bar sleeve.

3.8 WATERSTOPS

A. Flexible Waterstop: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

A.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. 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.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water

1.

equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 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 that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to 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 defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. 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.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill

A.

low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid- applied or sheet waterproofing, or built-up or membrane roofing.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to 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.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

   a. Specified overall values (SOV) of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values (MLV) of flatness, F(F) 17; and of levelness, F(L) 15.
   b. Specified overall values (SOV) of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values (MLV) of flatness, F(F) 24; and of levelness, F(L) 17; for surfaces to receive thin-set flooring.

3. For floor installations 10,000 sq. ft. or less in total project area, finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (90 percent compliance) in accordance to ACI 117 Section 4.8.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aluminum granule finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

A.

1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aluminum granules over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. 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 steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 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 ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

A.

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 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.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture- retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

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.

   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

   1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

A.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half 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, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, 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. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. 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 will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
4. Repair technique shall be tested on a mockup or surface to be concealed later, before repairing surfaces exposed to view, for approval by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include 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, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to

1. manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. 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.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified Testing Agency to perform field tests and inspections and prepare test reports.

B. Inspections: Verify and inspect concrete Work as shown on Drawings.

C. Concrete Tests: Testing 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 100 cu. yd. 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/C 143M; 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, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

1.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.

   a. Cast and laboratory cure two sets of two standard cylinder plus one spare standard cylinder specimens for each composite sample.
   b. To verify concrete strength for removal of shoring and reshoring in multistory construction, cast and field cure sets of two standard cylinder specimens for each composite sample. Number of field cured sets to be determined by Contractor.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory- cured specimens at 7 days and one set of two specimens at 28 days.

   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. Strength of each concrete mixture will be satisfactory if every 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.

   a. If 28-day compressive-strength test falls below satisfactory levels, strength test the spare cylinder at age determined by the Contractor and average with the strength of the 28-day specimens. The average strength of the three cylinders shall be considered one compressive-strength test.

9. 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 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.
10. 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.
11. Additional Tests: Testing 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. Testing Agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

1.

13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 03 35 00 CONCRETE FINISHING AND CURING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Leveling, floating, troweling, and other finishing treatments of newly-placed unformed concrete flatwork surfaces.
2. Curing unformed concrete flatwork surfaces.
3. Supplementary components, accessories and detail work necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 05 16 for preparation of concrete slabs for finish flooring.
2. Section 09 97 23 for concrete floor sealers.

1.2 REFERENCES

A. Definitions:

1. Freshly-Mixed Concrete: A homogenous mixture produced by assembling and blending hydraulic cement, aggregates, and water, with or without admixtures, fibers, or other cementitious materials.
2. Newly-Placed Concrete: Freshly-mixed concrete that has been deposited, distributed, consolidated, and screed in the place where it is to harden, but not yet troweled, or otherwise finished (aged up to approximately one hour after placement).
3. Newly-Finished Concrete: Means newly-placed and finished concrete during a period following final finishing operations immediately after bleed water glaze or sheen has disappeared and concrete is hard enough to resist surface damage, but before initial set, and whose surface is damp but not wet (aged approximately one to 4 hours old).
4. Cured Concrete: Means concrete having a deliberate action taken between the final finishing and termination of curing to reduce the loss of water from the surface of the concrete and control the temperature of the concrete
   a. Initially-Cured Concrete: Means newly placed and finished concrete during a period between placement and final finishing of concrete to reduce the loss of water from the surface of the concrete
   b. Newly-Cured Concrete: Means newly placed and finished concrete during a period following initial set, but before final set (aged approximately 4 to 8 hours old).
   c. Recently-Cured Concrete: Means newly-finished concrete during a period following final set (approximately 8 hours to 7 days old).
5. Hardened Concrete: Means newly-cured concrete that has developed sufficient strength to serve some purpose or resist breaking under stipulated loading (approximately 7 to 28 days or older) and that has not been exposed to weathering.
6. Aged Concrete: Means one of the following.

1.

   a. New Concrete: Hardened concrete aged more than 28 days old, whose surfaces have been exposed to a weathering, including abrasion, liquid penetration, freeze/thaw cycles, or salts and similar contaminates.

b. Existing Concrete: Existing concrete scheduled to remain, which may or may not require cleaning, resurfacing, rehabilitation, or strengthening.

7. Covering Material: Materials, products, and accessories and other items that penetrate, adhere to, or otherwise come into contact with concrete surfaces, including toppings, plaster, tile, sealers, damproofing, waterproofing, roofing, liquid flashings, joint sealants, flooring, adhesives, stains, paints, and coatings.

8. Smooth: Means having a continuously even surface free from irregularities, roughness, projections, bumps, points or ridges.

9. Surface Defect: Means surface voids, form streaking, sand streaking, aggregate transparency, color variation, layer lines, spalling, cracking, cold joints, offsets, honeycomb, bugholes in excess of 5/8-diameter and similar cavities or irregularities.

10. Trowel Mark: Means a concrete surface feature produced by troweling that can be both seen and felt.

11. Trowel Pattern: Means a concrete surface feature produced by troweling that can be seen, but cannot be felt.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Concrete Finishing:

a. Coordinate concrete finishing with covering material preparation, application, and installation requirements specified in other Sections.

b. Finish concrete to the tolerances and surface finishes required, recommended, approved, or accepted by the covering material supplier or manufacturer.

c. Either correct or remove, dispose of, and replace, or arrange and pay costs for the correction, improvement, or removal, disposal, and replacement of defective surface finishes and tolerances that do not conform to the covering material supplier or manufacturer's required, recommended, approved, or accepted tolerances and surface finishes.

2. Concrete Curing:

a. Wet curing is preferred.

b. When liquid membrane-forming curing compounds are selected by the Contractor for use in curing concrete, the Contractor shall coordinate the chemical and adhesive compatibility of the selected curing compounds with the selected covering materials.

c. The Contractor is responsible for performing, or arranging and paying costs for remedial work necessary to correct or improve either defective substrates, or failures of covering material installations resulting from (1) the selection and application of liquid membrane-forming curing compounds or form release agents; and (2) the coordination of selected liquid curing compounds or form release agents with selected covering materials.

B. Preinstallation Meeting: Concrete finishers and floor hardener, evaporation reducer, and liquid membrane-forming curing compound manufacturer's representatives must attend the preinstallation meeting specified in Section 07 26 16.

1.4 SUBMITTALS

A. Action Submittals:

A.

1. Product Data:

a. Submit manufacturer's product data and specifications for floor hardeners, evaporation reducers, and liquid membrane-forming curing compounds.
b. Include copies of product data for selected covering materials installed or applied as part of the work of other Sections together with floor hardener, evaporation reducer, and liquid membrane-forming curing compound product data.

2. Shop Drawings: Submit drawings showing locations of specified concrete finishes. Indicate curing method; identify curing compounds proposed for these areas with the manufacturer's product name.

B. Informational Submittals:

1. Certificates: Before starting work, submit an affidavit from each floor hardener, evaporation reducer, and liquid membrane-forming curing compound manufacturer on company letterhead evidencing that the selected products conform to the specified reference standards, are compatible with materials used in the concrete mixes, and will not negatively affect concrete color, finishing characteristics, quality, durability, or performance.
2. Application Instructions:
a. Submit manufacturer-prepared instructions for the proper surface preparation, mixing, and application of each floor hardener, evaporation reducer, and liquid membrane-forming curing compound.
b. If the manufacturer's application instructions are either unavailable or do not specifically apply to project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect for feedback before proceeding with the work.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Obtain each type, composition, and variety of floor hardener, evaporation reducer, and liquid membrane-forming curing compound through one source from a single manufacturer.
2. Products from more than one manufacturer may be used for different applications, however all products for like applications must come from the same manufacturer.

B. Quality Standard Requirements: Comply with American Concrete Institute (ACI) publication

1. ACI 302.1R "Guide for Concrete Floor and Slab Construction";
2. ACI 305 "Hot Weather Concreting"; and
3. ACI 308 "Standard Practice for Curing Concrete".

C. Concrete Finisher Qualifications:

1. Must be a company and individuals with at least 5 consecutive years' experience in the finishing of concrete on projects similar in material, design, complexity, and extent to this Project that have resulted in applications with a documented record of successful in-service performance.
2. Concrete finishing personnel must be qualified as ACI-certified Flatwork Technicians and Finishers.
a. Verify that finishers designated to perform any of the work of this Section have satisfactorily passed ACI qualification tests and are current in their certification.

a.

b. If any of those finishers need re-certification, then cause the re-testing of those finishers prior to performing the work of this Section.

D. Mockup: As specified in Section 03 30 00.

1.6 HANDLING

A. Delivery and Acceptance Requirements:

1. Delivery: Deliver floor hardeners, evaporation reducers, and liquid membrane-forming curing compounds to the Project site in original sealed unopened containers clearly marked with intact and legible identification labels indicating
   a. manufacturer's name and trademark;
   b. product type, size, grade, use, lot or batch number, and quantity;
   c. shelf life and expiration date; and
   d. ASTM designation or UL classification.
2. Acceptance at the Site:
   a. Inspect products and accessories delivered to the Project site for damage.
   b. Reject items that show damage or have damaged containers.
   c. With a minimum of handling, unload and store only undamaged items.

B. Storage and Handling Requirements:

1. Storage:
   a. Store floor hardeners, evaporation reducers, and liquid membrane-forming curing compounds as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage.
      1) Store flammable or combustible items in a cool, dry area away from sources of sparks and open flames.
      2) Store containers in a tightly closed condition, and away from direct sunlight, other flammable or combustible items, or sources of heat.
   b. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.
      1) Incline stored items to provide maximum drainage of accumulated moisture.
      2) Provide spacers to separate stored items and allow air to circulate around all surfaces.
      3) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.
      4) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture, or to ultraviolet radiation in excess of the manufacturer's recommended exposure limits.
2. Handling:
   a. Avoid contamination and damage to containers.
   b. Rotate inventory; do not use items the shelf life of which has expired.

C. Damaged Item Replacement Requirements: Either remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of finishing or curing items that become deteriorated, contaminated, or otherwise damaged.

A.

1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new waterproofing membrane items.

D. Packaging Waste Management:
1. Remove and dispose of construction waste at a disposal location away from the Project site.
2. Do not bury any type of wood, or wood-based or agrifiber products at the Project site.

1.7 PROJECT CONDITIONS

A. Environmental Requirements: If at any time during placing or curing the concrete evaporation rate exceeds 0.2 pounds per square foot per hour, as determined by Figure 2.1.5 of ACI 305 based on environmental data and concrete surface temperatures, especially when conditions of low humidity and high temperature exist, then provide preventive measures such as fog curing to reduce plastic shrinkage cracks during flatwork finishing operations, or apply an evaporation reducer in addition to other specified finishing requirements.

PART 2 - PRODUCTS

2.1 EVAPORATION REDUCERS

A. Description: Water-based polymer liquid applied to surfaces of newly-placed concrete in order to minimize rapid drying conditions due to high temperatures, low humidity, high winds, or direct sunlight.
B. Products: Acceptable products include the following, contingent on demonstrated conformance to the specified requirements, including the item description.
1. "MBT Confilm" by BASF Building Systems.
2. "Eucobar" by Euclid Chemical Co.
3. "E-Con" by L&M Construction Chemicals, Inc.
a. approved substitute.

2.2 FLOOR HARDENERS

A. Non-Oxidizing Metallic Floor Hardeners: Applied to exposed in-service surfaces of newly placed interior concrete loading dock slabs.
1. Description: Ferrosilicon or quartz-silica aggregate dry-shake surface hardener.
2. Products: Acceptable products include the following, contingent on demonstrated conformance to the specified requirements, including the item description.
a. "Lumiplate" by BASF Building Systems.
b. "Diamond Plate" by Euclid Chemical Co.
c. "Ferrocon FF" by L&M Construction Chemicals, Inc.
d. approved substitute.
B. Liquid Hardening Compound:
1. Description: Sodium silicate-based chemical hardening compound that chemically reacts to strengthen and harden concrete.
2. Products: Acceptable products include the following, contingent on demonstrated conformance to the specified requirements, including the item description.
a. "Eucosil" by Euclid Chemical Co.
b. "Chem Hard" by L&M Construction Chemicals, Inc.
c. approved substitute.

2.3 CURING MATERIALS

A. Wet Curing Materials:
   1. Water: Fresh, clean, clear, potable water from a domestic source. Water must conform to ASTM C 94 and must also be free of oil, grease, waxy films, curing compounds, release agents and other deleterious materials, including salts, acids, alkalis, organic materials, detergents or other matter that might negatively affect concrete quality, strength, durability or performance; or that might interfere with concrete curing, color, or appearance.
   2. Burlap Cloth: Provide jute mats or rugs conforming to AASHTO M 182 Class 3 (burlap cloth).
   3. Limitations: Burlap-backed polyethylene sheeting (Burlene) is not permitted.

B. Sheet Curing Materials:
   1. Curing Paper: Regular or white reinforced composite kraft paper conforming to ASTM C 171 and Federal Specification (FS) UU-B-790a requirements for Type II (concrete curing paper) Grade E (moisture retentive) Style 8 (regular color, reinforced).
   2. Non-Insulated Curing Tarp:
      a. Description: Reusable polypropylene (PP) or vinyl-coated polyester cover.
      b. Products: Provide one of the following.
         1) "Transguard 4000" by Reef Industries.
         2) "Tarps" by Hamilton Form Co, Ltd.
         3) "TVM Concrete Curing Blankets" by TVM Building Products.
   3. Limitations: Sheet curing materials may not be used to cure slabs scheduled to remain exposed-to-view in the finish work.

C. Dissipating Curing Compound:
   1. Description: Water-based curing compound conforming to ASTM C 309, Type 1-D (clear or translucent with fugitive dye -a dye that loses its coloring during proper usage) Class A (no restrictions) or Class B (resin). Cure-only compounds, curing and sealing compounds, and hardening and curing compounds are not permitted.
   2. Products: Design is based on "VaporSeal 309" by Floor Seal Technology, Inc. Other acceptable sources of comparable products include the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
      a. Dayton Superior Corp.
      b. Euclid Chemical Co.
      c. L&M Construction Chemicals, Inc.
      d. approved substitute.
   3. Limitations: Curing compounds may not be used to cure slabs scheduled to receive
      a. bonded concrete, mortar, or plaster;
      b. adhered floor coverings, including carpet and resilient flooring; or
      c. film-forming coatings or penetrants, including sealers, epoxy, paint, and fluid applied waterproofing.

2.4 ACCESSORIES
2.1

A. Screeds:
   1. Description: Non-corrosive, leak-resistant, plastic stake that acts as a permanent plug in the below grade vapor retarder. Unsealed penetrations of vapor retarder caused by placing or finishing concrete are not permitted.

2. Products: Provide either "Vapor Stake" by VaporStake, LLC, or a screeding system that does not puncture below grade vapor diffusion retarder.

B. Slip-Resistive Aggregate:
1. Description: Factory graded, rustproof, non-glazing, and unaffected by cleaning materials.
2. Products: Acceptable products include the following.
a. "Frictex NS" by Sonneborn-Contech
b. "Fut-Sure" by General Abrasive Company
c. Or equal.

C. Other Accessories: Install or apply other accessories and similar secondary items as supplied, required, recommended, approved, or accepted by the liquid membrane-forming curing compound manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect concrete from rapid moisture loss before and during finishing operations.
1. Apply evaporation reducer as needed prior to beginning finishing operations, and periodically during finishing.
2. Do not apply water to the slab surface during finishing operations.

3.2 CONCRETE FINISHING

A. General:
1. Comply with ACI 302.1R recommendations for screeding, floating, restraightening, and finishing operations for slabs.
2. Finish surfaces to produce a uniform appearance throughout the area involved, and throughout adjacent areas with the same concrete finish.

B. Compacting and Floating:
1. Use continuous screeds spaced or located to produce the specified concrete surface tolerances. Bring slabs to proper level and strike-off with a straightedge.
2. Remove excess water and laitance.
3. Compact and consolidate to embed coarse aggregates.
4. Float and test surfaces with a 10-foot straightedge and eliminate high and low spots.
5. Use methods and tools necessary to produce the proper surface finishes and tolerances.

C. Concrete Placed over Metal Decking:
1. Use adjustable screeds at all screeded points and adjust to compensate for existing deflection of deck and beams; and for deflection occurring during concreting operations. Do not use steel closures at metal deck edges as a screed.
2. Continuously monitor screeds and floors during concrete placement and finishing, and adjust concrete floor thickness as required to obtain level floors conforming to the specified tolerances.

D. Contraction Joints: Make joint lines straight, uniform in depth and cross section, and equally spaced and parallel to adjacent lines, walls, edges, and other construction with intersections accurately formed.
1. Where tooled joint are indicated, mark slabs with a 1/4-inch radiused edging or marking tool.
2. Where saw-cut joints is indicated, schedule cutting operations so that cutting is performed as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw blade, but before shrinkage stresses have developed sufficiently to produce cracking.

E. Special Techniques:

1. Scratch Finish:
   a. Screed and bullfloat concrete surface.
   b. Roughen the surface with stiff brushes or rakes to produce a 1/4-inch surface profile in one direction before final set.
2. Float Finish: Screed and bullfloat concrete surface.
   a. Consolidate surface with power-driven floats or by hand floating if area is too small or inaccessible by power-driven floats.
   b. Restraighten, cut down high spots, and fill low spots.
   c. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
3. Steel Trowel Finish:
   a. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with surface plane tolerance specified.
   b. Grind smooth surface defects that would telegraph through applied floor covering system.
   c. Steel trowel to a hard, dense, burnished finish. Do not double steel trowel interior slabs on grade having an underslab vapor retarder.
4. Light Trowel Finish:
   a. Apply float finish.
   b. Continue troweling passes and restraighten until the concrete surface is free of trowel marks, is uniform in texture, and is planed to the specified tolerance.
   c. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
5. Hard Trowel Finish:
   a. Apply light trowel finish.
   b. Continue hand troweling until a ringing sound is produced as the trowel is moved over the surface.
   c. Final hand-troweling shall leave finished surface free of trowel marks, uniform in texture and appearance, and planed to the specified tolerance.
6. Broom Finish:
   a. Apply float finish.
   b. Lightly steel trowel to remove irregularities.
   c. Roughen surface by drawing a minimum 24-inch-wide fiber bristle broom (for medium broom finish), or steel bristle broom (for heavy broom finish), across the concrete surface perpendicular to the main direction of traffic.
   d. Produce even texture from edge to edge; slightly lap adjacent strokes to produce a uniform pattern.
   e. Obtain the Architect's approval for proposed texture before final application.
7. Swirl Finish:
   a. Apply float finish.
   b. Hand float using a wood float to produce a continuous swirl patterned surface, free from porous and rough spots that may be produced by disturbing particles of coarse aggregate embedded near the surface.
   c. Obtain the Architect's approval for proposed texture before final application.
8. Slip-Resistive Aggregate Finish:
   a. Apply float finish.

b. Apply slip-resistive aggregate according to manufacturer's written instructions, but not less than 25 pounds per 100 square feet.

c. Follow spreading and tamping of slip-resistive aggregate with a final float, and apply a light trowel finish.

F. Site Tolerances:

1. Surfaces Scheduled to Receive a Scratch Finish: After placing slabs, plane the surface to a tolerance not exceeding 1/4-inch in 2 feet when tested with a 2 feet straightedge.

a. Slope surfaces uniformly to drains where required.

b. After leveling and before the final set, roughen the surface with stiff brushes, brooms or rakes.

2. All Other Surfaces: Finish to a tolerance of 1/8-inch in 10 feet when measured with a 10-foot straightedge placed anywhere on the surface. Variation from level shall not exceed 1/8-inch overall.

a. Scratch Finish Tolerance: 1/2-inch in 10 feet, when measured by placing a freestanding (unleveled) 10-foot straightedge anywhere on the slab and allowing it to rest on 2 high spots within 72 hours after concrete placement.

b. Float Finish Tolerance: 5/16-inch in 10 feet, when measured by placing a freestanding (unleveled) 10-foot straightedge anywhere on the slab and allowing it to rest on 2 high spots within 72 hours after concrete placement.

c. Light Trowel Finish Tolerance: When slab is not sloped, and the total project area is greater than 10,000 square feet, use the F-number system as measured by ASTM E 1155 with tolerances as follows:

1) Flatness: Overall F(F) 30; with a minimum local value of F(F) 24.

2) Levelness: Overall F(L) 20; with a minimum local value of F(L) 15.

3) Otherwise, use 3/16 inch in 10 feet measured by "10-ft straightedge method" in ACI 117.

d. Heavy Trowel Finish Tolerance: When slab is not sloped and total project area is greater than 10,000 square feet, use the F-number system as measured by ASTM E 1155 with tolerances as follows:

1) Flatness: Overall F(F) 30; with a minimum local value of F(F) 24.

END OF SECTION

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SECTION 042200 - CONCRETE UNIT MASONRY PART1

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Miscellaneous masonry accessories.

B. Related Sections:

1. Division 04 Section "Cast Stone Masonry" for furnishing cast stone trim.
2. Division 07 Section "Water Repellents" for water repellents applied to concrete unit masonry.
3. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
4. Division 09 Section "Stone Facing" for stone window stools.
5. Division 32 Section "Unit Paving" for exterior concrete unit masonry paving.
6. Division 32 Section "Segmental Retaining Walls" for dry-laid, concrete unit retaining walls.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

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

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1.Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.

2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention,

and ASTM C 91 for air content.

3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.

4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.5 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Certificates for MR Credit 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

a. a. Include material test reports substantiating compliance with requirements.

2. Cementitious materials. Include brand, type, and name of manufacturer.

3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

4. Grout mixes. Include description of type and proportions of ingredients.

5. Reinforcing bars.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

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

1.7 QUALITY ASSURANCE

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

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

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

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

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

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

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

1.9 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

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

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: CMU shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

Angelus Block Co., Inc.
Sun Valley, CA (818) 767-8576
Orange, CA (714) 637-8594
Fontana, CA (909) 350-0244
Gardena, CA (310) 323-8841
Oxnard, CA (805) 485-1137
Indio, CA (760) 347-3245

Preblended mortar.
1. Spec Mix Preblended Mortar Mix, by E-Z Mix, Inc.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

C.Integral Water Repellent: Provide units made with integral water repellent where indicated.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

D. CMU: ASTM C 90.

1. Density Classification: Medium weight unless otherwise indicated.
2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

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

2.3 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

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

E. Aggregate for Mortar: ASTM C 144.

F. Aggregate for Grout: ASTM C 404.

G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMU, containing integral water repellent by same manufacturer.

H. Water: Potable.

2.4 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 706/A 706M.

2.5 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed steel bolts complying with ASTM F 1544, Grade 36; with ASTM A 563, Grade A hex nuts and; ASTM F 436 flat washers.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

B. Elastomeric Sealant: ASTM C 920, chemically curing polysulfide sealant; of type, grade, class, and use classifications required to seal joints and remain watertight

C. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

2.7 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

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

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification for Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use coarse grout that will comply with Table 1.19.1 in ACI 530/ASCE 5/TMS 402 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified

28- day compressive strength indicated, but not less than 2000 psi.

3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

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

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

3.2 INSTALLATION, GENERAL

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

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

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

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more

than 1/4 inch in 10 feet, or 1/2 inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.

2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.

4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

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

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.

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

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

F. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.

2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints; butter ends with sufficient mortar to fill head joints and shove into place.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.

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

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

3.6 CONTROL AND EXPANSION JOINTS

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

B. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.
2. Keep head joints free and clear of mortar or rake out joint for application of sealant.

3.7 FLASHING

A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 07 Section "Joint

Sealants" for application indicated.

4. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.

5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.8 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

2. Limit height of vertical grout pours to not more than 60 inches.

3.9 FIELD QUALITY CONTROL

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

B. Inspections: Level 1 special inspections according to the "California Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site- prepared mortar.

2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140

for compressive strength.

D. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

E. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.10 REPAIRING, POINTING, AND CLEANING

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

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

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

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

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

B. Excess Masonry Waste: Remove excess clean masonry waste and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

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SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1. 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. 1.2 SUMMARY

A. Section Includes:
1. Structural steel.
2. Grout.

B. Related Sections:
1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
2. Division 05 Section "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
3. Division 05 Section "Metal Stairs."
4. Division 09 painting Sections and Division 09 Section "High-Performance Coatings" for surface-preparation and priming requirements.

1. 1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or elements along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members of the SLRS indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

A.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are

indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1. 1.4 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Data for MR Credit 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand critical welds.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing. For demand critical welds include the following:

1. One or more combination of welding variables (e.g. power source, volt, amp, travel speed, etc.) that produces heat input within the range used for the WPS Heat Input Envelope Test.
2. Electrode manufacturer and trade name.

1. 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

A.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

F. Source quality-control reports.

1. 1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

1. When accepted by local jurisdiction: Fabricators approved by the Los Angeles Department of Building and Safety.

B. Installer ualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 358.
4. AISC 360.
5. RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
6. AWS D1.1/D1.1M.
7. AWS D1.8/D1.8M.

E. Pre-installation Conference: Conduct conference at Project site.

1. 1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel

members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

A.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's Testing Agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1. 1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

1. 2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:

1. W-Shapes: 60 percent.
2. Channels, Angles, M, S-Shapes: 60 percent.
3. Plates and Bars: 25 percent.
4. Cold-Formed Hollow Structural Sections: 25 percent.
5. Steel Pipe: 25 percent.
6. All Other Steel Materials: 25 percent.

B. W-Shapes: ASTM A 992/A 992M.

C. Channels, Angles, M-, S-Shapes: ASTM A 36/A 36M.

D. Plates and Bars: ASTM A 36/A 36M, typical; ASTM A 572/A 572M, Grade 50, when used in SLRS connection.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

A.

1. Finish: Black except where indicated to be galvanized.

G. Welding Electrodes: Comply with AWS requirements.

1. 2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating. All threaded components of the fastener assembly must be galvanized by the same process. Mixing high-strength bolts that are galvanized by one process with nuts that are galvanized by the other is not permitted.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

D. Shear Connectors: ASTM A 108, Grades 1010 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

E. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain.

F. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.

2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Plain.

1.

1. 2.3 PRIMER

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers", including 2004 Addenda.

B. Primer: Comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."

C. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.

D. Galvanizing Repair Paint: ASTM A 780.

1. 2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

1. 2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."

A.

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

1. 2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened unless noted otherwise on Drawings.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

1. 2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Top flange of beams supporting steel decking.
4. Surfaces to be high-strength bolted with slip-critical connections.
5. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
6. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

1.

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. 2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

1. 3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

1. 3.2 PREPARATION

A. Determine, furnish and install all temporary supports, such as temporary guys, beams, braces, falsework, cribbing or other elements required for the erection operation. These temporary supports shall be sufficient to secure the bare structural steel framing or any portion thereof against loads that are likely to be encountered during erection, including those due to wind and those that result from erection operations. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. 3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

A.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

1. 3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened unless noted otherwise on Drawings.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of

temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.

1.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

1. 3.5 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified independent Testing Agency to inspect field welds and high-strength bolted connections and prepare test reports.

B. Inspections: Verify and inspect structural steel Work as shown on Drawings.

C. Bolted Connections: Bolted connections will be tested and inspected according to RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at Testing Agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

c. Ultrasonic Inspection: ASTM E 164.

E. SLRS Connections: Test and inspect SLRS connection elements as indicated in accordance to AISC 341, AWS D1.1/D1.1M and AWS D1.8/D1.8M.

F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360- degree flash or welding repairs to any shear connector.

2. Testing Agency, where warranted, may select a reasonable number of additional studs to be subjected to the bend tests.

G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

1. 3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and

repair galvanizing to comply with ASTM A 780.

A.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power- tool cleaning.

END OF SECTION 051200

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SECTION 05 40 00 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. 1. Non-axial-load-bearing CFS framing.
2. 2. Slotted channel framing (trapeze support assemblies).
3. 3. Supplementary components, accessories, and detail work necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. 1. Section 09 22 16 for non-structural metal framing.
2. 2. Section 09 22 26 for suspension systems.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. AHJ: Authority (Authorities) Having Jurisdiction.
2. AISI: American Iron and Steel Institute.
3. AWS: American Welding Society.
4. CSF: Cold-Formed Steel.
5. HDG: Hot Dip Galvanized.
6. SFRM: Sprayed Fire-Resistive Material.
7. SSMA: Steel Stud Manufacturing Association.
8. USSG: United States Standard Gage.

B. Definitions:

1. Manufacturer: Means the metal framing manufacturer, unless otherwise indicated.

2. Structural (Cold-Formed) Metal Framing: Means metal framing members having a base metal thickness range of between 118 mils (10-gage) and 33 mils (20-gage), and installed in both transverse and axial load-bearing applications.

3. Non-Structural (Lightgage) Metal Framing: Means metal framing members havin g a base metal thickness of 30 mils (20-gage) or less, and installed in non-load-bearing interior construction assemblies typically supporting plaster or gypsum board.

4. Gage: Means the thickness of sheet metal based on weight measured in pounds per square foot per inch of thickness. For the purposes of this specification, gages are classified by the following Table. Minimum thickness indicated in the first column is equivalent to 95 percent of the design thickness and is the minimum acceptable thickness of base metal delivered to the project jobsite.

Reference Gage	Minimum Thickness (mils)	Design Thickness (inch)
Non-Structural (Lightgage) Metal Framing specified in Section 09 22 16		
25	18	0.0188
22	27	0.0283
20	30	0.0312
Structural (Cold-Formed) Metal Framing specified in this Section		
20	33	0.0346
18	43	0.0451
16	54	0.0566
14	68	0.0713
12	97	0.1017
10	118	0.1242

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

1. System Description: Drawings of metal framing are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.

2. Design Requirements:

a. Engineer, fabricate, assemble, and install metal framing to meet or exceed the specified performance criteria; conform to the profiles indicated and to other requirements of the Contract Documents; satisfy the requirements of the AHJ; and provide structurally sound, assemblies that accommodate, resist, distribute, or transfer, as applicable, the minimum specified in-service loads and thermal, seismic, wind sway, and other types of movement without incipient or catastrophic failure.

b. Maintain the visual design concept indicated, including member sizes, profiles, and alignment of components. Deviation from the visual design concept indicated is not permitted without prior written authorization from the Architect.

3. Performance Requirements: Unless otherwise indicated, metal framing must conform to the following.

a. Design Pressure (Lateral Wind Load): As indicated on the structural drawings and general notes.

b. Uniformly Distributed Lateral Live Load: Provide interior non-bearing wall and partition construction assemblies engineered to accommodate, resist, distribute or transfer, as applicable, a minimum lateral load of 10 psf without incipient or catastrophic failure, structural distress of supporting framing members, or other detrimental effects.

c. Design Loads: Exterior wall and interior partition assemblies must be engineered to accommodate, resist, distribute or transfer, as applicable, the loads to which they are subjected, including attachment of any architectural components, non- structural components, casework, equipment, and similar items.

d. Thermal Movements: Provide metal framing that allows for thermal movements resulting from the following minimum temperature differentials (changes) in both ambient and surface temperatures; and prevent buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1) Design Ambient Temperature Differential (Change): At least 120 deg. F.

2) Design Material Surface Temperature Differential (Change): At least 180 deg. F.

3) Base engineering calculations on material surface temperatures due both to solar heat gain and to nighttime-sky heat loss.

4) Provide fasteners that resist rotation and withstand shear stress resulting from thermal expansion and contraction.

e. Superstructure Displacement: Accommodate the following without evidencing failure, buckling, opening of joints, fastener hole elongation, overstressing of components or base material, joint sealant or other connection material failure, wave, warp, wrinkles, distortion in finished surfaces, or other detrimental effects.

1) Vertical Displacement of Adjacent Stories (Live Load Deflection):

2) At all exterior stud walls and interior partitions, allow for at least 3/4-inch vertical live load structure deflection, unless otherwise indicated on the structural drawings and general notes.

3) Where exterior stud walls occur at or near the building perimeter, provide allowance for earthquake vertical deflections as indicated on the structural drawings and general notes.

4) Horizontal Displacement of Adjacent Stories (Interstory Drift): Allow for displacement indicated on the structural drawings and general notes.

f. Perpendicular Deflection (Convexity and Concavity): Limit deflection under maximum design pressure to the following, measured in a direction normal to the assembly plane, and disregarding contribution of sheathing materials. For asymmetric wall construction, the more stringent condition requirement applies to the entire assembly. Limit all stud wall deflections to CBC 2007 Table 1604A.3.

1) Construction Supporting Metal Panels: Not more than L/180.

2) Construction Supporting Gypsum Board: Not more than L/240.

3) Construction Supporting Tile: Not more than L/360.

4) Horizontal Joist Framing: Not more than L/240.

4. Corrosion Protection: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:

a. Submit a list of proposed products, materials and accessories to be provided, along with their manufacturer's product data, specifications, typical installation details and other data necessary to demonstrate compliance with specified requirements for each item listed.

b. Along with the other required submittals for items furnished under this Section, combine copies of manufacturer's product data for items furnished under other Sections together with the product data required for the work installed under this Section.

2. Shop Drawings:

a. Submit project-specific, minimum 1-1/2-inch scale dimensioned details showing the following.

1) Layout, spacing, sizes, thicknesses, and types of cold-formed metal framing;

2) Reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

3) Connection details and attachments to other work, including seismic bracing proposed for use and edge of slab conditions.

4) Head of wall connections for fire-resistance rated assemblies.

5) Framed opening details.

6) Acoustical seals and tie-in conditions to fireproofing.

7) Inside and outside corner conditions.

b. Furnish 3-dimensional or isometric drawings for conditions too difficult to illustrate in 2-dimensional orthographic projections.

B. Informational Submittals:

1. Certificates:

a. Steel Mill Certificates: Submit the supplier's mill certificates with each delivery of materials delivered to the Project site evidencing that the material furnished complies with the specified requirements, including base-metal thickness, yield strength, and HDG metallic coating thickness.

b. Welder's Certificates: Submit copies of current welder's certificates for each welder designated to perform any of the work of this Section.

2. Delegated Design Submittals: Submit engineering calculations demonstrating conformance to the requirements of the Contract Documents.

a. Calculations must be legible; must incorporate sufficient cross-references to the shop drawings to make the calculation readily understandable and reviewable; and must include

1) design loads;

2) analysis of framing members, including section -property computations;

3) analysis of anchors;

4) the signature and seal of the licensed professional responsible for preparing the calculations.

b. Test reports are not an acceptable substitute for calculations.

3. Test and Evaluation Reports: Submit current report from the International Code Council

Evaluation Services (ICC-ES), or other qualified national testing organization acceptable to the AHJ evidencing the following items conform to the requirements of the AHJ.

a. Steel sheet.
b. Mechanical fasteners.
c. Expansion anchors.
d. Power-actuated fasteners.
e. Vertical deflection clips.
f. Horizontal drift deflection clips.
g. Miscellaneous structural clips and accessories.

4. Installation Instructions:

a. Submit manufacturer-prepared instructions for the proper installation of metal framing, fasteners, and accessories.

b. If the manufacturer's installation instructions are either unavailable or do not specifically apply to project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect for feedback before proceeding with the work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain products and accessories used for Project through one source from the same manufacturer.

B. Regulatory Requirements:

1. Fire-Resistance Requirements: Where materials are part of an fire-resistance-rated assembly, provide metal framing within the assembly that are identical to or better than those products indicated as listed and tested in compliance with ASTM E 119 by a qualified testing and inspecting agency, or qualified national testing organization, acceptable to the AHJ.

2. Acoustic Requirements: Where materials are part of an STC-rated assembly, provide metal framing within the assembly that are identical to or better than those products indicated as listed and tested in compliance with ASTM E 90 and ATM E 413 by a qualified testing and inspecting agency, or qualified national testing organization, acceptable to the AHJ.

C. Quality Standard Requirements:

1. Comply with all requirements of the current California Building Code (CBC).

2. Comply with the requirements AISI publications S100, "North American Specification for the Design of Cold-Formed Steel Structural Members" and
SG03 "Cold-Formed Steel Design Manual" for cold-formed steel framing design.

3. Comply with AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

4. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

D. Qualifications:

1. Manufacturer: Obtain metal framing products and materials only from a manufacturer that is a current member of SSMA.

2. Installer: Firm and individuals with at least 5 consecutive years' experience in the installation of specified products, and whose installation has resulted in applications with a record of

successful in-service performance on projects similar in material, design, complexity and extent to this Project.

3. Welders: Qualify welding procedures and personnel in compliance with AWS "Qualification" requirements of AWS D1.1 (steel) and AWS D1.3 (sheet steel).

a. Verify welders to be employed in this work have satisfactorily passed AWS qualification tests and are current in their certification.

b. If re-certification is required, re-testing shall be Contractor's responsibility.

4. Licensed Professional:

a. Engineer Qualifications: Professional structural engineer legally qualified to practice in California, and having at least 10 consecutive years providing engineering services of the kind indicated on projects similar in material, design, complexity and extent to this Project.

b. Engineering Responsibility: Shop drawings, design calculations, and other structural data must be prepared directly by, or under the direct supervision of, a qualified professional structural engineer.

1.6 HANDLING

A. Delivery: Protect materials from, exposure to weather, contact with damp or wet surfaces and or other sources of moisture during delivery.

B. Storage:

1. Store materials off the ground or floor on pallets, and protected from precipitation or other forms of moisture with breathing-type covers. Un-vented polyethylene tarpaulins are not permitted.

a. Incline stored items to provide maximum drainage.

b. Provide spacers to separate stored items and to provide air circulation around all surfaces.

c. Protect stored items to prevent contact with the soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

d. Do not leave materials uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost or other sources of moisture.

C. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become corroded, deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.

2. Replace removed items with undamaged new items.

D. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. HDG Metallic-Coated Steel Sheet: ASTM A 1003 Structural Grade 50, Type H (ST50H),

zinc-coated with at least a G60 coating designation, having equal coating weight on both surfaces.

B. Recycled Content: Provide steel products having minimum average recycled steel product content such that the total post-consumer recycled content plus half the pre- consumer recycled content is not less than 50 percent.

2.2 COLD FORMED METAL FRAMING

A. Manufacturers: Available manufacturers of acceptable products, components and accessories that may be incorporated into the Work include the following.

1. CEMCO.
2. ClarkDietrich Building Systems.
3. Olmar Supply.
4. SCAFCO Corp.
5. The Steel Network, Inc.

B. Studs: Pre-punched C-shaped studs manufactured from minimum 54-mil (16-gage) base metal thickness HDG metallic-coated steel sheet, having minimum 1-5/8-inch wide stiffened flanges with minimum 1/2-inch returns, and manufacturer's standard knockout sizing and spacing.

C. Top and Bottom Runners (Tracks): Un-punched U-shaped runners manufactured from material corresponding in size and gage to studs, but not less than 54-mil (16-gage) base metal thickness HDG metallic-coated steel sheet, and having minimum 1-1/2-inch wide unstiffened flanges.

D. King Studs: C-shaped studs manufactured from at least 54-mil (16-gage) base metal thickness HDG metallic-coated steel sheet, having at least 3-inch wide stiffened flanges with minimum 7/8-inch returns.

E. Bridging:

1. Cold Rolled Channel (CRC) Bridging:

a. a. Bridging Channels: 1-1/2-inch wide by 1/2-inch deep cold-rolled channel bridging manufactured from minimum 54-mil (16-gage) base metal thickness HDG metallic-coated steel sheet.

b. Bridging Clips: Design is based on "EasyClip U-, B-, or X-Series Clip Angles" manufactured by ClarkDietrich Building Systems. Other acceptable products include the following.

1) "BridgeClip", "BC600", or "BC800" by The Steel Network.

2) Or equal. As an alternate, provide 1-1/2-inch wide by 1/2-inch deep by full stud width cold-rolled angle clips manufactured from minimum 54-mil (16- gage) base metal thickness HDG metallic-coated steel sheet.

2. Manufactured Bridging Channels:

a. Description: Channel- or L-shaped bridging with pre-notched slots manufactured from minimum 54-mil (16-gage) base metal thickness HDG metallic-coated steel sheet.

b. Product: Design is based on "Spazzer 5400" manufactured by ClarkDietrich Building Systems. Other acceptable products include the following.

1) "BridgeBar 150" by The Steel Network.

2) Or equal.

c. Bridging Clips: Provide one of the following, as determined by selected manufactured bridging channels.

1) "Spazzer Bar Guard" by ClarkDietrich Building Systems.
2) "BridgeClip", "BC600", or "BC800" by The Steel Network.
3) Or equal.

F. Headers:

1. Built-Up Headers:

a. Built-Up Curtain Wall Headers: Un-punched C-shaped studs and U-channel runners manufactured from minimum 54-mil (16-gage) base metal thickness HDG metallic-coated steel sheet with minimum 1-5/8-inch wide stiffened flanges.

b. Load-Bearing Box Beam Headers: Un-punched C-shaped studs manufactured from minimum 54-mil (16-gage) base metal thickness HDG metallic-coated steel sheet with minimum 1-5/8-inch wide stiffened flanges.

c. Header Connectors:

1) Description: Connectors to attach either beams to columns or headers to jambs.
2) Product: Provide "DROP'N LOCK CLIP" manufactured by ClarkDietrich Building Systems, or equal.

2. Manufactured Headers:

a. Description: One- or 2-piece pre-engineered header with associated inserts and clips.

b. Products: Provide "RedHeader RO Rough Opening System" or equal.

G. Deflection Connectors:

1. Head-of-Wall Connectors:

a. Description: Slotted track used in head-of-wall deflection conditions for interior and exterior non-load-bearing walls in order to accommodate vertical movement caused by normal head-of-wall and floor extension or compression, as well as interstory seismic drift as indicated on S002 Tables.

b. Product: Design is based on "SLP-TRK" slotted slip track by Clark Dietrich Building Systems. Other acceptable products include the following.

1) "CEMCO Slotted Track (CST)" by California Expanded Metals Co.
2) Or equal.

2. Bypass Connectors:

a. Description: Clips used to attach exterior curtain wall studs to the building superstructure and to provide for vertical building movement independent of the metal stud framing.

b. Products:

1) Bypass Slab Connectors: Design is based on "Slide Clip" (minimal or no standoff conditions) or "Fast Clip Slide Clip" (medium standoff conditions) manufactured by Clark Dietrich Building Systems. Other acceptable products include the following.

a) "VertiClip SLB" by The Steel Network.
b) Or equal.

2) Bypass Structure Connectors: Design is based on "Quick Clip" (medium standoff conditions) and "Extended Fast Clip Slide Clip" or "Fast Strut" (large standoff

conditions) by Clark Dietrich Building Systems. Other acceptable products include the following.

a) "VertiClip SLS", "VertiClip SLT" or "VertiClip SLT(L)" by The Steel Network.

b) Or equal.

H. Combination Vertical Deflection and Lateral Drift Connectors:

1. Description: Bypass connectors used to attach exterior curtain wall studs to the building superstructure and to provide both vertical and lateral building movement independent of the metal stud framing.

2. Products:

a. Clip Connectors: Design is based on "DriftClip DSLB" (attaches to slab edge) or "DriftClip DSLS" (attaches to superstructure) by The Steel Network.

b. Combination Track-and-Clip Bypass Slab Connectors: Design is based on "DriftTrack DTSLB" track with "VertiClip SLB" clip connectors having step bushings preinstalled in vertical slots by The Steel Network.

c. Or equal.

I. Rigid Connectors:

1. Multipurpose Connectors: Design is based on "Uni-Clip" universal framing clip by ClarkDietrich Building Systems. Other acceptable products include the following.

a. "StiffClip AL" by The Steel Network.

b. Or equal.

J. Accessories:

1. Shims: Load bearing, non-leaching, high-density multimonomer plastic.

2. Fasteners:

a. Screw Fasteners: Provide at least 0.242-inch shank diameter (UTS #14) by at least one inch long hex-washer head stainless steel, bi-metal, duplex anti- corrosive steel, 3-coat anti-corrosive steel, or ceramic-coated, anti-corrosive self- drilling steel screw fasteners specified in Section 05 05 23.

b. Powder Actuated Fasteners: As specified in Section 05 05 23.

3. Other Accessories: Provide other accessories and similar secondary items as furnished, required, recommended, approved or accepted by the framing manufacturer.

2.3 SLOTTED CHANNEL FRAMING (TRAPEZE SUPPORT ASSEMBLIES)

A. Description: Continuous slot-channel metal framing complying with MFMA-4, and associated fittings and hardware necessary for supporting cable trays, conduit, pipes and similar items.

B. Products: Design is based on "P3000 SL" slotted channels by Unistrut Corp. Other acceptable sources of comparable products are limited to one of the following.

1. Erico, Inc.
2. Flex-Strut, Inc.
3. PHD Manufacturing, Inc.

C. Items must conform to the following:

1. Type: Standard and welded combination channels as required by conditions of installation and service.

2. Height: Provide heights as required by engineering calculations to meet load capacities, but not less than minimum 1-3/8 inches.

3. Suspension system: Hot dip galvanized coarse-threaded (UNC) carbon steel rods having diameters as required by engineering calculations to meet load capacities, but not less than minimum 3/8-inch.

4. Accessories: Provide kickers, perimeter angle pieces and other accessories furnished, required, recommended or approved by the slotted channel framing manufacturer and necessary for a complete and structurally-sound installation.

D. Material: At least 0.0747-inch base metal thickness (USSG 14) HDG metallic-coated steel sheet complying with ASTM A 653, structural steel (SS), Grade 33 or better, at least a G90 zinc coating designation on both surfaces with equal coating weight on each surface.

E. Finish: Chemically treated where scheduled to retain natural zinc finish and bonderized where painted finish is indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

A.

1. Verify that work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance;

B. Evaluation and Assessment:

1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct or improve deficient conditions and to conform to the manufacturer's installation requirements.

2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the manufacturer's installation requirements.

3.2 INSTALLATION

A. General:

1. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

2. Comply with AISI publication "Standard for Cold-Formed Steel Framing - General

Provisions" requirements for metal framing, with the requirements of fire- resistance-rated assemblies indicated, and with the manufacturer's installation instructions.

a. Use materials and methods required, recommended, approved, or accepted by the manufacturer along with manufacturer-recommended accessories and techniques.

b. Set items true to line, to required levels and lines, plumb, level, square, and cut and fitted without warp, or rack.

B. Special Techniques:

1. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

2. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16-inch.

3. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

a. Cut framing members by sawing or shearing; do not torch cut.

b. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

1) Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

2) Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

4. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

5. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

6. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

7. Install insulation specified in Section 07 21 00 into built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

8. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

C. Exterior Non-Load Bearing Stud Installation:

1. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

2. Fasten both flanges of studs to top and bottom track, as indicated.

3. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

4. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical

loads while providing lateral support.

a. Install deflection tracks and anchor to building structure.

b. Connect vertical deflection clips to bypassing studs and anchor to building structure.

c. Connect drift clips to cold formed metal framing and anchor to building structure.

5. Install horizontal bridging in wall studs at unsupported flanges only, spaced in rows indicated on Shop Drawings, but not more than 48 inches apart. Fasten at each stud intersection.

6. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

D. Installation Tolerances:

1. Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8-inch in 10 feet and as follows:

2. Space individual framing members no more than plus or minus 1/8-inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

E. Attachment: Securely attach framing and accessories in place to supporting construction.

3.3 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.

a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.

b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include

1) descriptions and locations of defective work;

2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and

3) similar documentation and visual depictions of Contractor-proposed corrections.

c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.

d. Corrected work must also be inspected by the Owner's testing agency and re-tested, as applicable.

e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon

1) corrections being performed skillfully,

2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;

3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and

4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:

1. Repair or refinish items that

a. are damaged, loose, chipped, broken, stained, or corroded;

b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or

c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.

2. Repair damaged galvanized coatings in conformance with ASTM A 780, Annex A2 using galvanizing repair paint specified in Section 05 05 12.

3. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. General: The Owner requires testing and inspection of installed items to evaluate the metal framing's in-service performance and conformance to the specified requirements.

a. Tests and inspections are performed by a qualified independent testing and inspection agency acceptable to the Architect and the AHJ, and must be witnessed by the testing agency's personnel, the installer, the Contractor, and the Architect.

b. The testing and inspection agency

1) cannot be directly employed by the Contractor or by another entity or individual other than the Owner;

2) addresses and sends to the Owner all test reports within 14 days after the completion of any test; and

3) also sends copies of all test reports to the AHJ, the Architect, and the Contractor within the same 14-day period.

c. The Contractor shall

1) assist the Owner with selecting a testing and inspection agency, when requested;

2) arrange all tests and inspection;

3) coordinate its work and the construction schedule with the specified tests;

4) coordinate the requirements of each required or specified test and inspection with other specified or required tests and inspections;

5) provide all work, facilities, personnel, and controls necessary for each test and

inspection;

6) notify the testing agency personnel, the installer, and the Architect that the work is ready for inspection; and

7) receive all test reports and distribute copies to the installer and the Architect.

2. Required Tests: Verification of field and shop welds.

B. Nonconforming Work:

1. Testing: When testing reveals items that are deficient, defective, do not perform properly, or do not conform to the specified requirements, make corrections acceptable to the Architect, and then arrange and pay costs for re-testing until it can be demonstrated that all items perform properly and conform to the specified requirements, as determined by the Architect.

2. Inspection: When an inspection reveals items that are deficient, defective, do not perform properly, or do not conform to the specified requirements, make corrections acceptable to the Architect and then arrange and pay costs for re-inspection until all items perform as specified and pass inspection.

3.5 CLEANING

A. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

END OF SECTION

SECTION 05505 – TREILLAGE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Screenpanels and accessories.

B. Related Sections:

1.02 REFERENCES:

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

B. ASTM A82 – Mechanical, Physical and Performance Properties of Carbon Steel Wire

C. ASTM A641 – Zinc-Coated (Galvanized) Carbon Steel Wire

D. ASTM A879 – Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.

E. ASTM B117 – Operating Salt Spray (Fog) Apparatus.

F. RAL – German Institute for Quality Assurance and Indication.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 013300. Provide two sets of submittals.

B. Product Data: Submit manufacturer's product data, standard details, and installation instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer: Minimum 5 years experience manufacturing and supplying trellis structures of the type required for this project.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from damage. Store panels flat. Provide edge protection when strapping is used. Do not apply loads to panel edges.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. GREENscreen®, Los Angeles, CA; phone 800-450-3494, fax 310-837-0523, www.greenscreen.com.

2.02 PANELS

A. Panels shall be rigid, three-dimensional welded wire grid fabricated of 14-gage ASTM A641 galvanized steel wire.

B. Face Grid: Wires shall be welded at each intersection to form a 2 x 2 inch face grid on the front and back of panels,

C. Trusses: Face grids shall be separated by bent wire trusses spaced at 2-inch centers and welded to front and back face grids at each truss apex.

D. Thickness: 2 inches as shown on Drawings.

E. Length and Width: Provide in 2-inch nominal increments.

F. Tolerance: 1/8 inch in width and ¼ inch in length.

2.03 ACCESSORIES

A. Trim:

1. Fabricate from 20-gage ASTM A879 galvanized steel.
2. Types:
   a. Channel Trim: Thickness of panel x ½ inch legs.

B. Clips and Straps: Provide manufacturer's standard types of clips and straps suitable for mounting conditions. Fabricate from ASTM A879 galvanized steel. Adjustable clips shall have ¼ inch diameter 18-8 stainless steel bolt, washer, and nut.

C. Plastic Spacers: Provide ½ inch thick black Ultra High Molecular Weight polyethylene (UHMW) washers to hold clips away from mounting surface.

F. Fasteners for Attachment to Structure:

1. To Concrete or Masonry: 550 lbs.

2.04 FABRICATION

A. Cut to size.

2.05 FINISHES

A. Metal components (except fasteners) shall be factory finished after fabrication.

B. Finish System: pretreat with general purpose, alkaline, water based cleaner / degreaser applied at 240 degrees F. prime with zinc-rich epoxy powder coat. Topcoat with polyester or polyester-urethane powder coat.

C. Salt Spray Resistance: Finish shall remain rust free when tested 1680 hours in accordance with ASTM B117.

D. Color: *Gloss Silver*.

E. Touch-Up Paint: Provide high quality, exterior-grade spray paint suitable for conditions of use.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect substrates and conditions affecting work of Section. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Fence Posts: Install posts as shown on Drawing.

3.03 INSTALLATION

A. Install panels plumb and square, centered within area designated for panels, and aligned to maintain modular grid.

B. Avoid cutting panels in field. Where field cutting is essential, apply touch-up paint to cut edges.

C. Install securely with fasteners located to meet manufacturer's requirements.

D. Repair bent or damaged panels. If panels cannot be repaired to satisfaction of Landscape Architect, remove from jobsite and replace with new panels.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Shear wall panels.
4. Wood blocking, cants, and nailers.
5. Wood furring.
6. Wood sleepers.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Timber: Lumber of 5 inches nominal or greater in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NLGA: National Lumber Grades Authority.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
1.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. LEED Submittals:

1. Certificates for Credit MR 6: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
3. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.

C. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Shear panels.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
A.
1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules- writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
1.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction.

1. Application: Interior partitions not indicated as load-bearing.
2. Species:

a. Douglas fir-larch; WCLIB or WWPA.

B. Load-Bearing Partitions: Construction or No. 2 grade.

1. Application: Exterior walls and interior load-bearing partitions.

2. Species:

a. Douglas fir-larch (north); NLGA.

C. Joists, Rafters, and Other Framing Not Listed Above: No. 1 or No. 2 grade.

1. Species:

a. Douglas fir-larch; WCLIB or WWPA.

2.4 TIMBER FRAMING

A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:

1. Species and Grade: Douglas fir-larch; No. 1 or No. 2 grade; WCLIB or WWPA.
1.

2.5 ENGINEERED WOOD PRODUCTS

A. Engineered Wood Products, General: Products shall contain no urea formaldehyde.

B. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

C. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal- depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi.

D. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal- depth members.
2. Modulus of Elasticity, Edgewise: 2,200,000 psi.

E. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. Web Material: Either oriented strand board or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
2. Structural Properties: Provide units with depths and design values not less than those indicated.
3. Provide units complying with APA PRI-400, factory marked with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.

F. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I- joists at bearing ends, complying with research/evaluation report for I-joists.

1. Manufacturer: Provide products by same manufacturer as I-joists.
2. Material: Product made from any combination solid lumber, wood strands, and veneers.

3. Provide performance-rated product complying with APA PRR-401, rim board grade, factory marked with APA trademark indicating thickness, grade, and compliance with APA standard.
1.

2.6 SHEAR WALL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.

B. Wood-Framed Shear Wall Panels: Prefabricated assembly consisting of wood perimeter framing, tie downs, and Exposure I, Structural I plywood or OSB sheathing.

1. Products shall contain no urea formaldehyde.

2.7 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.
7. Utility shelving.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and the following species:

1. Douglas fir- larch; WCLIB or WWPA.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure- preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.
A.
D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.9 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.

2.10 MISCELLANEOUS MATERIALS

A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
A.
E. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.

F. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

J. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in Los County Building Code.

M. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish
A.
materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide 2-by-6-inch nominal- size wood studs spaced 16 inches o.c. unless otherwise indicated.
2. For interior partitions and walls, provide 2-by-4-inch nominal- size wood studs spaced 16 inches o.c. unless otherwise indicated.
3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

D. Provide diagonal bracing in walls, at locations indicated, at 45-degree angle, full-story height unless otherwise indicated. Use 1-by-4-inch nominal- size boards, let-in flush with faces of studs.

3.4 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

J. Provide full depth solid bridging at intervals of 96 inches o.c., between joists.

3.5 TIMBER FRAMING INSTALLATION

A. Install timber with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space at sides and ends of wood members.

C. Install wood posts using metal anchors indicated.

D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.6 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration.

B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.7 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

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SECTION 06 10 53 – MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-decorative, utilitarian wood items that are not specified in other Sections, including
      a. dimension lumber nailers and blocking;
      b. plywood panels; and
      c. telephone and electrical equipment backing panels.
   2. Rough hardware used for fastening wood items together, and for joining wood items to other materials, including
      a. nails, brads and staples;
      b. power actuated fasteners;
      c. wood screws; and
      d. bolts and nuts.
   3. Wood pressure-treatment, including
      a. preservative pressure-treated wood; and
      b. fire-retardant pressure-treated wood.
   4. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.
   5. Additional fastening requirements specific to a particular work result are specified within the appropriate specification section.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. ACQ: Alkaline Copper Quaternary.
   2. APA: Means the Engineered Wood Association.
   3. AWPA: American Wood Protection Association.
   4. CCA: Chromium Copper Arsenate.
   5. DOC: Department of Commerce.
   6. S4S: Surfaced Four Sides.
   7. NLGA: Means the National Lumber Grades Authority.
   8. SPIB: Means the Southern Pine Inspection Bureau.
   9. WCLIB: West Coast Lumber Inspection Bureau.

1.3 REFERENCES

A. Definitions:

1. Manufacturer: Means the hardware or pressure treatment manufacturer, as applicable, unless otherwise indicated.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Select rough hardware type, grade, and class as required for the application into which they are installed.

1. Fastening Pressure-Treated Wood: Provide fasteners that do not corrode due to treatment materials used in the pressure treating process that are present either at the time of installation, or when in the presence of moisture.
   a. Either provide ceramic-coated anti-corrosive steel fasteners and hot-dip galvanized steel connectors conforming to ASTM A 653, Class G185; or provide Type 316 stainless steel fasteners and connectors.
   b. Uncoated (bare) carbon steel, electrodeposited zinc-coated steel, and aluminum fasteners and connectors are not permitted.
2. Other Exterior Locations: Provide either hot-dip galvanized or stainless steel fasters.
3. Elsewhere: Fasteners may be coated or uncoated as selected by the Contractor, unless otherwise indicated or specified.

1.5 SUBMITTALS

A. Action Submittals:

1. Product Data: Submit the manufacturer's product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
   a. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   b. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   c. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   d. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Informational Submittals:

1. Test and Evaluation Reports: Submit the following, showing compliance with building code in effect for Project:
   a. Preservative-treated wood.
   b. Fire-retardant-treated wood.

1.6 QUALITY ASSURANCE

A. Source Limitations: To verify to the extent possible the prevention of internal hydrogen embrittlement (IHE) in steel fasteners during surface preparation, pretreatment, and coating, all steel fasteners must be obtained from a source that periodically audits its fastener coating processes in conformance with ASTM F 1940. New or revised plating or coating processes must also be qualified by ASTM F 1940.

1.7 HANDLING

A. Storage:
   1. Stack materials on treated or non-decaying skids sized and arranged as to support the material without producing noticeable distortion, and to permit an air circulation around stacks and under coverings.
   2. Storage areas shall be free of debris, decayed wood and vegetation and shall have sufficient drainage to prevent treated wood products from contact with standing water.

PART 2 - PRODUCTS

2.1 WOOD MATERIALS

A. Dimension Lumber: No. 1 or No. 2 grade Douglas fir graded in conformance with WCLIB Grading Rules, S4S, seasoned to a moisture content of not more than 19 percent, and stamped S-Dry.

B. Plywood Panels: Unless indicated otherwise, provide the following.
   1. Grade: APA C-C Plugged EXT; panels must have a visible APA grade mark.
   2. Thickness: Not less than 1/2-inch nominal thickness, unless otherwise indicated.
   3. Construction: Not less than 5-layer (5-ply), unless otherwise indicated.
   4. Panel Edges: Tongue-and-groove, unless otherwise indicated.

C. Telephone and Electrical Equipment Backing Panels: 3/4-inch by 8 feet by 4 feet, Type A- C grade plywood.

2.2 WOOD PRESSURE-TREATMENT

A. Preservative Pressure-Treated Wood:
   1. Application: Provide preservative pressure-treated wood where indicated, and at the following locations.
      a. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with concrete or masonry.
      b. Wood within 18 inches of grade.
      c. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in contact with roofing, metal flashings, or waterproofing.

d. Other wood exposed to weather.

2. Description: Wood products conforming to AWPA C1 and AWPA P5 manufactured with ACQ wood preservative materials.
3. Products: Design is based on “Preserve” or “Preserve Plus” manufactured by Chemical Specialties, Inc., or approved substitute.
4. Items must conform to the following:
   a. Retention: 0.25 pounds per cubic foot in compliance with AWPA C2 for lumber and timber and AWPA C9 for plywood.
   b. Moisture Content: Kiln dry after treatment to not more than 19 percent moisture content for lumber and not more than 15 percent moisture content for plywood.
   c. Limitations: Preservative pressure-treated wood products must be arsenic-and CCA-free.

B. Fire-Retardant Pressure-Treated Wood:
1. Application: Provide fire-retardant pressure-treated wood in the following locations.
   a. Wood within fire-resistive construction.
   b. Elsewhere as indicated.
2. Description: Wood products conform to AWPA C20 and AWPA C27 manufactured with fire-retardant materials for which the fire-retardant manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested in compliance with ASTM D 5664 and ASTM D 5516.
   a. Provide exterior type wood at exterior locations.
   b. Provide Type A High Temperature (HT) wood at interior locations.
3. Products: Design is based on “D-Blaze” fire retardant manufactured by Chemical Specialties, Inc., or approved substitute.
4. Items must conform to the following:
   a. Limitations: Products must not promote corrosion of metal fasteners.

2.3 ROUGH HARDWARE MATERIALS

A. Uncoated (Bare) Carbon Steel Fasteners:
1. Screws: Manufactured from carbon steel wire rods and uncoated coarse round wire conforming to ASTM A 510, Grades 1018 to 1022.
2. Bolts: ASTM A 307, Grade A.
3. Nuts and Flat Washers: ASTM A 563, Grade C3.

B. Stainless Steel Fasteners:
1. Description: Austenitic stainless-steel screws, bolts, and studs conforming to ASTM F 593 and nuts conforming to ASTM F 594 requirements for Alloy Group 1 (304 Series) or Alloy Group 2 (316 Series).
2. Performance Requirements:
   a. Type 304: Fasteners may not display any visible sign of surface red rust after at least 1,000 hours of ASTM B 117 salt spray test performed on screws that have been driven through and removed from sheet metal panels.

b. Type 316: Fasteners may not display any visible sign of surface red rust after at least 1,500 hours of ASTM B 117 salt spray test performed on screws that have been driven through and removed from sheet metal panels.

C. HDG Zinc-Coated Steel Fasteners:

1. Description: Carbon steel fasteners having hot dip galvanized coating conforming to
   a. ASTM A 153 minimum zinc coating weight requirements for Class C materials (fasteners over 3/8-inch diameter and similar articles; washers 3/16-inch and 1/4-inch thick) or Class D materials (fasteners 3/8-inch diameter and under, rivets, nails and similar articles; washers under 3/16-inch thick); and
   b. ASTM F 2329 for coating of threaded fasteners and washers by hot-dip zinc galvanizing.
2. Performance Requirements: Fasteners may not display any visible sign of surface red rust after at least 32 hours of ASTM B 117 salt spray test performed on screws that have been driven through and removed from sheet metal panels.

D. Ceramic-Coated Anti-Corrosive Steel Fasteners:

1. Application: Use ceramic-coated anti-corrosive steel fasteners
   a. with pressure treatments in woods;
   b. when attaching to exotic hardwood lumber base material;
   c. with composite lumber; and
   d. when attaching cement board, high density exterior sheathing, and tile-backers to framing members in exterior, high moisture interior, or high corrosion environments.
2. Description: Carbon steel fasteners having a 3-coat finish that provides electrolytic corrosion protection by combining the sacrificial protection of zinc with the barrier protection of a ceramic topcoat.
3. Product: “Grabber” screws by Grabber Construction Products (ICC-ES Report No. ESR-5280), or approved substitute.
4. Items must conform to the following:
   a. Basecoat: At least an 8-to 10-micron (0.0003-to 0.0004-inch) mechanically deposited zinc-alloy coating.
   b. Intermediate Coat: Chromate conversion coating.
   c. Topcoat: Corrosion-resistant baked ceramic surface coating.
   d. Performance Requirements: Fasteners may not display any visible sign of surface red rust after at least 1,000 hours of ASTM B117 salt spray test performed on screws that have been driven through and removed from sheet metal panels.

2.4 ROUGH HARDWARE

A. Nails, Brads and Staples: ASTM F 1667.

1. For fastening lumber to lumber: Cement-coated or annular (ringed-shank) threaded nails of sufficient length to penetrate a minimum of 1-1/4-inch into adjoining members, or stove or lag bolts used with washers.

2. For fastening plywood to lumber: Provide annular (ringed-shank) threaded nails; 8d for 1/2-inch plywood and 10d for 3/4-inch plywood.

B. Power-Driven Staples, Nails, P-nails, and Allied Fasteners: ICC-ES Report No. 1539.

C. Wood Screws: ASME B18.6.1.

D. Steel Drill Screws for Fastening Lumber or Plywood to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

E. Bolts:
1. Steel Bolts: ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
2. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
3. Lag Bolts: ASME B18.2.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
1. Examine substrates and other conditions under which rough carpentry is installed.
2. Verify that
a. work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of gypsum sheathing installation, durability, appearance, and performance; and
b. items penetrating rough carpentry are installed.
c. framing members are straight and aligned.
d. openings are properly framed, are true to line, plumb, square and within allowable tolerances, and will provide solid anchoring surfaces.
e. spaces between framing members are thoroughly cleaned of debris.

B. Evaluation and Assessment:
1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.
2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 INSTALLATION

A. General:

1. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
2. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   a. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels.
   b. Space clips not more than 16 inches O.C.
3. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
   a. Fit carpentry to other construction.
   b. Scribe and cope as needed for accurate fit.
   c. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
4. Select fasteners of size that will not fully penetrate members where opposite side is exposed to view or will receive finish materials.
   a. Make tight connections between members.
   b. Install fasteners without splitting wood
   c. Do not countersink nail heads, unless otherwise indicated.
5. Install wood furring, sleeper, blocking and nailer where indicated and where required for attaching other work.
   a. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
   b. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
   c. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Telephone and Electrical Equipment Backing Panels

1. Securely fasten plywood to wall framing.
2. Paint face and edges of plywood with a fire-resistant, washable paint.
3. Seal or paint backside of plywood to prevent warping.

C. Attachment: Securely attach rough carpentry items in place.

D. Repair: Use copper naphthenate conforming to AWPA M4 for field-applying treatment to cuts, holes, and injuries such as abrasions, or holes caused by the removal of nails and spikes, which may penetrate preservative treatment zones.

3.3 CLEANING

A. Cleaning Installed Work:

1. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering
2. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
3. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

END OF SECTION

SECTION 06 16 43 – GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Gypsum sheathing.
   2. Joint treatment materials, including protection of sheathing panel joints and penetrations through sheathing panels.
   3. Supplementary accessories and detail work necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 21 16 for gypsum board shaft wall assemblies.
   2. Section 09 28 00 for tile backing boards.
   3. Section 09 29 00 for various styles of gypsum board panels.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. GA: Gypsum Association.
   2. STC: Sound Transmission Class.
   3. UL: Underwriter's Laboratories.
   4. UV: Ultraviolet Solar Radiation.

B. Definitions:
   1. Manufacturer: Means the gypsum sheathing manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Before starting work, including bulk purchase and delivery of products, verify with the air barrier manufacturer that the selected seam seal tape is both chemically and adhesively compatible with the selected air barrier membrane specified in
      Section 07 27 13 (modified bituminous sheet air barriers).
   2. Where items are installed or applied as part of fire-resistance-rated or STC-rated assemblies, items must be identical those products tested and listed as part of the selected UL or GA fire resistance and sound control system design designation.

B. Scheduling:

1. Coordinate sheathing delivery with installation to minimize storage periods at the site.
2. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.
3. Schedule installation to keep gypsum sheathing exposure to UV within the manufacturer's recommended limits.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit a list of proposed products and, accessories to be provided, along with their manufacturer's product data and other data necessary to demonstrate compliance with specified requirements for each item listed.

B. Informational Submittals:
   1. Installation Instructions:
      a. Before starting work, submit manufacturer-published, prepared instructions for proper sheathing installation, including recommendations for joint protection.
      b. If the manufacturer's instructions are either unavailable or do not reflect Project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect before proceeding with the work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of gypsum board and all related accessories, including joint treatment materials, through one source from a single domestic manufacturer.
   1. Gypsum panel products must be manufactured in North America by a domestic company from (a) gypsum mined in North America; (b) synthetic gypsum (FGD gypsum) recovered from coal-fired plants operating in North America; or (c) a combination of both.
   2. Panel products may not be manufactured outside of North America by a domestic company.
   3. Panel products may not be manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company.

1.6 HANDLING

A. Packaging Requirements:
   1. Comply with Gypsum Association publication GA-801 "Handling Gypsum Board" and applicable requirements of ASTM C 1264 for the inspection, rejection, certification, packaging, marking, shipping, handling, and storage of gypsum panel products.

2. Each delivery must include with it a copy of manufacturer-prepared instructions for the proper storage, handling, installation, and protection of each product delivered.

B. Storage and Handling Requirements:
1. Storage: Keep materials dry and stored off the ground, covered with waterproof tarpaulins. Neatly stack gypsum sheathing flat to prevent sagging.
   a. Protect against contact with damp or wet surfaces.
   b. Provide air circulation under covering and around stacks of materials.
   c. If sheathing is left unprotected and then installed, moisture in the sheathing can provide conditions favorable for mold, mildew and fungus.
2. Handling: Handle gypsum sheathing to prevent damage.

C. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become wet, deteriorated, contaminated, or otherwise damaged.
1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

D. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

PART 2 - PRODUCTS

2.1 GYPSUM SHEATHING

A. Description: Gypsum-based commercial exterior sheathing conforming to ASTM C 1177, with a heat-cured, acrylic-coated, fiberglass mat on the face side, back side, and around long edges.

B. Products: Design is based on “DensGlass Sheathing” manufactured by GP Building Products. Other acceptable comparable products include the following, contingent on demonstrated conformance to the specified requirements, including the item description above; listed below in the order of preference
1. “SECUROCK Glass-Mat Sheathing Panels” by USG Corp
2. “Gold Bond e^{2}XP Extended Exposure Sheathing” by National Gypsum Co.
3. “GlasRoc Sheathing” by CertainTeed Corp.
4. Or equal.

C. Items must conform to the following:
1. Size: Provide at least 4-foot by 8-foot sheets.
2. Thickness: Provide the following, unless otherwise indicated on the Drawings.
   a. Regular Sheathing: At least 1/2-inch.
   b. Fire-Resistance Rated Sheathing: At least 5/8-inch.
3. Edges: Square.

4. Exposure: Up to 12 months after delivery to the project site.

2.2 JOINT TREATMENT MATERIALS:

A. Glass Mesh Tape: 4-inch wide, alkali-resistant, polymer-coated, glass-fiber mesh tape provided by the gypsum sheathing panel manufacturer.

B. Joint Sealant: Provide low modulus single-component sealant specified in Section 07 92 00, unless otherwise supplied, required, recommended, approved, or accepted by the manufacturer.

C. Seam Seal Tape:
   1. Description: 40-mil thick self-adhering, rubberized asphalt/polyethylene flexible flashing tape.
      a. Acrylic-coated polypropylene tape is not permitted.
      b. Glass mesh tape applied without sealant is not permitted.
   2. Products: Design is based on “Perm-A-Barrier Wall Flashing” manufactured by W.R. Grace & Co. Other acceptable sources of comparable products are limited to the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
      a. CETCO, Inc.
      b. The Henry Co.
   3. Seam Seal Tape Primer: “Perm-A-Barrier WB Primer” water-based primer, or equal.

2.3 ACCESSORIES

A. Fasteners: Provide 0.138-inch shank diameter (UTS #6) by 1-1/4-inch long Philips bugle head stainless steel, bi-metal, duplex anti-corrosive steel, 3-coat anti-corrosive steel, or ceramic-coated anti-corrosive steel screw fasteners specified in Section 05 05 23.

B. Other Accessories: Provide other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine substrates and other conditions under which gypsum sheathing are installed.
   2. Verify that
      a. work performed as part of the work of other Sections conforms to the manufacturer’s installation tolerance requirements; provides true, flat, and level

surfaces; and satisfies all other conditions relating to the quality of gypsum sheathing installation, durability, appearance, and performance; and

b. items penetrating gypsum sheathing are installed.

c. framing members are straight and aligned.

d. openings are properly framed, are true to line, plumb, square and within allowable tolerances, and will provide solid anchoring surfaces.

3. spaces between framing members are thoroughly cleaned of debris.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

C. Evaluation and Assessment:

1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 INSTALLATION

A. General:

1. Install gypsum sheathing in compliance with ASTM C 1280, GA publication GA-253, "Application of Gypsum sheathing", and the following.

a. Comply with both the manufacturer's installation instructions when installing protecting, and repairing gypsum sheathing and accessories.

b. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

c. In the event of conflict between the manufacturer's instructions and the referenced standards, then the manufacturer's instructions govern.

2. Do not install materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Use appropriate-length materials to minimize end joints.

B. Special Techniques:

1. Orient panels with long edge perpendicular to framing and short edges vertically oriented and centered over studs.

a. Fit sheathing snugly around all window and door openings.

b. Install panels with minimum 3/8-inch gap where non-load-bearing construction abuts structural elements.

c. Install panels with a minimum 1/4-inch gap where they abut masonry or similar materials that might retain moisture.

d. Do not bridge building expansion joints. Cut and space edges of panels to match framing spacing.

2. Securely fasten sheathing panels to framing.
   a. Stagger vertical joints at least 16 inches O.C., but not less than one framing space between adjacent rows.
   b. Locate fasteners a minimum of 3/8-inch from perimeter edges, and space fasteners a maximum of 8 inches O.C. both along the panel perimeter and over the panel face.
   c. Drive fasteners to bear tightly against face of sheathing. Do not break or rupture facing, fracture underlying core or countersink fasteners.

C. Attachment: Securely attach sheathing in place.

D. Long-term Joint Treatment:
   1. Panel Joint and Penetration Treatment:
      a. Immediately after sheathing is installed, apply glass mesh joint tape centered over sheathing panel joints and around penetrating items. Provide minimum overlap at intersections greater than or equal to tape width.
      b. Apply minimum 3/8-inch continuous bead of sealant over glass mesh joint tape.
      c. With a trowel, compress and embed sealant into the entire surface of the tape creating a flat and level surface.
      d. As an alternate to sealant and glass mesh tape, specified seam seal tape may be provided when applied to properly prepared and primed sheathing surfaces in compliance with the seam seal tape manufacturer’s instructions.
   2. Fastener Treatment: Apply sealant to each exposed fastener; trowel level and smooth.

3.3 CORRECTION AND REPAIR

A. Correction:
   1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.
      a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
      b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
         1) descriptions and locations of defective work;
         2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
         3) similar documentation and visual depictions of Contractor-proposed corrections.
      c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.

d. Corrected work must also be inspected by the Owner's testing agency and retested, as applicable.

e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon

1) corrections being performed skillfully,

2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;

3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and

4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer’s field representative and the Architect.

B. Repair:

1. Repair or refinish items that

a. are damaged, loose, chipped, broken, stained, or corroded;

b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or

c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.

2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 CLEANING

A. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.5 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

1. Protect in place the installed sheathing from prolonged exposure to UV in excess of the manufacturer's recommended limits.

2. If exposed to UV for more than 300 days, remove and replace sheathing, or install in conformance with the manufacturer's instructions either asphalt-saturated organic felt weather-resistant building paper conforming to FS UU-B-790a, Type I, Grade C, or spun bonded high-density polyethylene (HDPE) building wrap covering exposed sheathing surfaces.

3. Remove sheathing exposed to UV for more than 360 days and replace with new sheathing.

B. Do not store anything adjacent to or against installed sheathing panels unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use sheathing panel surfaces as work surfaces.

END OF SECTION

SECTION 06 41 00 – ARCHITECTURAL WOOD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Shop-fabricated casework.
2. Casework facings.
3. Finish hardware.
4. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. FSC: Forest Stewardship Council.
2. HPDL: High-Pressure Decorative Laminate.
3. HPVA: Hardwood Plywood and Veneer Association.
4. LMA: Laminating Materials Association.
5. LPDL: Low-Pressure Decorative Laminate.
6. NEMA: National Electrical Manufacturers Association.
7. MDF: Medium Density Fiberboard.
8. WI: Woodwork Institute.

B. Definitions:
1. High-Pressure Decorative Laminate: Means a facing material consisting of multiple plies of phenolic resin-coated Kraft papers covered with a high-grade decorative paper layer and compressed under high pressure and heat (a minimum of 1,000 psi at 280-300 deg. F) for an extended period of time.
2. Low-Pressure Decorative Laminate: Means a facing material consisting of a single, thin sheet of decorative paper that is saturated and compressed under low pressure (approximately 600 psi at 392 deg. F) for 20 seconds.
3. Manufacturer: Means the HPDL, LPDL, or hardware manufacturer, as applicable, unless otherwise indicated.
4. Fabricator: Means the casework fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. System Description:

1. Drawings of casework are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.
2. Maintain the visual design concept indicated, including member sizes, profiles, and alignment of components. Deviation from the visual design concept indicated is not permitted without prior written authorization from the Architect.

B. Design Requirements: Fabricate, assemble and install casework in conformance with the specified quality standard requirements in order to meet or exceed the specified grades, and to conform to the profiles indicated and to other requirements of the Contract Documents.

C. Shelving Performance Requirements:
1. Design Load: 3/4-inch minimum thickness, designed to support a minimum of 50 psf. Total applied, uniformly distributed weight shall not exceed 200 pounds on any one shelf.
2. Maximum Deflection: Not more than L/144, except that all shelving shall be of the same thickness in the same assembly, room or space where not concealed by doors.

D. Coordination: Coordinate fabrication and installation with the work of related trades to ensure that supporting construction conforms to the fabricator's tolerance requirements; and that necessary rough-in work, backings, and anchorage are properly installed. Deliver backing and embedments, templates, and installation instructions to related trades before affected work begins.

E. Sequencing:
1. Deliver materials to the project site only after the building has been enclosed with a permanent exterior enclosure, and
   a. "wet work" in storages areas, including concrete, plastering, gypsum board finishing, tiling, painting, and similar work, has been completed and cured or dried to a condition of equilibrium;
   b. storage areas have been broom cleaned; and
   c. the HVAC system has been activated and is both operating and maintaining temperature and relative humidity at occupancy levels.
2. Install fabric-wrapped panels and accessories after all finishing operations, including painting, are completed.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: Submit fabricator's product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
   a. Include copies of product data for items installed as part of the work of this Section, but specified in other Sections.

b. Include details of core and edge construction and trim for openings, and shop- finishing specifications.

c. Include sample copies of the complete terms of all warranties covering items furnished or installed under this section

2. Shop Drawings: Comply with the requirements of this sections and with the specified quality standard requirements for shop drawing policy and procedure. The first page of each set of shop drawings must bear a WI Shop Drawing Certified Compliance Label.

a. Submit schedule indicating casework identification symbols and locations.

b. Use the same reference numbers and details as the Drawings.

c. Furnish elevations and details showing standard construction and fabrication methods. Indicate materials, construction, finish, and accessories.

d. Indicate location and size of blocking for finish hardware.

3. Samples: Submit a 12-inch samples of each facing type, color and finish showing (a) typical panel construction with facing; and (b) edge trim finished as specified. Label each sample by project location and indicate whether the facing is applied to exposed, semi-exposed, or concealed surfaces.

B. Informational Submittals:

1. Woodwork Quality Standard Compliance Certificates: Submit WI-certified compliance certificates for the specified grades.

C. Closeout submittals: Furnish the Owner with minimum 6 keys for each casework lock. Label with individual tags indicating lock location(s).

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of architectural wood casework and accessories through one source from a single fabricator.

B. Regulatory Requirements: Provide U-shaped wire cabinet door and drawer pulls, or equally accessible pull hardware, at all accessible casework. Hardware must not require tight grasping, pinching, or twisting of the wrist. (CBC section 1125B.4)

C. Qualifications:

1. Manufacturer: Must be a legal business entity with at least 10 consecutive years' experience fabricating architectural wood casework similar in material, design, complexity, and extent to this Project, and whose products have resulted in applications with a record of successful in-service performance.

2. Installer: Must be a company and individuals with at least 5 consecutive years' experience in the installation of architectural wood casework on projects similar in material, design, complexity, and extent to this Project that have resulted in applications with a documented record of successful in-service performance.

D. Quality Standard Requirements: Provide architectural wood casework conforming to WI publication "Architectural Woodwork Standards".

E. Field Samples (post-submittal, *in situ* visual mockups): Include field samples as part of the work of this Section.

1. Before starting work, including bulk purchase and delivery of products, prepare a field sample in a manner approved by the Architect to demonstrate the expected final visual effect of the planned installation.
2. At a minimum, comply with the following:
   a. Size: Provide door sample for approval by the Architect.
   b. Illumination: Illuminate field samples with at least the same type and level of illumination maintained in the room or space after the building is occupied.
3. The Architect reviews field samples to determine if the work falls within an acceptable range for
   a. visual appearance;
   b. mottling, sheen, color, and texture variation;
   c. evenness of finish;
   d. integration of the work of different trades;
   e. installation tolerances;
   f. overall quality;
   g. fabrication and installation (workmanship); and
   h. conformance to specified requirements.
4. The Architect either rejects or approves field samples as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
   a. If a field sample is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
      1) Repeat field samples until the Architect approves them.
      2) Approval of field samples does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by Owner in writing.
   b. Upon written authorization from the Architect, field samples may remain part of the Work after being properly identified for future reference.

1.6 HANDLING

A. Packaging Requirements:

1. Deliver casework unitized, palletized and shop-wrapped in polyethylene bags. Shrink-wrap each pallet and provide corner guards for protection.
2. Mark each item with identification number in distribution and installation.
3. Each elevation must bear a WI-Certified Compliance Certificate.

B. Delivery and Acceptance Requirements:

1. Delivery:
   a. Deliver items to the Project site in conformance with the fabricator’s requirements, recommendations, or instructions for transport and delivery; in original unopened containers clearly marked with intact and legible identification labels indicating

1) fabricator's name and trademark; and
2) item identification mark.

b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.

c. During transport and delivery, protect items from (1) prolonged exposure to UV radiation in excess of the fabricator's recommended limits; (2) exposure to weather; (3) becoming wet; and (4) other sources of deterioration or damage.

2. Acceptance at the Site:

a. Inspect for damage all items delivered to the Project site.

b. Reject the delivery of items that show damage or have damaged containers.

c. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:

1. Storage: Store casework in an assigned spaces having controlled temperature and humidity conforming to the recommendations of WI.

a. Store items as shipped, upright in their original shipping containers, and in conformance with the fabricator's requirements, recommendations, or instructions for storage.

b. Store casework flat on pallets or on at least three full 2-by-4s, one centered and the other two within 6 inches from each end.

a. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.

1) Provide spacers to separate stored items and allow air to circulate around all surfaces.

2) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.

3) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture, or to ultraviolet radiation in excess of the fabricator's recommended exposure limits.

4) Store materials and place equipment in a manner to avoid permanent deflection of floor or roof decks.

5) Protect casework from construction activity with plywood and store away from direct sunlight.

2. Handling:

a. Handle casework with clean hands, except that casework having a transparent finish must be handled with clean white gloves.

b. Do not drag casework items across one another.

c. Maintain shop packaging or other means of protection of casework until Substantial Completion.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions:
1. Temperature and Relative Humidity:
   a. Install casework only if the temperature and relative humidity have been maintained within a range required, recommended, approved, or accepted by the fabricator for at least 96 hours before installation.
   b. Acclimate casework to the specified temperature and relative humidity conditions for at least 72 hours before installation.
   c. After casework have been installed, maintain a constant temperature of between 60 and 80 deg. F until Final Completion.
2. Illumination: Illuminate work areas during application with at least the same level of illumination maintained in the room or space after the building is occupied, and as otherwise required, recommended, approved, or accepted by the fabricator to properly perform the Work.

B. Existing Conditions:
1. Field-verify measurements before preparing submittals and indicate those field measurements on the shop drawings.
2. If field measurements cannot be made without delaying the Work, establish working dimensions that accommodate installation tolerances, as well as related tolerances specified for the Work of other sections, and indicate those working dimensions on the shop drawings.
3. Coordinate the installation of adjacent work to ensure the actual dimensions accommodate the previously established working dimensions.
4. Provide enough additional material during fabrication to allow for proper trimming and fitting at the Project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Dimension Lumber: No. 1 or No. 2 grade Douglas fir graded in conformance with WCLIB Grading Rules, S4S, seasoned to a moisture content of not more than 19 percent, and stamped S-Dry.

C. Formaldehyde-Free Medium Density Fiberboard (MDF):

1. Description: Composite fiber panels conforming to ANSI A208.2, made with binder containing no urea formaldehyde.
2. Items must conform to the following:
   a. Density: At least 45 pounds per cubic foot
   b. Nominal Thickness: At least 1/2-inch, unless otherwise indicated.
   c. Grades:
      1) At Countertops where Sinks Occur: Provide at least Grade 150-MR 50.
      2) Elsewhere:
      3) Thicknesses Less Than or Equal to 3/8-inch: Provide at least Grade 230.
      4) Thicknesses Greater Than 3/8-inch: Provide at least Grade 150.
3. Performance Requirements:
   a. Modulus of Rupture: At least 3,600 psi, when tested in compliance with ASTM D 1037.
   b. Internal Bond: At least 110 psi, when tested in compliance with ASTM D 1037 Part A.
   c. Screw Holding Face: At least 280 pounds, when tested in compliance with ASTM D 1037 Part A.
   d. Screw Holding Edge: At least 250 pounds, when tested in compliance with ASTM D 1037 Part A.
   e. Thickness Swell: Not more than 2.0 percent, when tested in compliance with ASTM D 1037 Part A.

D. Solid Hardwood Trim: Provide where new cabinets meets existing conditions.

2.2 ARCHITECTURAL WOOD CASEWORK

A. Description: Custom Grade, Construction Type I (single-length sections), Style 1 (frameless) cabinets with Type A (flush overlay) cabinet doors and drawers, conforming to the requirements of the referenced quality standard.

B. Core Construction: MDF core.

C. Edge Profile: Square edge with thin applied band.

D. Wood Veneer Facing:

1. Wood Veneer:
   a. Wood Species and Cut for Exposed Surfaces: Oak , Alder . No exposed or loose knots.
   b. Grain Direction: Vertical on cabinet doors, Horizontal on drawers.
   c. Matching of Veneer Leaves: Book and slip matched as indicated.
   d. Semi-Exposed Surfaces: Provide surface materials indicated below:
      1) Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
      2) Drawer Sides and Backs: Solid-hardwood lumber.
      3) Drawer Bottoms: Hardwood plywood.

4) Toe bases are considered an exposed surface, unless the toe base is indicated as receiving a resilient base.

2. Wood Veneer Finish:
   a. General: Finish casework at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.
   b. Opaque Finish: Preparing surfaces and apply shop-applied primer for field finishing.
   c. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, when measured with a 60-degree gloss meter in compliance with ASTM D 523:
      1) Grade: Custom.
      2) Stain: "Minwax" Cherry 235 or equal. Use Minwax Pre-stain wood conditioner prior to staining wood.
      3) Sheen: Satin.

E. Plastic Laminate Facing:
   1. Plastic Laminate Color and Pattern for Exposed Surfaces: "Wilson Art" Milan Cherry or equal .
   2. Exposed Surfaces: General purpose type HPDL conforming to NEMA LD-3, minimum Grade HGS.
      a. For the purposes of this specification, toe bases are considered to be an exposed surface, unless the toe base is indicated to receive a resilient base.
   3. Semi-Exposed Surfaces:
      a. Drawer Sides, Bottoms and Backs: Thermoset decorative panels having specified edge banding on components with exposed or semi-exposed edges.
      b. Edges of Plastic-Laminate Shelves: Provide specified edge banding.
      c. Elsewhere: Cabinet liner type HPDL conforming to NEMA LD-3, minimum Grade CLS.
      d. Color: "Wilson Art" or equal Lt Walnut.
      e. Surface Finish: As specified in Section 06 05 49.
   4. Concealed Surfaces (including underside of countertop substrate): Backer type HPDL conforming to NEMA LD-3, minimum Grade BKV.
   5. Fire Class: Provide Class A materials and products having a maximum flame spread index (FSI) value of 25 or less when tested in compliance with ASTM E 84.

F. Accessories: Provide accessories and other similar secondary items supplied, required, recommended, approved, or accepted by the fabricator.

2.3 FINISH HARDWARE

A. General:
   1. Provide hardware required for a complete installation, as indicated and specified, and as listed in WI's current Approved Hardware Listings, except as herein modified.
   2. Hardware finish must match door hardware specified in Section 08 71 00, unless otherwise noted.

B. Hinges:
   1. Description: Frameless concealed hinges (European type) conforming to BHMA A156.9, B01601, 165 degrees of opening, self-closing.
   2. Product: Design is based on “Salice” by Häfele. Other acceptable manufacturers of comparable products include the following:
      a. Blum.
      b. Grass.
      c. Stanley Commercial Hardware.
   3. Items must conform to the following: Provide at least 3 hinges where doors exceed 24-inch wide and 36-inch high.

C. Pulls:
   1. Description: Back-mounted pulls conforming to BHMA A156.9.
   2. Product: Jamison Collection. Satin Nickel. Length 6"or equal.

D. Full Extension Drawer Slides:
   1. Description: Heavy Duty (Grade 1HD-100 and Grade 1HD-200) conforming to BHMA A156.9, B05091; powder coated or chrome-plated steel finish.
   2. Product: Design is based on groove side mounted full extension slides by Häfele. Other acceptable manufacturers of comparable products include the following:
      a. Accuride.
      b. Knape & Vogt.
   3. Provide drawer slides with stops to prevent accidental removal.

2.4 ACCESSORIES

A. Counter Supports:
   1. Description: Flush mount counter support brackets.
   2. Product: Design is based on “Rakks Sill Support Models EH-1209FM” and “EH- 1818FM” by Rangine Corp., or equal.

2.5 FABRICATION

A. General: Fabricate items to the dimensions, profiles, and details shown, and in conformance with the specified quality standard requirements, unless otherwise noted or indicated.
   1. Shop-assemble work in as large units as practicable to minimize field cutting and jointing.
   2. Where necessary to fit at the project site, provide ample allowance for cutting and fitting. Provide sufficient scribe where items intersect walls and partitions.
   3. Conceal means of fastening various items together.
   4. Accurately cut openings for equipment.
      a. Verify size of equipment by measuring the actual equipment from Shop Drawings or templates provided by those furnishing the equipment.

b. Make accurate cutouts and openings, plumb, level and square.
c. When equipment does not cover cut edges, finish edges the same as faces.

5. Assemblies must be free from open joints, hammer and machine marks, structural defects, and surface blemishes.

B. Finish Hardware:
1. Fit hardware accurately and install in compliance with the hardware manufacturer's printed instructions.
2. Accurately fit doors and drawers with uniform clearance at all edges.
3. Doors and drawers shall operate freely, but not loosely, without sticking or binding, with all hardware adjusted and functioning properly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
1. Examine substrates and other conditions under which countertops are installed.
2. Verify that
a. work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of casework installation, durability, appearance, and performance; and
b. items penetrating casework are installed.
c. openings are properly framed, are true to line, plumb, square and within allowable tolerances, and will provide solid anchoring surfaces.

B. Evaluation and Assessment:
1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the fabricator's installation requirements.
2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the fabricator's installation requirements.

3.2 INSTALLATION

A. General:
1. Set units true to line, to required levels and lines, plumb, level, square, and fitted without warp or rack; with flush well-fitted joints; and in alignment with adjacent construction

2. Scribe and cope the work of this section as necessary for an accurate fit. Perform required cutting, drilling, and fitting for a complete installation
3. Install casework in conformance with the specified quality standard requirements for the specified grade.

B. Special Techniques:
1. Install casework in a manner consistent with the specified quality grade, plumb, level, true and straight with no distortions.
   a. Shim using concealed shims.
   b. Secure to ground, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a satisfactory installation. Scribe and cut for accurate fit to adjacent finished surfaces and refinish cut surfaces or repair damaged finish at cuts.
   c. At gypsum board construction, anchor through wall surface to wood blocking or wood studs only. Indicate location of required concealed backing on casework shop drawings.
   d. Furnish fillers, closures and trim as required for a complete installation. Scribe in place where required.

C. Attachment: Securely attach casework items and accessories in place to supporting construction. Utilize fasteners, adhesives, and bonding agents recommended by fabricator for the type of installation indicated.

3.3 CORRECTION AND REPAIR

A. Correction:
1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the fabricator’s field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,

2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and reinstalling or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
   c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 ADJUSTING

A. Lubricate and adjust operating parts and hardware as necessary to function properly and provide a smooth, quiet operation, free from warp, twist, or distortion.

B. Test and adjust doors and drawers. Verify safe, easy, and reliable operation.

C. Remove and replace damaged, defective, malfunctioning, or unsafe materials, units, components, accessories, and parts.

3.5 CLEANING

A. Cleaning Installed Work:
1. Remove protective materials after installation.
2. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering
3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
   a. Protect other work from staining or damage caused by cleaning operations.
   b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
4. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
5. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to, on, or against installed casework unless it is adequately protected from damage and staining, as determined by the Architect.

C. Do not use casework surfaces as work surfaces.

Remove protection when it’s no longer needed and before Substantial Completion

END OF SECTION

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SECTION 06 46 00 -WOOD TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid wood interior standing and running trim.
   2. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. FSC: Forest Stewardship Council.
   2. MDF: Medium Density Fiberboard.
   3. WI: Woodwork Institute.

B. Definitions:
   1. Fabricator: Means the wood trim fabricator.

1.3 ADMINISTRATIVE REQUIREMENTS

A. System Description:
   1. Drawings of wood trim are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.
   2. Fabricate, assemble and install wood trim in conformance with the specified quality standard requirements in order to meet or exceed the specified grades, and to conform to the profiles indicated and to other requirements of the Contract Documents.

B. Sequencing:
   1. Deliver materials to the project site only after the building has been enclosed with a permanent exterior enclosure, and
      a. “wet work” in storages areas, including concrete, plastering, gypsum board finishing, tiling, painting, and similar work, has been completed and cured or dried to a condition of equilibrium;
      b. storage areas have been broom cleaned; and
      c. the HVAC system has been activated and is both operating and maintaining temperature and relative humidity at occupancy levels.

2. Install fabric-wrapped panels and accessories after all finishing operations, including painting, are completed.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit fabricator's product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
   2. Shop Drawings: Comply with the requirements of this sections and with the specified quality standard requirements for shop drawing policy and procedure. The first page of each set of shop drawings must bear a WI Shop Drawing Certified Compliance Label.
      a. Submit schedule indicating wood trim identification symbols and locations.
      b. Use the same reference numbers and details as the Drawings.
      c. Furnish elevations and details showing standard construction and fabrication methods. Indicate materials, construction, finish, and accessories.
      d. Indicate location and size of blocking for finish hardware.
   3. Samples: Submit a 12-inch long samples of each facing type, color and finish showing typical trim construction. Label each sample by project location.

B. Informational Submittals:
   1. Woodwork Quality Standard Compliance Certificates: Submit WI-certified compliance certificates for the specified grades.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wood trim and accessories through one source from a single fabricator.

B. Qualifications:
   1. Manufacturer: Must be a legal business entity with at least 10 consecutive years' experience fabricating wood trim similar in material, design, complexity, and extent to this Project, and whose products have resulted in applications with a record of successful in-service performance.
   2. Installer: Must be a company and individuals with at least 5 consecutive years' experience in the installation of wood trim on projects similar in material, design, complexity, and extent to this Project that have resulted in applications with a documented record of successful in-service performance.

C. Quality Standard Requirements: Provide wood trim conforming to WI publication "Wood trim Standards".

1.6 HANDLING

A. Packaging Requirements:

1. Deliver wood trim unitized, palletized and shop-wrapped in polyethylene bags. Shrink-wrap each pallet and provide corner guards for protection.
2. Mark each item with identification number in distribution and installation.

B. Delivery and Acceptance Requirements:
1. Delivery:
   a. Deliver items to the Project site in conformance with the fabricator's requirements, recommendations, or instructions for transport and delivery; in original unopened containers clearly marked with intact and legible identification labels indicating
      1) fabricator's name and trademark; and
      2) item identification mark.
   b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.
   c. During transport and delivery, protect items from (1) prolonged exposure to UV radiation in excess of the fabricator's recommended limits; (2) exposure to weather; (3) becoming wet; and (4) other sources of deterioration or damage.
2. Acceptance at the Site:
   a. Inspect for damage all items delivered to the Project site.
   b. Reject the delivery of items that show damage or have damaged containers.
   c. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:
1. Storage: Store wood trim in an assigned spaces having controlled temperature and humidity conforming to the recommendations of WI.
   a. Store items as shipped, upright in their original shipping containers, and in conformance with the fabricator's requirements, recommendations, or instructions for storage.
   b. Store wood trim flat on pallets or on at least three full 2-by-4s, one centered and the other two within 6 inches from each end.
   a. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.
      1) Provide spacers to separate stored items and allow air to circulate around all surfaces.
      2) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.
      3) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture, or to ultraviolet radiation in excess of the fabricator's recommended exposure limits.
      4) Store materials and place equipment in a manner to avoid permanent deflection of floor or roof decks.
      5) Protect wood trim from construction activity with plywood and store away from direct sunlight.

2. Handling:
   a. Handle wood trim with clean hands, except that wood trim having a transparent finish must be handled with clean white gloves.
   b. Do not drag wood trim items across one another.
   c. Maintain shop packaging or other means of protection of wood trim until Substantial Completion.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.
   1. Remove and dispose of damaged items at a disposal location away from the Project site.
   2. Replace removed items with undamaged new items.

E. Packaging Waste Management:
   1. Remove and dispose of construction waste at a disposal location away from the Project site.
   2. Do not bury any type of wood, or wood-based or agrifiber products at the Project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions:
   1. Temperature and Relative Humidity:
      a. Install wood trim only if the temperature and relative humidity have been maintained within a range required, recommended, approved, or accepted by the fabricator for at least 96 hours before installation.
      b. Acclimate wood trim to the specified temperature and relative humidity conditions for at least 72 hours before installation.
      c. After wood trim have been installed, maintain a constant temperature of between 60 and 80 deg. F until Final Completion.
   2. Illumination: Illuminate work areas during application with at least the same level of illumination maintained in the room or space after the building is occupied, and as otherwise required, recommended, approved, or accepted by the fabricator to properly perform the Work.

B. Existing Conditions:
   1. Field-verify measurements before preparing submittals and indicate those field measurements on the shop drawings.
   2. If field measurements cannot be made without delaying the Work, establish working dimensions that accommodate installation tolerances, as well as related tolerances specified for the Work of other sections, and indicate those working dimensions on the shop drawings.
   3. Coordinate the installation of adjacent work to ensure the actual dimensions accommodate the previously established working dimensions.

4. Provide enough additional material during fabrication to allow for proper trimming and fitting at the Project site.

PART 2 - PRODUCTS

2.1 WOOD BASE

A. Material: Provide materials that comply with requirements of WI's quality standard for each type of wood trim materials and quality grade specified, unless otherwise indicated.

B. Comply with the following:
   1. Height: AS INDICATED ON THE DRAWINGS.
   2. Pattern: Custom wood base, AS INDICATED ON THE DRAWINGS.
   3. Grade: Premium.
   4. Finish: Paint specified in Section 09 91 00.

2.2 FABRICATION

A. Back-cut or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

B. Assemble items in plant except where limitations of access to place of installation require field assembly.

C. Assemble moldings in shop to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

D. Provide rabbeted joints. Finger joints are not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine supporting and adjacent construction and other conditions under which wood trim are installed.
   2. Verify that work performed as part of the work of other Sections conforms to the fabricator’s installation tolerance requirements; provides true, flat, and level bearing surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance.

B. Evaluation and Assessment:
   1. Reject work that does not conform to the fabricator’s installation requirements. The Contractor shall either perform or arrange and pay costs for all remedial work

necessary to correct or improve deficient conditions and to conform to the fabricator's installation requirements.

2. Proceeding with installation stipulates the installer's acceptance of existing conditions. After starting work, the installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the fabricator's installation requirements.

3.2 PREPARATION

A. Condition wood trim to average prevailing humidity in installation area prior to hanging.

3.3 INSTALLATION

A. General:
   1. Set units true to line, to required levels and lines, plumb, level, square, and fitted without warp or rack; with flush well-fitted joints; and in alignment with adjacent construction
   2. Scribe and cope the Work of this section as necessary for an accurate fit. Perform required cutting, drilling, and fitting for a complete installation
   3. Install wood trim in conformance with the specified quality standard requirements for the specified grade.

B. Special Techniques:
   1. Install wood trim materials true and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8-inch in 96 inches.
   2. Scribe and cut wood trim materials to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
   3. Anchor wood trim materials to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk concealed fasteners and blind nailing. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork.
   4. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches long, except where shorter single- length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
   5. Complete finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail and screw holes with matching filler where exposed.

C. Interface with Other Work: Securely attach wood trim in place.

3.4 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified appearance criteria and other requirements, as determined by the fabricator's field representative and the Architect.
2. Arrange and pay costs for either removing and re-installing, or replacing items that cannot be satisfactorily corrected, as determined by the fabricator's field representative and the Architect.

B. Repair:
1. Repair or refinish items that
   a. have damaged, loose, chipped, broken, stained, or corroded components, accessories, and similar items; or
   b. do not match the appearance of specified finishes, as determined by the Architect;
   c. do not comply with specified requirements.
2. Wood trim may be repaired or refinished if restoration work conforms to specified requirements and shows no evidence of repair or refinishing, as determined by the Architect.
3. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the fabricator's field representative and the Architect.

3.5 CLEANING

A. Cleaning Installed Work:
1. Remove protective materials after installation.
2. Clean surfaces of wood trim using cleaning agents, equipment, tools, and procedures furnished, required, recommended, approved, or accepted by the fabricator. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.
3. Replace items that cannot be satisfactorily cleaned, as determined by the fabricator's field representative and the Architect.

B. Waste Management: After completing the work of this Section, leave work areas around the project site free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed wood trim from corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to or against the installed wood trim unless the wood trim are adequately protected from damage and staining, as determined by the fabricator's field representative and the Architect.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 07 21 00 – THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Insulation applied for thermal protection (a) in walls, ceilings, attics, and crawl spaces;, including
      a. semi-rigid board insulation;
      b. blanket insulation; and
      c. continuous insulation systems.
   2. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AHJ: Authority (Authorities) Having Jurisdiction.
   2. FSI: Flame Spread Index.
   3. MSG: Manufacturers' Standard Gage for Sheet Steel.
   4. LTTR: Long Term Thermal Resistance.
   5. SDI: Smoke Developed Index.
   6. SWG: Steel Wire Gage.

B. Definitions:
   1. Manufacturer: Means the insulation manufacturer, unless otherwise indicated.
   2. Manufacturers' Standard Gage for Sheet Steel: Means the thickness steel sheet based on a weight of 41.82 pounds per square foot per inch of thickness.
   3. Steel Wire Gage: Means the diameter of steel wire in inches according to dimensions established by Washburn & Moen, Roebling, or American Steel and Wire Co.
   4. Thermal Transmittance (U-value): Means the measure of heat flux (flow of energy per unit of area per unit of time), and is expressed in units of BTU per hour square foot degrees Fahrenheit of air to air temperature difference between the two sides of a material (Btu/sq. ft. x h x deg. F).
   5. Thermal Resistance (R-value): Means the designation of an insulation material’s resistance to heat flux. The R value is numerically equal to the reciprocal of the material’s thermal transmittance, and is expressed in units of degrees Fahrenheit

hour square foot per BTU inch at 75 degrees Fahrenheit (deg. F x h x sq. ft./Btu x in. at 75 deg. F).

6. Long-Term Thermal Resistance: Means a 15-year, time-weighted, average predicted R-value for permeably faced polyisocyanurate insulation, as determined by testing methods outlined in ASTM C 1303.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Fiberglass and mineral wool insulation used in plenum spaces must be fully encapsulated.
2. Fiberglass and mineral wool insulation may not be installed in direct contact with interior ventilation.
3. Both board insulation and spray applied foam insulation may not be manufactured with blowing agents known to have ozone depleting potential (ODP).

B. Performance Requirements: Provide exterior wall insulation having a minimum R-value of at least R-19 for the insulation material only, unless otherwise indicated.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: Submit the manufacturer's product data, specifications, and other data necessary to demonstrate conformance to the specified requirements. Include sample copies of the complete terms of all warranties covering items furnished or applied under this section.

B. Informational Submittals:

1. Product Certification: Before starting work, submit either testing results from a qualified testing and inspection agency or qualified national testing organization, or an affidavit from the insulation manufacturer, evidencing that the selected insulation conforms to the specified reference standards and either meets or exceeds the specified performance requirements, based on comprehensive testing of the manufacturer's current product formulations performed by a qualified testing and inspection agency in compliance the specified test procedures.
2. Test and Evaluation Reports: Submit current report from the International Code Council Evaluation Services (ICC-ES) evidencing insulation conforms to the requirements of the AHJ.
3. Installation Instructions:
   a. Submit manufacturer-prepared instructions for the proper installation of each specified insulation type.
   b. If the manufacturer's instructions are either unavailable or do not specifically apply to project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect for feedback before proceeding with the work.

1.5 QUALITY ASSURANCE

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

1.6 HANDLING

A. Delivery:
   1. Deliver insulation to the Project site in original unopened packaging clearly marked with intact and legible identification labels indicating
      a. manufacturer's name and trademark;
      b. product type, size, grade, use, lot or batch number, and quantity;
      c. shelf life and expiration date; and
      d. ASTM designation or UL classification.
   2. Protect materials during transport and delivery from prolonged exposure to ultraviolet radiation in excess of the manufacturer's recommended limits, and exposure to weather, contact with damp or wet surfaces, and other sources of moisture.

B. Storage and Handling Requirements:
   1. Storage:
      a. Store insulation items as shipped, in their original packaging, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage.
         1) Provide adequate dunnage and bracing during storage. Store roll goods on pallets with identification labels clearly visible and in a manner that facilitates inspection.
         2) Store flammable or combustible items in a cool, dry area away from sources of sparks and open flames.
      b. Store items outdoors, off the ground or floor on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un- vented polyethylene tarpaulins may not be used.
         1) Incline stored items to provide maximum drainage of accumulated moisture.
         2) Provide spacers to separate stored items and allow air to circulate around all surfaces.
         3) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.
   2. Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture, or to ultraviolet radiation in excess of the manufacturer's recommended exposure limits.
   3. Comply with Division 01 Section "Construction IAQ Management" for storage and handling requirements.

C. Handling:
   1. Protect insulation from excessive moisture during handling.

2. Avoid contamination and damage to containers.

D. Damaged Item Replacement Requirements: Either remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of insulation items that becomes wet, deteriorated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new insulation.

E. Packaging Waste Management:

1. Remove and dispose of construction waste at a disposal location away from the Project site.

1.7 PROJECT CONDITIONS

A. Surface Conditions: Surfaces covered with insulation must be dry. If surface moisture is observed or detected, provide equipment necessary to dry those surfaces to permit application, as determined by insulation manufacturer's representative.

PART 2 - PRODUCTS

2.1 SEMI-RIGID BOARD INSULATION

A. Exposed Ceiling Insulation:

1. Description: Faced semi-rigid mineral wool insulation conforming to ASTM C 612 Types I through III, Category 1 physical property requirements (no compressive resistance properties required).
2. Manufacturer: Design is based on products and accessories by Thermafiber, Inc.
3. Products:
   a. Insulation: "FireSpan 90" curtain wall insulation.
   b. Insulation Fasteners: "THERMAFIBER Impasse" insulation hangers and locking washers.
4. Items must conform to the following:
   a. Thermal Resistance: Provide material having an R-value of at least R-19 (R 4.2 per inch of thickness).
   b. Size: At least 24 inches wide.
   c. Thickness: At least 2.0 inches.
   d. Density: At least 8.0 pounds per cubic foot.
   e. Facing: Foil-scrim-Kraft (FSK) vapor retarder facing.

2.2 BLANKET INSULATION

A. Fiberglass Blanket Insulation:

1. Description: Un-faced urea-formaldehyde-free inorganic glass-fiber blanket insulation conforming to ASTM C 665 Type I insulation requirements (blankets without membrane coverings).
2. Manufacturers: Provide products by one of the following.
   a. CertainTeed Corp.
   b. Johns Manville.
   c. Knauf Insulation.
   d. Owens Corning Fiberglass Corp.

e. Or equal.

3. Items must conform to the following:
   a. Thermal Resistance: Provide material having an R-value of at least R-21.
   b. Size: As required for a self-supporting friction fit.
   c. Thickness: At least 6-1/4 inches.
   d. Density: At least 0.75 pounds per cubic foot.
   e. Facing: None.

2.3 ACCESSORIES

A. Mechanical Fasteners: Provide tape, staples, and other devices for fastening insulation as required, recommended, approved, or accepted by the insulation manufacturer.

B. Insulation Hangers:
   1. Manufacturer: Design is based on products by AGM Industries, Inc.
   2. Products:
      a. Anchors: “TACTOO Insul-Hangers” adhesively attached spindle-type anchors.
      b. Adhesive: “GPA-72” anchor adhesive.
      c. Insulation Standoff: One-inch “Clutch Clip”.
      d. Insulation Retaining Washers: “Style RC 200” round or “SC 250” square washers.
   3. Items must conform to the following:
      a. Hanger materials:
         1) Base Plate and Insulation Standoff and Retaining Washers: At least 2 inches square by minimum 0.149-inch (MSG 28) base metal thickness galvanized perforated steel sheet.
         2) Retaining Washers: At least 1-1/2 inches square or diameter by minimum 0.149-inch (MSG 28) base metal thickness galvanized perforated steel sheet.
         3) Spindle: At least 0.106-inch diameter (SWG 12) zinc-coated wire, depth to suit insulation depth indicated.
      b. Hanger Adhesive:
         1) Adhesive used with impaling pins must either be manufactured or approved by the insulation hanger manufacturer. “Peel and press” hangers with self- adhering adhesive backings are not permitted.
      c. Hanger Wire: At least 0.106-inch diameter (SWG 12) soft temper zinc-coated wire conforming to ASTM A 641, Class 3 or A coating.

C. Vapor-Retarder Tape: At least 4-inch wide pressure-sensitive tape required, recommended, approved, or accepted by the insulation manufacturer for sealing joints and penetrations in insulation facings.

D. Adhesive: Product required, recommended, approved, or accepted by the insulation manufacturer, with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

E. Other Accessories: Provide other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the insulation manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

1. Examine supporting and adjacent construction, substrates indicated to receive insulation, and other conditions under which insulation is installed.
2. Verify that
   a. framing members are straight and aligned;
   b. spaces between framing members have been thoroughly cleaned of debris;
   c. work performed as part of the work of other Sections conforms to the insulation manufacturer's installation tolerance requirements; provides true, flat, and level bearing surfaces; and satisfies all other conditions relating to the quality of insulation, durability, appearance, and performance;
   d. surfaces identified to receive insulation are free from dirt, dust, oil, grease, waxy films, curing compounds, release agents, and other deleterious materials that would adversely affect the quality of application, and material system assembly appearance and performance; and
   e. ambient project conditions are within the specified ranges, and existing construction conforms to allowable tolerances.

B. Evaluation and Assessment:

1. Reject work that does not conform to the insulation manufacturer's installation requirements. The Contractor shall either perform or arrange and pay costs for all remedial work necessary to correct or improve deficient conditions and to conform to the insulation manufacturer's installation requirements.
2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the insulation manufacturer's installation requirements.

3.2 PREPARATION

A. Repair, clean, and prepare surfaces in conformance with the insulation manufacturer's installation instructions.

B. Surfaces must be clean, smooth, dry, and free of flaws, sharp edges, loose or foreign material, holes, voids, gaps, cracks, or other imperfections and irregularities that would

adversely affect the quality of installation, performance, or interfere with insulation attachment.

3.3 INSTALLATION

A. General:
   1. Comply with the insulation manufacturer's installation instructions.
   2. Use materials and methods required, recommended, approved, or accepted by the Insert item description manufacturer, along with manufacturer-recommended accessories and techniques.
   3. Only install insulation that is undamaged, dry, and unsoiled; and that has not been left exposed at any time to precipitation.
   4. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

B. Special Techniques:
   1. Framed Construction Blanket Insulation: Install in cavities formed by framing members.
      a. Use insulation that fills the cavities. If more than one length is required to fill the cavities, then provide lengths that will produce a snug fit between ends.
      b. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
      c. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
      d. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
      e. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
      f. For wood-framed construction, install blankets in conformance with ASTM C 1320 and the following:
         1) With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
         2) With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
      g. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
         1) Exterior Walls: Set units with facing placed toward interior construction.
         2) Interior Walls: Set units with facing placed toward areas of high humidity.
   2. Curtain Wall Insulation:
      a. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation

manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.

b. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.4 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. Corrected work must also be inspected by the Owner's testing agency and re- tested, as applicable.
   e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
      3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
      4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:

1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or

c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.

2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.5 CLEANING

A. Cleaning Installed Work:
   1. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
   2. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas around the project site free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.
   1. Protect in place the installed insulation from prolonged exposure to UV in excess of the manufacturer's recommended limits.
   2. If exposed to UV for more than 30 days, exposed to weather, or otherwise becomes wet, then remove and replace such insulation in conformance with the manufacturer's instructions.
   3. Protect in place the newly-installed insulation from prolonged exposure to UV in excess of the manufacturer's recommended limits, to weather, to or otherwise becomes wet.

B. Do not store anything adjacent to, on, or against installed insulation unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use insulation surfaces as work surfaces.

D. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fabricated rigid sheet metal copings.
2. Other fabricated rigid sheet metal flashing and trim.
3. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
1. Section 05 50 00 for dissimilar metal protection.
2. Section 07 65 26 for flexible self-adhering sheet flashing.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. ACM: Aluminum Composite Material.
2. HPC: High Performance Coating.
3. MSG: Manufacturer’s Standard Gage for Sheet Metal.
4. NRCA: National Roofing Contractors Association.
5. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.
6. USSG: United States Standard Gage for Sheet and Plate Iron and Steel.

B. Definitions:
1. Manufacturers' Standard Gage for Sheet Steel: Means the thickness steel sheet based on a weight of 41.82 pounds per square foot per inch of thickness.
2. Fabricator: Means the sheet metal fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
2. Coordinate installation of counter flashing with installation of base flashing.
3. Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof.
4. Coordinate the installation of equipment support flashings with the installation of roofing and equipment.

5. Coordinate the installation of wall flashings with the installation of wall-opening components, such as windows, doors, and louvers.

B. System Description:
1. Copings:
a. Aluminum: Provide 2 colors matching stone and metal panels.
b. Stainless Steel: Provide (1) as part of the rain screen system; and (2) if flashing is concealed and cannot be easily replaced after installation; and (3) if flashings come into contact with the ground.
c. Galvanized with Field-Applied High Performance Coatings: Copings at stucco.

C. Delegated Design Requirements:
1. System Description: Drawings of sheet metal flashings and trim are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.
2. Design Requirements:
a. Engineer, fabricate, assemble, and install sheet metal flashings and trim to meet or exceed the specified performance criteria; conform to the profiles indicated and to other requirements of the Contract Documents; satisfy the requirements of the AHJ; and provide structurally sound, assemblies that accommodate, resist, distribute, or transfer, as applicable, the minimum specified in-service loads and thermal, seismic, wind sway, and other types of movement without incipient or catastrophic failure.
b. Maintain the visual design concept indicated, including member sizes, profiles, and alignment of components. Deviation from the visual design concept indicated is not permitted without prior written authorization from the Architect.
3. Performance Requirements: Unless otherwise indicated, sheet metal flashings and trim must conform to the following.
a. Thermal Movements: Provide sheet metal flashings and trim that allow for thermal movements resulting from the following minimum temperature differentials (changes) in both ambient and surface temperatures; and prevent buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1) Design Ambient Temperature Differential (Change): At least 120 deg. F.
2) Design Material Surface Temperature Differential (Change): At least 180 deg. F.
3) Base engineering calculations on material surface temperatures due both to solar heat gain and to nighttime-sky heat loss.
4) Provide fasteners that resist rotation and withstand shear stress resulting from thermal expansion and contraction.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: For sealant, fasteners, solder, and other manufactured items, submit product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
2. Shop Drawings: Submit large-scale dimensioned drawings showing materials, joints, profiles, edge conditions and attachments to other work.
   a. Indicate material thickness and methods of field installation.
   b. Include project-specific at least 1-1/2-inch scale dimensioned detail drawings showing profiles, shapes, joints, seams, and dimensions, including terminations, penetrations, miters, hems, interior corner conditions, and exterior corner conditions. Furnish edge details where specified items abut adjacent items.
   c. Indicate method of fastening to adjacent construction.
      1) Show fasteners, brackets, clips, cleats, straps, mounting devices, and similar attachments to other work.
      2) Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
   d. Include medium-scale pictorial oblique or axonometric projection 3-D drawings for conditions too difficult to illustrate as two-dimensional multi-view orthographic projection drawings. Perspective projections do not meet the requirements for 3-D drawings and are returned without review.
3. Samples: Prior to fabrication, submit samples of all sheet metal assembly components for field fit verification.

1.5 QUALITY ASSURANCE

A. Quality Standard Requirements: Unless otherwise indicated, provide sheet metal items conforming to
   1. NRCA publication “Roofing and Waterproofing Manual”, Volume 2, “Architectural Sheet Metal and Metal Roofing” for the design and installation of sheet metal flashing and trim items installed as part of new construction roofing applications; and
   2. SMACNA publication “Architectural Sheet Metal Manual” requirements for design dimensions, geometry, metal thickness and other characteristics, and installation of other sheet metal flashing and trim items installed elsewhere.

B. Qualifications:
   1. Fabricator: Must be a legal business entity with at least 5 consecutive years’ experience fabricating sheet metal flashing and trim similar in material, design, complexity, and extent to this Project, and whose products have resulted in applications with a record of successful in-service performance.
   2. Licensed Professional:
      a. Engineer Qualifications: Professional structural engineer legally qualified to practice in California, and having at least 10 consecutive years providing engineering services of the kind indicated on projects similar in material, design, complexity and extent to this Project.
      b. Engineering Responsibility: Shop drawings, design calculations, and other structural data must be prepared directly by, or under the direct supervision of, a qualified professional structural engineer.

C. Mockups: Along with portions of the building enclosure system specified in other sections, including backup wall construction, exterior cladding, insulation, ties and other penetrations, and flashings, construct an integrated mockup (pre-submittal, *ex situ* integrated/composite mockup).

1. Required mockups are indicated on the Drawings.
2. Before starting work, including bulk purchase and delivery of products, submit drawings of the proposed mockup to the Architect for information.
3. After the Architect's review of the submitted mockup drawings, construct mock up to
   a. review construction techniques;
   b. coordinate the work of multiple sections;
   c. train the trades involved in the work;
   d. demonstrate aesthetic effects, quality of materials, and fabrication and installation (workmanship); and
   e. serve as a platform for preconstruction testing.
4. At a minimum, comply with the following:
   a. Where directed by the Architect, demonstrate patching techniques, and materials and techniques proposed for repair of surfaces to match adjacent undamaged surfaces.
5. The Architect reviews the mockup to determine if the work falls within an acceptable range for
   a. visual appearance;
   b. mottling, sheen, color and texture variation, and evenness of finish;
   c. integration of the work of different trades;
   d. installation tolerances;
   e. quality and fabrication and installation (workmanship);
   f. compliance with the specified requirements; and
6. The Architect either rejects or approves mockups as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
7. If a mockup is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
   a. Repeat mockups until the Architect approves them.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by the Owner in writing.
8. When the mockup is approved, protect the approved mockup until removal is authorized in writing by the Architect. After removal is authorized by the Architect, dismantle, remove, and dispose of the mockup at a disposal location away from the Project site.

1.6 HANDLING

A. Packing, Shipping, Handling and Unloading Requirements: To prevent damage during fabrication, delivery, storage, handling, and installation, provide either strippable film or

the fabricator ’s other standard form of temporary protection for metal finish surfaces scheduled to remain exposed.

B. Storage:
   1. Store sheet metal flashing and trim items as shipped, and in conformance with the fabricator’s requirements, recommendations, or instructions for storage. Provide adequate dunnage and bracing during storage.
   2. Store items outdoors, off the ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.
      a. Incline stored items to provide maximum drainage of accumulated moisture.
      b. Provide spacers to separate stored items and allow air to circulate around all surfaces.
      c. Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.
      d. Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture.

C. Handling:
   1. Protect sheet metal flashing and trim from excessive moisture during handling.
   2. Handle in a manner that prevents bending, warping, twisting or other physical damage.

D. Damaged Item Replacement Requirements: Either remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of sheet metal flashing and trim items that become corroded, deteriorated, stained, or otherwise damaged.
   1. Dismantle, remove, and dispose of damaged items at a disposal location away from the Project site.
   2. Replace removed items with undamaged new sheet metal flashing and trim items.

E. Packaging Waste Management:
   1. Remove and dispose of construction waste at a disposal location away from the Project site.
   2. Do not bury any type of wood, or wood-based or agrifiber products at the Project site.

1.7 PROJECT CONDITIONS

A. Existing Conditions:
   1. Field-verify measurements before preparing sheet metal flashing and trim submittals and indicate those field measurements on the shop drawings.
   2. If field measurements cannot be made without delaying the Work, establish working dimensions that accommodate installation tolerances, as well as related tolerances specified for the Work of other sections, and indicate those working dimensions on the shop drawings.

3. Coordinate installation of adjacent work to ensure actual dimensions accommodate previously established working dimensions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. HDG Metallic Coated Steel Coil, Sheet, and Strip: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface, coating designation indicated below on both surfaces, minimized spangle, chemically treated, oiled, and mill phosphatized (paint-grip).
   1. Natural Finish: G90 minimum coating designation (galvanized), minimized spangle, chemically treated, and oiled.
   2. Painted Finish: A60 minimum coating designation (galvannealed), not chemically treated, not oiled, and mill phosphatized (paint-grip).

2.2 FABRICATED COPINGS

A. Items must conform to the following:
   1. Profile: Provide standard profile from SMACNA publication “Architectural Sheet Metal Manual”, Chapter 3, Figure 3-4B.
      a. Coping Top Width: AS INDICATED ON THE DRAWINGS.
      b. Coping Side Dimension: AS INDICATED ON THE DRAWINGS.
      c. Corner Style: AS INDICATED ON THE DRAWINGS.
      d. Joint Style: J2 (butt and backup plate).
      e. Exterior Face Edge Style: AS INDICATED ON THE DRAWINGS.
      f. Roof Side Face Edge Style: AS INDICATED ON THE DRAWINGS.
   2. Attachment: AS INDICATED ON THE DRAWINGS.

B. Fabrication:
   1. Fabricate in at least 8-foot, but not more than 10-foot, sections.
   2. Fabricate backup plates from the same material and thickness as copings.
   3. Miter corners, seal, and solder or weld watertight.
      a. All corners and transitions must be shop or factory fabricated.
      b. Only linear transitions may be field fabricated.

C. Shop Finishing: Provide fluoropolymer finish specified in Section 05 05 14.

2.3 OTHER FABRICATED SHEET METAL FLASHING AND TRIM

A. Description:
   1. Reglets: Fabricate from at least 0.0250-inch thick (USSG 24) stainless steel sheet. Furnish units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces.
   2. Interlocking Counterflashings: Provide same material and thickness as reglets.
   3. Through-Wall Flashing: Fabricate from at least 0.0250-inch thick (USSG 24) stainless steel sheet.
   4. Opening Flashings in Frame Construction: Fabricate from at least 0.0359-inch base metal thickness (USSG 20) HDG metallic-coated steel sheet.
   5. Other Fabricated Sheet Metal Flashing and Trim: Unless otherwise indicated, comply with

following.

a. Flashing and Trim in Contact with Soil and Elsewhere Indicated: Fabricate from at least 0.0250-inch thick (USSG 24) stainless steel sheet.

b. Other Flashing and Trim: Unless otherwise noted, fabricate from at least 0.0239- inch base metal thickness (USSG 24) HDG metallic-coated steel sheet, or from at least 0.0250-inch thick (USSG 24) stainless steel sheet.

B. Finish: Unless otherwise indicated, uncoated (bare) natural finish.

2.4 ACCESSORIES

A. Splash Pans: Standard precast concrete units formed from at least 3,000 psi concrete. Provide pans with rounded corners and smooth and dense surfaces, free of honeycombs.

B. Sealant:

1. Exposed Sealant: Low modulus sealant specified in Section 07 92 00.
2. Concealed Sealant: Butyl sealant specified in Section 07 92 00.

C. Fasteners: Uncoated stainless steel gasketed screw fasteners specified in Section 05 05 23.

D. Soldering Materials: As specified in Section 05 05 23.

E. Underlayment: Self-adhering sheet flashing underlayment specified in Section 07 65 26.

F. Other Accessories: Install or apply other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the sheet metal flashing and trim fabricator.

2.5 FABRICATION

A. Shop Fabrication:

1. Fabricate items at the shop to greatest extent possible, in largest sections practicable to minimize field jointing. Inside and outside corners, and changes in direction, must be shop-fabricated assemblies with continuously welded or soldered joints.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to conform to the specified performance requirements, but not less than that specified for each application and metal.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks; precise, straight, and true to line, size, shape, and levels indicated; with accurate angles and straight edges; and with exposed edges folded back to form hems.
4. Form non-expansion, but movable, joints in metal to accommodate sealant. Where lapped expansion provisions cannot be used, form expansion joints with at least one inch deep intermeshing hooked flange; fill with butyl sealant concealed within joints.
5. Fabricate non-moving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
6. Cut, reinforce ,and punch fabrications as necessary to receive other components, accessories, hardware, and similar items; and as required to securely attach flashings and sheet metal to supporting construction.
   a. Exposed fasteners are not permitted on faces exposed to view.
   b. Provide concealed fasteners and expansion provisions elsewhere.
7. Fabricate cleats and attachment devices from the same material as the item being anchored, of sizes as recommended by SMACNA publication “Architectural Sheet Metal Manual” for the application, but not less than thickness of metal being secured

8. Do not use graphite pencils to mark metal surfaces.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4-inch in 20 feet on slope and location lines

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine supporting and adjacent construction, substrates indicated to support sheet metal flashing and trim, and other conditions under which sheet metal flashing and trim is installed.
   2. Verify that
      a. openings have been framed within allowable tolerances; are square, plumb, level, and true to line; and provide sound anchoring surfaces;
      b. work performed as part of the work of other Sections conforms to the referenced standard's installation tolerance requirements; provides true, flat, and level bearing surfaces; and satisfies all other conditions relating to the quality of sheet metal flashing and trim installation, durability, appearance, and performance;
      c. shapes and dimensions of surfaces to be covered by sheet metal flashings can accommodate the fabricated items' established working dimensions and installation tolerances; and
      d. surfaces identified to support sheet metal flashing and trim are clean.

B. Evaluation and Assessment:
   1. Reject work sheet metal flashing and trim that does not conform to the referenced standard's installation requirements. The Contractor shall either perform or arrange and pay costs for all remedial work necessary to correct or improve deficient conditions and to conform to the referenced standard's installation requirements.
   2. Proceeding with installation stipulates the installer's acceptance of existing conditions. After starting work, the installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the referenced standard's installation requirements.

3.2 INSTALLATION

A. General: Comply with the referenced standard requirements for sheet metal flashing and trim installation.
   1. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks. Do not use graphite pencils to mark metal surfaces.
   2. Set items true to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush, well-fitted, hairline joints; in alignment with adjacent construction. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

a. Trim to fit substrates and to result in watertight performance. Torch cutting is not permitted.
b. Shim as required with concealed shims.
c. Install sealant tape where indicated.

3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
4. Space cleats not more than 12 inches apart. Anchor each cleat with at least 2 fasteners. Bend tabs over fasteners.

B. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints not more than 10 feet on center.
2. Joints may not be located within 24 inches of any corner or intersection.
3. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints with intermeshing hooked flanges at least one inch deep, and fill with sealant concealed within the joints.

C. Fastener Sizes: Provide fasteners that will penetrate metal at least as required, recommended, approved, or accepted by the fastener manufacturer to achieve maximum pull-out resistance.

D. Seal joints AS INDICATED ON THE DRAWINGS and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members at least one inch into the sealant. Form joints to completely conceal sealant.
2. When ambient temperature at the time of installation is between 40 and 70 deg. F, set joint members for 50 percent movement each way.
a. Adjust setting proportionately for installation at higher ambient temperatures.
b. Do not install sealant-type joints at temperatures below 40 deg. F.
3. Prepare joints and apply sealants in conformance with the requirements of Section 07 92 00.

E. Soldered Joints:
1. Clean surfaces to be soldered.
2. Pre-tin sheet edges to at least 1-1/2 inches from the edge; reduce pre-tinning area where the pre-tinned surface would show in the completed Work.
a. Tin edges of uncoated stainless steel sheets using solder recommended for stainless steel along with acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Clean and neutralize in conformance with the solder manufacturer's installation instructions.
3. Do not use torches for soldering.
4. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

F. Special Techniques:

1. Roof Drainage System Installation: Install sheet metal roof drainage components as indicated to produce a complete roof drainage system conforming to the referenced standard.
2. Roof Flashing Installation: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level AS INDICATED ON THE DRAWINGS. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
   a. Roof Edge Flashing: Anchor to resist uplift and outward forces in conformance with the recommendations of SMACNA's "Architectural Sheet Metal Manual" and AS INDICATED ON THE DRAWINGS. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
   b. Copings: Anchor to resist uplift and outward forces in conformance with the recommendations of SMACNA's "Architectural Sheet Metal Manual" and AS INDICATED ON THE DRAWINGS.
      1) Interlock exterior bottom edge of coping with continuous cleat anchored to the supporting substrate at not more than 24-inches on center.
      2) Anchor the interior leg of copings with washers and screw fasteners through slotted holes at not more than 24 inches on center.
   c. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
   d. Counterflashing: Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant.
   e. Roof-Penetration Flashing: Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.
3. Wall Flashing Installation: Install sheet metal wall flashing as indicated, and to intercept and exclude penetrating moisture in conformance with the referenced standard’s recommendations.
   a. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend beyond wall openings as indicated on the shop drawings.
4. Miscellaneous Flashing Installation:
   a. Equipment Support Flashing: Weld or seal flashing with elastomeric sealant to equipment support members.
   b. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated. Pipe and install drain lines to plumbing waste or drainage system as indicated on the plumbing drawings.

G. Interface with Other Work: Securely fasten sheet metal flashing and trim items in place, and provide measures necessary to accommodate, resist, distribute, or transfer, as applicable, the minimum specified in-service loads and thermal or other types of movement without incipient or catastrophic failure.

H. Installation Tolerances: Shim and align sheet metal flashing and trim within an installed tolerance of 1/4-inch in 20 feet on slope and location lines indicated, and within 1/8- inch offset of adjoining faces and of alignment of matching profiles.

I. Attachment: Securely attach sheet metal flashings, trim, and accessories in place to

supporting construction.

3.3 CORRECTION AND REPAIR

A. Correction:
1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. Corrected work must also be inspected by the Owner's testing agency and re- tested, as applicable.
   e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
      3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
      4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
   c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 CLEANING

A. Cleaning Installed Work:

1. Remove protective materials after installation.
2. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering
3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
   a. Protect other work from staining or damage caused by cleaning operations.
   b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
4. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
5. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas around the project site free from debris, materials, equipment, and related items.

3.5 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to, on, or against installed sheet metal flashings or trim unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use sheet metal flashing or trim surfaces as work surfaces.

D. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 65 26 – SELF-ADHERING SHEET FLASHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Flexible high-temperature self-adhering sheet flashing.
   2. Preparation of substrates scheduled to receive self-adhering sheet flashing.
   3. Supplementary components, accessories, and detail work necessary for a complete application, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 05 40 00 for sill self-adhering sill sealer and plate liner.
   2. Section 06 16 43 for self-adhering seam seal tape for gypsum sheathing panel joints.

2.2 REFERENCES

A. Definitions:
   1. Roof: Means the top cover of a building having a slope of 60 degrees or less from the zero-degree horizontal plane.
   2. Non-Roof: Means the top cover of a building having a slope more than 60 degrees from the zero-degree horizontal plane.
   3. Wall: Means one of the sides of a room or building connecting a floor and ceiling or foundation and roof, and having a slope less than 30 degrees from the 90-degree vertical plane.

3.3 ADMINISTRATIVE REQUIREMENTS

A. Performance Requirements: Self-adhering sheet flashing membranes installed around the perimeter of exterior fenestration assemblies must conform to Level 3 (elevated temperature exposure) requirements of the American Architectural Manufacturers Association (AAMA) publication AAMA 711, " Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products".

B. Scheduling:
   1. Curing: Either allow sufficient time in the construction schedule to permit concrete to cure for at least 28 days, or provide a chemically and adhesively compatible surface treatment so that the concrete water vapor emission rate falls below the level acceptable to the self-adhering sheet flashing manufacturer before starting surface preparation and self-adhering sheet flashing installation.

2. Exposure: Schedule installation to keep self-adhering sheet flashing exposure to ultraviolet radiation within the self-adhering sheet flashing manufacturer's recommended limits.

4.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer's product data, specifications, typical application details, and other data necessary to demonstrate conformance to the specified requirements.
   2. Shop Drawings: Submit dimensioned drawings showing locations and extents of sheet flashing membranes.
      a. Include project-specific at least 1-1/2-inch scale dimensioned detail drawings showing profiles, shapes, joints, seams, and dimensions, including terminations, penetrations, coves, hems, interior corner conditions, and exterior corner conditions either not detailed the product data, or that are detailed on the product data, but in a manner that is not specific to the Project.
      b. Include medium-scale pictorial oblique or axonometric projection 3-D drawings for conditions too difficult to illustrate as two-dimensional multi-view orthographic projection drawings. Perspective projections do not meet the requirements for 3-D drawings and are returned without review.
   3. Samples: Submit manufacturer's standard samples of each proposed flashing membrane.

B. Informational Submittals:
   1. Certificates:
      a. Product Certification: Before starting work, submit either testing results from a qualified testing and inspection agency or qualified national testing organization, or an affidavit from the flashing membrane manufacturer, evidencing that the selected flashing membranes items conform to the specified performance requirements, based on comprehensive testing of the manufacturer's current product formulations performed by a qualified testing and inspection agency in compliance the specified test procedures.
   2. Application Instructions:
      a. Submit manufacturer-prepared instructions for the proper application of each flashing membranes system.
      b. If the manufacturer's instructions are either unavailable or do not specifically apply to project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared application requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect for feedback before proceeding with the work.

5.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flashing membranes and accessories through one source from the same manufacturer.

6.6 PROJECT CONDITIONS

A. Ambient Conditions:
   1. Weather: Do not apply flashing membranes in adverse weather conditions, or when material or ambient temperature, relative humidity, or other environmental requirements are outside the limits recommended by the flashing membrane manufacturer.
      a. Proceed with application only when there is no threat of impending precipitation, and both current and forecasted weather conditions permit proper application performed in conformance with the manufacturer's requirements, recommendations, and installation instructions.
      b. Do not apply flashing membranes during snow or rain, on in fog or mist.

B. Existing Conditions:
   1. Surface Conditions:
      a. Surfaces covered with flashing membranes must be dry. If surface moisture is observed or detected, provide equipment necessary to dry those surfaces to permit application, as determined by flashing membrane manufacturer's representative.
      b. Do not apply flashing membranes to concrete slabs until the slabs have cured and are sufficiently dry to promote a good bond for adhesives, as determined by performing the flashing membranes adhesive manufacturer's required or recommended moisture and bond tests.
   2. Other Existing Conditions: Do not apply flashing membranes in areas where dust is being generated or where liquids are being sprayed.

PART 2 - PRODUCTS

2.1 HIGH TEMPERATURE SELF-ADHERING SHEET FLASHING

A. Description: Self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/butyl adhesive, with release liner on the adhesive side.

B. Products: Design is based on "Grace Ultra" flashing membrane manufactured by W.R. Grace and Co. Other acceptable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
   1. "CCW WIP 403HR" by Carlisle Coatings and Waterproofing.
   2. "Perma-Seal PE" by Henry Co.

C. Items must conform to the following:
   1. Thickness: At least 25 mils.
   2. Roll Width: Not less than 9 inches.
   3. UV Exposure Limit: Not more than 30 calendar days.

2.2 ACCESSORIES

A. Primer:
   1. Gypsum Sheathing Primer: “Perm-A-Barrier Primer Plus” water-based primer required for exterior gypsum sheathing substrates.
   2. Other Primer: “Bituthene Primer B2 LVC” low-VOC solvent-based primer required for cementitious and other substrates.

B. Liquid Flashing: “Bituthene Liquid Membrane” 2-component, elastomeric, cold-applied, trowel grade material used as repair material for defects on concrete surfaces; as fillet and reinforcement material at inside corners; as flashing material at outside corners and around drains, protrusions, curbs and parapets; and as sealing material at membrane terminations.

C. Sealant and Other Accessories: Provide sealant and other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the flashing membrane manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine supporting and adjacent construction, substrates indicated to receive sheet flashing membranes, and other conditions under which flashing membranes are installed.
   2. Verify that
      a. concrete surfaces have been repaired in compliance with the requirements of Section 03 35 00 and conform to the manufacturer’s recommended tolerances;
      b. openings have been formed within allowable tolerances; are square plumb true to line; and provide sound anchoring substrates;
      c. work performed as part of the work of other Sections conforms to the flashing membrane manufacturer’s installation tolerance requirements, and satisfies all other conditions relating to the quality of flashing membrane application, durability, appearance, and performance;
      d. surfaces identified to receive flashing membranes are free from dirt, dust, oil, grease, waxy films, curing compounds, release agents, and other deleterious materials that could adversely affect the quality of installation and performance; and
      e. ambient project conditions are within the flashing membrane manufacturer’s recommended ranges.

B. Evaluation and Assessment:
   1. Reject work that does not conform to the flashing membrane manufacturer’s application requirements. The Contractor shall either perform or arrange and pay

costs for all remedial work necessary to correct or improve deficient conditions and to conform to the flashing membrane manufacturer's application requirements.

2. Proceeding with application stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the flashing membrane manufacturer's application requirements.

3.2 PREPARATION

A. Protection of In-Place Conditions: Protect work areas from excessive dust and other airborne contaminants during surface preparation and application.

B. Surface Preparation:

1. Repair, clean, and prepare surfaces in conformance with the flashing membrane manufacturer's application instructions.
2. Remove grease, oil, paint, and other penetrating contaminants or film-forming curing compounds and coatings from surfaces.
3. Surfaces must be clean, smooth, dry, and free of flaws, sharp edges, loose or foreign material, holes, voids, gaps, cracks, or other imperfections and irregularities that could adversely affect the quality of application and flashing membranes durability, appearance, and performance.
4. Prime surfaces when required, recommended, approved, or accepted by the self- adhering sheet flashing manufacturer.

3.3 INSTALLATION

A. General:

1. Comply with the flashing membrane manufacturer's installation instructions. Use materials and methods required, recommended, approved, or accepted by the flashing membrane manufacturer, along with manufacturer-recommended accessories and techniques.
2. Accurately align flashing membranes and maintain uniform side and end laps at least 3 inches, or as otherwise specifically depicted in the project details. Apply flashing membranes with side laps shingled in the direction of liquid water flow.
3. Clean seam areas, overlap flashing membranes, and roll side and end laps of flashing membranes in conformance with the flashing manufacturer's installation instructions to ensure a watertight seam installation.
4. Pressure is essential to eliminate wrinkles and bubbles.
   a. Press and form material tightly against the substrate.
   b. Ensure complete and continuous adhesion by using a hand roller.
   c. Apply Liquid Membrane at flashing membrane leading edges.
5. Repair tears, voids, and lapped seams in flashing membranes that does not meet requirements.

B. Special Techniques:

1. Around Windows: Install flashing in the following order of precedence:
   a. Install in conformance with details indicated on Drawings.
   b. Install in conformance with the flashing membrane manufacturer, and the door and window manufacturers' installation instructions.
   c. Install in conformance with ASTM E 2112.
2. Under Copings where Indicated: Install over wall flashing or water-resistant barrier. Lap joints 2 inches minimum. Hand-roll seams for complete adherence to substrate.
3. Under Plaster Control Joints:
   a. Determine where control joints will occur, and then snap chalk lines as a guide.
   b. Install continuous 12-inch wide flashing membrane strip from the top metal trim to the drip screed.
   c. Lap flashing membrane over the drip screed.

3.4 CORRECTION AND REPAIR

A. Correction:
   1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the flashing membrane manufacturer's field representative and the Architect.
   2. Arrange and pay costs for either removing and re-installing or replacing items that cannot be satisfactorily corrected, as determined by the flashing membrane manufacturer's field representative and the Architect.

3.5 FIELD QUALITY CONTROL

A. Site Tests and Inspections: Before weather-resistive barrier (WRB) or air barrier (AB) systems are installed, examine self-adhering sheet flashings. Verify laps, seams and joints are weathertight. Roll again where flashings are not in firm and continuous contact with the substrate.

B. Nonconforming Work: When examination reveals flashing membranes items that are deficient, faulty, do not perform properly, or do not conform to the specified requirements, make corrections acceptable to the Architect, and then arrange and pay costs for re-testing until it can be demonstrated that all items perform properly and conform to the specified requirements, as determined by the Architect.

3.6 PROTECTION

A. Protect in place installed flashing membranes from prolonged exposure to ultraviolet radiation in excess of the manufacturer's recommended limits, and from sources of deterioration or other damage until Substantial Completion.

B. Do not store anything adjacent to or against the applied flashing membranes unless the flashing membranes are adequately protected from damage, as determined by the flashing membrane manufacturer's field representative and the Architect.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 07 92 00 – JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Exterior joint sealants.
2. Specialty joint sealants.
3. Interior joint sealants.
4. Joint sealant backings.
5. Tape sealants.
6. Supplementary accessories and detail work necessary for a complete application, whether or not such items are indicated on the Drawings or included in the Specifications.

2.2 REFERENCES

A. Definitions:
1. Manufacturer: Means the joint sealant manufacturer, unless otherwise indicated.
2. Ultra Low Modulus: Means having a joint movement extension/compression capability of at least a 100-percent increase and at least a 50-percent decrease, when tested in compliance with ASTM C 719.
3. Low Modulus: Means having a joint movement extension/compression capability of at least a 50-percent increase and at least a 50-percent decrease, when tested in compliance with ASTM C 719.
4. Medium Modulus: Means having a joint movement extension/compression capability of at least a 35-percent increase and at least a 35-percent decrease, when tested in compliance with ASTM C 719.
5. High Modulus: Means having a joint movement extension/compression capability of at least a 25-percent increase and at least a 25-percent decrease, when tested in compliance with ASTM C 719.
6. Very High Modulus: Means having a joint movement extension/compression capability of at least a 12.5-percent increase and at least a 12.5-percent decrease, when tested in compliance with ASTM C 719.

3.3 ADMINISTRATIVE REQUIREMENTS

A. Performance Requirements:
1. Provide joint sealants that establish and maintain a continuous watertight seal without staining or deteriorating joint substrates.
2. For applications where sealants are applied to porous substrates, provide products that have undergone testing in compliance with ASTM C 1248, and that have not stained porous joint substrates identical to those indicated for the Project.

B. Scheduling:
1. Curing: Either allow sufficient time in the construction schedule to permit concrete to cure for at least 28 days without being re-wetted, or provide a chemically and adhesively compatible substrate treatment so that the concrete RH and MVER is permanently below the limit acceptable to the manufacturer before starting surface preparation and sealant application.

4.4 SUBMITTALS

A. Action Submittals:

1. Product Data: Submit the joint sealant manufacturer's product data, specifications, and other data necessary to demonstrate conformance to the specified requirements. Include sample copies of the complete terms of all warranties covering items furnished or applied under this section.
2. Samples:
   a. Initial Selection: Submit exposed sealant colors are selected by the Architect from the manufacturer's standard colors. Submit manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
   b. Verification: For each type 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.

B. Informational Submittals:

1. Certificates: Before starting work, either submit testing results from a qualified testing and inspection agency or qualified national testing organization, or submit an affidavit from the joint sealant manufacturer evidencing that the selected joint sealants conform to the specified reference standards; and either meet or exceed the specified performance requirements, based on comprehensive testing of the manufacturer's current product formulations performed by a qualified testing and inspection agency in compliance the specified test procedures.
2. Test and Evaluation Reports: Submit evidence showing that the proposed joint sealants have been tested for chemical and adhesive compatibility with joint substrates. Include interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
3. Installation Instructions:
   a. Before starting work, submit manufacturer-prepared instructions for the proper installation of each joint sealant.
   b. If the manufacturer's instructions are either unavailable or do not specifically apply to project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect for feedback before proceeding with the work.
4. Field Quality Control Submittals: Submit properly-formatted field test report log evidencing that joint sealants have been applied and tested in-place as specified, and found to conform to the specified performance requirements.

C. Closeout Submittals:

1. Operation and Maintenance Data: Submit to the Owner a copy of the joint sealant manufacturer's recommendations for maintenance, including
   a. recommendations for care, repair, restoration, cleaning, maintenance, and troubleshooting;
   b. recommendations for periodic inspections and identification of common causes of damage;
   c. recommendations for cleaning and repairing joint sealants, including warnings against using materials and methods that may be detrimental to joint sealant durability, appearance, and performance; and
   d. instructions for both permanent repair and temporary repair and patching until permanent repair can be made.
2. Warranty Documentation: Submit final warranties, signed by both the installer's and the

manufacturer's, representatives, with complete terms clearly indicated for all warranties covering items furnished or applied under this Section.

5.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type, grade, and variety of joint sealant and accessories through one source from the same manufacturer. Different sealant types can be provided by different manufacturers, provided they are demonstrably proven to be chemically and adhesively compatible through testing.

B. Mockups: Along with portions of the building enclosure system specified in other sections, including backup wall construction, exterior cladding, insulation, ties and other penetrations and flashings, construct an integrated Type A mockup (pre-submittal, *ex situ* integrated/composite mockup).

1. Required mockups are indicated on the Drawings.
2. Before starting work, including bulk purchase and delivery of products, submit drawings of the proposed mockup to the Architect for information.
3. After the Architect's review of the submitted mockup drawings, construct mock up to
   a. review construction techniques;
   b. coordinate the work of multiple sections;
   c. train the trades involved in the work;
   d. demonstrate aesthetic effects, quality of materials, and fabrication and installation (workmanship); and
   e. serve as a platform for preconstruction testing.
4. At a minimum, comply with the following:
   a. Where directed by the Architect, demonstrate patching techniques, and materials and techniques proposed for repair of surfaces to match adjacent undamaged surfaces.
5. The Architect reviews the mockup to determine if the work falls within an acceptable range for
   a. visual appearance;
   b. mottling, sheen, color and texture variation, and evenness of finish;
   c. integration of the work of different trades;
   d. installation tolerances;
   e. quality and fabrication and installation (workmanship);
   f. compliance with the specified requirements; and
6. The Architect either rejects or approves mockups as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
7. If a mockup is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
   a. Repeat mockups until the Architect approves them.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by the Owner in writing.
8. When the mockup is approved, protect the approved mockup until removal is authorized in writing by the Architect. After removal is authorized by the Architect, dismantle, remove, and dispose of the mockup at a disposal location away from the Project site.

C. Field Samples (post-submittal, *in situ* visual mockups): Include field samples as part of the work of this Section.

1. Before starting work, including bulk purchase and delivery of products, prepare a field sample in

an unobtrusive location and manner approved by the Architect to demonstrate the expected final visual effect of the planned joint sealant installation.

2. At a minimum, comply with the following:
   a. Size: At least 4-foot long joint in each differing sealant color selected .
   b. Illumination: Illuminate field samples with at least the same type and level of illumination maintained in the room or space after the building is occupied.
3. The Architect reviews field samples to determine if the work falls within an acceptable range for
   a. visual appearance;
   b. color variation;
   c. integration of the work of different trades;
   d. overall quality;
   e. installation workmanship; and
   f. conformance to the specified requirements.
4. The Architect either rejects or approves field samples as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
   a. If a field sample is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
      1) Repeat field samples until the Architect approves them.
      2) Approval of field samples does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by Owner in writing.
   b. Upon written authorization from the Architect, field samples may remain part of the Work after being properly identified for future reference.

D. Preconstruction Testing:
1. Compatibility and Adhesion Testing: For testing indicated below, submit to joint sealant manufacturers samples of materials that will contact or affect joint sealants.
   a. Submit at least 8 pieces of each material, including joint substrates, shims, joint- sealant backings, secondary seals, and miscellaneous materials.
   b. Allow sufficient time in the construction schedule for testing and analyzing results to prevent delaying the Work.
   c. Testing determines whether priming and other specific joint preparation techniques are required to obtain optimum adhesion of joint sealants to joint substrates.
   d. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
2. Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
   a. Locate test joints where indicated, or if not indicated, then as directed by the Architect.
   b. Conduct field tests for each installation of each type of sealant and joint substrate indicated.
   c. Notify the Architect 7 days in advance of dates and times when test joints will be tested.
   d. Arrange for tests to take place with joint-sealant manufacturer's field representative present.
   e. Test joint sealants in compliance with ASTM C 1521. For joints with dissimilar substrates, verify adhesion to each substrate separately as described in ASTM C 1521; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   f. Report whether the joint sealant connected to the pulled-out portion failed to adhere to the

joint substrates or tore cohesively. If sealants fail adhesively, then retest until satisfactory adhesion is obtained.

g. Evaluation of Preconstruction Field-Adhesion-Test Results: Absent other indications of noncompliance with specified requirements, sealants are

considered satisfactory if they do not evidence adhesive failure during testing. Do not install sealants that fail to adhere to joint substrates during testing.

h. Conduct field adhesion testing only when sealants have achieved adequate cure per manufacturer' recommendations.

6.6 PROJECT CONDITIONS

A. Ambient Conditions:

1. Weather: Do not apply joint sealants in adverse weather conditions, or when ambient temperature relative humidity or other environmental requirements are outside the limits recommended by the joint sealant manufacturer.
   a. Proceed with installation only when there is no threat of impending precipitation, and both current and forecasted weather conditions are favorable to proper installation being performed in conformance with the manufacturer's requirements, recommendations, or instructions for and in a manner that does not void any warranty.
   b. Do not apply joint sealants during snow or rain, on in fog or mist.
   c. Apply only as much joint sealants as can be made weathertight each day.
2. Temperature and Relative Humidity: Ambient temperature must be at least 40 deg. F while performing the Work of this section.

B. Existing Conditions:

1. Surface Conditions:
   a. Surfaces to which joint sealant are applied must be dry. If surface moisture is observed or detected, provide equipment necessary to dry those surfaces to permit application, as determined by joint sealant manufacturer's representative.
   b. Do not apply joint sealants to concrete slabs until the slabs have cured and are sufficiently dry to promote a good bond for the joint sealants, as determined by performing the joint sealant manufacturer's recommended bond tests.
2. Other Existing Conditions: Do not apply joint sealants
   a. in areas where dust is being generated or where liquids are being sprayed;
   b. where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated; and
   c. when contaminants that may interfere with adhesion have not been removed from joint substrates.
3. Typical Joint Widths:
   a. Typical Joints: 1/4-inch.
   b. Concrete Joints Where Movement is Expected: 1/2 to 3/4-inch.
4. Typical Joint Depths:
   a. Joints Less than 1/2-inch Wide: From 1/2 the width to full width of the joint
   b. Joints Greater than 1/2-inch Wide but not Greater than 2 Inches: 1/2 the width of the joint.

7.7 WARRANTY

A. Manufacturer's Warranty: All joint sealants must be covered by a written warranty that protects the Owner for at least 20 years after date of manufacture against defective products, materials,

and accessories.

B. Installer's Warranty: All joint sealants must be covered by a written warranty that protects the Owner for at least 5 years after Substantial Completion against
   1. improper substrate preparation;
   2. patent or latent defects; and
   3. incipient or catastrophic failure.

C. Terms:
   1. Defects include
      a. loss of joint sealant integrity, including intrusion of water into joints;
      b. adhesive or cohesive failure;
      c. discernible color changes beyond the manufacturer's published information relative to a control sample from the original application;
      d. hardening beyond the shore A hardness value listed in the submitted manufacturer's product data; and
      e. cracking or brittleness, other than that caused by substrate movement.
   2. Warranties exclude damage, deterioration, or failure caused by
      a. movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction;
      b. disintegration of joint substrates from natural causes exceeding design specifications;
      c. mechanical damage caused by individuals, tools, or other outside agents; and
      d. changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.
   3. Remedy: If a product fails before the warranty expires, then
      a. the manufacturer shall replace joint sealant materials;
      b. the installer shall repair or replace installed joint sealants;
      c. or

both. PART 2 -

PRODUCTS

2.1 SILICONE EXTERIOR JOINT SEALANTS

A. Ultra-Low Modulus Single-Component Sealant:
   1. Application: As scheduled at the end of this Section .
   2. Description: Neutral-curing silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 100/50, Use NT, A or O sealant, as applicable.
   3. Products: Provide "790" manufactured by Dow Corning Corp. or "GE SCS 2700 SilPruf LM" manufactured by Momentive Performance Materials, Inc.

B. Low Modulus Single-Component Sealant:
   1. Application: As scheduled at the end of this Section .
   2. Description: Neutral-curing silicone sealant conforming to ASTM C 920 requirements for

Type S, Grade NS, Class 50, Use NT, M, G, A or O sealant, as applicable.

3. Products: Provide "795" manufactured by Dow Corning Corp. or "GE SCS 2000 SilPruf LM" manufactured by Momentive Performance Materials, Inc.

2.2 SILICONE SPECIALTY JOINT SEALANTS

A. Low Modulus Single-Component Sealant For Porous Surfaces:

1. Application: As scheduled at the end of this Section .
2. Description: Neutral-curing silicone sealant conforming to ASTM C 920 for Type S, Grade NS, Class 50, Use NT, M, G, A or O sealant, as applicable.
3. Products: Provide "756 SMS" manufactured by Dow Corning Corp., or "SCS 9000NB" manufactured by Momentive Performance Materials, Inc.

B. Single-Component Damp Location Sealant:

1. Application: As scheduled at the end of this Section .
2. Description: White or clear medium or high modulus mildew-resistant silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25, Use NT, A or O sealant, as applicable.
3. Products: Provide "786" manufactured by Dow Corning Corp., or "Sanitary SCS 1700" manufactured by Momentive Performance Materials, Inc.

2.3 ACRYLIC LATEX INTERIOR JOINT SEALANTS

A. General Purpose Interior Sealant:

1. Application: As scheduled at the end of this Section .
2. Description: Siliconized acrylic-latex sealant conforming to ASTM C 834 requirements for Type OP, Grade NF classification, as required.
3. Products: Provide one of the following.
   a. "Sonneborn Sonolac" manufactured by BASF Building Systems.
   b. "AC-20+Silicone" manufactured by Pecora Corp.
   c. "Tremflex 834" manufactured by Tremco, Inc.

2.4 BUTYL SEALANT

A. Application: Applied to weatherseal joints between sheet metal flashings and substrates.

B. Description: Single-component, solvent-release plasticized polyisobutylene (butyl rubber) conforming to ASTM C 1311.

2.5 JOINT SEALANT BACKINGS

A. Closed Cell Foam Joint Backing:

1. Installation: Installed at joints susceptible to the presence of moisture prior to joint sealing, such as horizontal joints. Closed cell foam may not be used as a backing for single-component (air-cure) materials.
2. Description: Extruded polyethylene foam cylindrical sealant backings conforming to ASTM C 1330, Type C.

3. Products: Provide one of the following.
   a. “Mile High Foam” manufactured by Backer Rod Mfg. Inc.
   b. “HBR” or “Green Rod” manufactured by Nomaco, Inc.
   c. “NuFlex 870” manufactured by TVM Building Products.
4. Performance Requirements:
   a. Water Absorption: Between 0.03 and 0.10 grams per cubic centiliter when tested in compliance with ASTM C 1016, Procedure B.
   b. Density: Between 24 and 48 kilograms per cubic meter when tested in compliance with ASTM D 1622.
   c. Outgassing: Less than 1 bubble when tested in compliance with ASTM D 1253.
   d. Compression Recovery: At least 90 percent, when tested in compliance with ASTM D 5249.
   e. Compression Deflection: At least 20.5 percent, when tested in compliance with ASTM D 5249.
   f. Tensile Strength: At least 200 kPa, when tested in compliance with ASTM D 1623.

B. Open Cell Foam Joint Backing: Allowed only for interior use; and as the second (interior) line of a double-line sealant application.

C. Bi-Cellular (Dual-Cell) Foam Joint Backings:
1. Installation: Installed at all other joints. Only bi-cellular (dual-cell) foam may be used as a backing for single-component (air-cure) materials.
2. Description: Extruded polyethylene foam cylindrical sealant backings conforming to ASTM C 1330, Type B.
3. Products: “Sof Rod” or “Dual Rod” manufactured by Nomaco, Inc., approved substitute.
4. Performance Requirements:
   a. Water Absorption: Between 0.03 and 0.10 grams per cubic centiliter when tested in compliance with ASTM C 1016, Procedure B.
   b. Density: Between 24 and 48 kilograms per cubic meter when tested in compliance with ASTM D 1622.
   c. Outgassing: Less than 1 bubble when tested in compliance with ASTM D 1253.
   d. Compression Recovery: At least 90 percent, when tested in compliance with ASTM D 5249.
   e. Compression Deflection: At least 20.5 percent, when tested in compliance with ASTM D 5249.
   f. Tensile Strength: At least 200 kPa, when tested in compliance with ASTM D 1623.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 ACCESSORIES

A. Primer: Non-staining type material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Non-corrosive type chemical cleaners acceptable to

manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

D. Other Accessories: Install or apply other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the joint sealant manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint- sealant performance.
   2. Examine substrates indicated to receive joint sealants, and other conditions under which joint sealants are applied.
   3. Verify that
      a. surfaces identified to receive joint sealant are free from dirt, dust, oil, grease, waxy films, curing compounds, release agents, and other deleterious materials that would adversely affect the quality of application, and material system assembly appearance and performance; and
      b. ambient project conditions are within the specified ranges, and existing construction conforms to allowable tolerances.

B. Evaluation and Assessment:
   1. Reject work that does not conform to the joint sealant manufacturer's installation requirements. The Contractor shall either perform or arrange and pay costs for all remedial work necessary to correct or improve deficient conditions and to conform to the joint sealant manufacturer's installation requirements.
   2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the joint sealant manufacturer's installation requirements.

3.2 PREPARATION

A. Protection of In-Place Conditions:
   1. Work Area Protection: Protect work areas from excessive dust and other airborne contaminants during surface preparation installation and while joint sealants are curing, setting, or drying.
   2. Adjacent Material Protection: Use masking tape where required to prevent sealant contact with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Without disturbing the joint seal, remove tape promptly after tooling.

B. Surface Preparation: Thoroughly clean joints immediately before installing joint sealants. Comply with joint sealant manufacturer-prepared instructions and the following:
   1. Prepare joint surfaces per ASTM C 1193 and as recommended by joint sealer manufacturer.
   2. Repair, clean, and prepare surfaces in conformance with the joint sealant manufacturer's installation instructions and the requirements of this Section.
   3. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealantmanufacturer), old joint sealants, oil, grease,

waterproofing, water repellents, water, surface dirt, and frost.

4. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete, masonry, stone, and plaster.
5. Remove laitance and form-release agents from concrete and plaster.
6. Surfaces must be clean, smooth, dry, and free of flaws, sharp edges, loose or foreign material, holes, voids, gaps, cracks, or other imperfections and irregularities that would adversely affect the quality of installation; and joint sealant durability, appearance, and performance.

C. Joint Priming: Prime and seal joint substrates, where recommended by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience.

1. Apply primer to comply with joint-sealant manufacturer's written instructions.
2. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

D. Use masking tape to prevent contact of sealant with adjoining surfaces. remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. General:

1. Comply with ASTM C 1193 and with the joint sealant manufacturer’s installation instructions, except where more stringent requirements are shown or specified.
2. Use materials and methods required, recommended, approved, or accepted by the joint sealant manufacturer, along with manufacturer-recommended accessories and techniques that do not lead to or result in specified warranties becoming void.

B. Special Techniques:

1. Install sealant backings of type indicated to support 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.
   a. Do not leave gaps between ends of sealant backings.
   b. Do not stretch, twist, puncture, or tear sealant backings.
   c. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
2. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
3. Size materials to achieve required width/depth ratio.
4. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   a. Place sealants so they directly contact and fully wet joint substrates.
   b. Completely fill recesses in each joint configuration.
   c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
   d. Employ installation techniques that will ensure joint sealers are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting"

of bond surfaces equally on opposite sides.

e. Joint configuration: Fill sealant joint to a slightly concave surface, slightly below adjoining surfaces, unless otherwise indicated.

f. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture or dirt.

g. Joint sealant geometry: Install in accordance with AST C 1193 and as recommended by joint sealer manufacturer.

5. Promptly after sealant application, and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

a. Remove excess sealant from surfaces adjacent to joints.

b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

c. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

d. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.

e. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.

C. Cure joint sealants according to the manufacturer's installation instructions, taking care to prevent contamination and damage during installation stages and curing.

D. Maintain finished joint free of embedded matter, ridges and sags.

3.4 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.

a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.

b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include

1) descriptions and locations of defective work;

2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and

3) similar documentation and visual depictions of Contractor-proposed corrections.

c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.

d. Corrected work must also be inspected by the Owner's testing agency and re- tested, as applicable.

e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon

1) corrections being performed skillfully,

2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;

3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and

4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:

1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
   c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

C. Conformance: Completed work must match the approved filed samples, as determined by the Architect.

3.5 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. The Owner requires testing and inspection of applied joint sealant to evaluate the joint sealant's in-service performance and conformance to the specified requirements.
2. Tests and inspections are performed by a qualified independent testing and inspection agency acceptable to the Architect and the AHJ, and must be witnessed by the testing agency's personnel, the Installer, the joint sealant joint sealant manufacturer's field representative, the Contractor, and the Architect.
3. The testing and inspection agency
   a. cannot be directly employed by the Contractor or by another entity or individual other than the Owner;
   b. sends to the Owner all test reports within 14 days after the completion of any test; and
   c. also sends copies of all test reports to the AHJ, the Architect, and the Contractor within the same 14-day period.
4. The Contractor shall
   a. assist the Owner with selecting a testing and inspection agency, when requested;
   b. arrange all tests and inspections;
   c. coordinate its work and the construction schedule with the specified tests;
   d. coordinate the requirements of each required or specified test and inspection with other specified or required tests and inspections;
   e. provide all work, facilities, personnel, and controls necessary for each test and inspection;
   f. notify the testing agency personnel, the Installer, the joint sealant joint sealant manufacturer's field representative, and the Architect that the work is ready for

inspection; and

g. receive all test reports and distribute copies to the Installer and the joint sealant joint sealant manufacturer's field representative.

B. Field-Adhesion Testing: Testing and inspection agency retained by the Owner will perform non-destructive and destructive field adhesion tests on sealant in conformance with ASTM C 1521.

1. Non-Destructive Testing:
   a. The center of sealant beads are depressed with a probing tool to depth of 50 percent of the bead width.
   b. If sealant fails, then the failure is recorded along with whether the failure was an adhesive or cohesive failure, and the maximum surface depression as a percentage of joint width.
   c. Tests are performed every 12 inches for first 10 linear feet of each joint; if test failure is not observed, then tests are performed every 24 inches thereafter.
2. Destructive Testing:
   a. A 6-inch-long tail of sealant is cut loose from substrate.
   b. The tail is marked one inch from the beginning of the adhesive bond away from the cut tail.
   c. The tail is grasped one inch from the beginning of the adhesive bond and pulled until it extends to 2 times the published movement capability of the sealant. If sealant does not fail, it is then pulled to failure.
   d. Elongation at the point of failure is recorded along with whether the failure was an adhesive or cohesive failure.
   e. Sealant is then observed during the complete filling of the joint for the presence of voids, for joint configuration, and for conformance with specified requirements. Observations and sealant dimensions are recorded.
   f. 10 tests are performed for the first 1,000 linear feet of joint for each type of sealant and substrate; if failure at two times the movement capability is not observed, then one test is performed for either every 1,000 linear feet thereafter or at a rate of one test per floor per building elevation, whichever is more frequent.
3. Test reports must include the date each sealant was installed; the name of person who installed the sealant; and the test date, test location, and whether primer was applied.
4. After testing is complete, promptly replace failed sealants in test areas.
   a. Neatly cut out and remove failed sealant, prepare and prime surfaces, and install new sealant.
   b. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
5. Sealant evidencing no adhesive failure from testing or other noncompliance with specified requirements is considered conforming to the specified performance requirements.

C. Nonconforming Work: When testing reveals items that joint sealants are deficient, defective, faulty, do not perform properly, or do not conform to the specified requirements, make corrections acceptable to the Architect and the joint sealant manufacturer's field representative, and then arrange and pay costs for re-testing until it can be demonstrated that all items perform properly and conform to the specified requirements, as determined by the Architect.

1. Neatly cut out and remove non-conforming sealant, prepare and prime surfaces, and install new sealant.
2. Perform field adhesion tests on new sealant.

D. Conformance: Completed work must match the approved field sample, as determined by the Architect.

3.6 CLEANING

A. Cleaning Installed Work:
   1. Remove protective materials after installation.
   2. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
   3. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas around the project site free from debris, materials, equipment, and related items.

3.7 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to, on, or against installed sealants unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use surfaces containing sealants as work surfaces.

D. Remove protection when it's no longer needed and before Substantial Completion.

3.8 EXTERIOR JOINT SEALANT SCHEDULE

A. Exposed Exterior Sealant in Contact with PVC Roof Membrane or Coating: Urethane-based sealant.

B. Sealant in Contact with Modified Bituminous Sheet Air Barriers: Silicone-based sealant.

C. Exposed-in-Service Perimeter Joints:
   1. Between Cement Plaster and Adjacent Non-Porous Materials: Low modulus single-component silicone sealant.
   2. Between Frames and Adjacent Facade Materials: Low modulus single-component silicone sealant.

D. Exposed-in-Service Expansion and Connection Joints:
   1. Aluminum Composite Metal Panels (ACM): Low modulus single-component silicone sealant for porous surfaces.
   2. Exterior Cement Plaster: Ultra-low modulus single-component silicone sealant.
   3. Coping Joints and Coping-to-Facade Joints: Low modulus single-component silicone sealant.

E. Exposed-in-Service Horizontal Concrete Surface Joints: High modulus single-component urethane traffic sealant.

F. Concealed-in-Service Internal Metal-To-Metal Seals: Low modulus silicone sealant.

G. All Other Exterior Joints: Ultra-low modulus silicone single-component sealant.

3.9 INTERIOR JOINT SEALANT SCHEDULE

A. Exposed-in-Service Perimeter Joints:

1. Interior Perimeters of Exterior Openings: Low modulus single-component silicone sealant.
2. Perimeters of Interior Frames: Low modulus single-component silicone sealant.

B. Exposed-in-Service Expansion and Connection Joints:

1. Unit Masonry Walls: Low modulus single-component silicone sealant for porous surfaces.
2. Cast-in-Place Concrete Walls: Low modulus single-component silicone sealant for porous surfaces.

C. Exposed-in-Service Vertical Masonry Control Joints: Low modulus single-component silicone sealant.

D. Joints Located in Toilet Rooms; Bathrooms; and Similar Damp, Wet, and Semi-Wet Locations (other than floor joints): High modulus single-component damp location sealant.

E. Exposed-in-Service Control Joints in Gypsum Board: General purpose interior sealant.

F. Exposed and Non-exposed Acoustical Applications in Gypsum Board: Acoustical sealant specified in Section 09 81 33.

END OF SECTION

SECTION 08 12 13 – STANDARD HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formed metal frames for doors, sidelights, transoms, borrowed lights, and other openings.
2. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
1. Section 05 05 12 for damaged galvanizing repair, including cold galvanizing repair compound and galvanizing repair paint.
2. Section 05 05 13 for shop-applied primer and damaged primer repair, including spot primer.
3. Section 05 05 23 for metal fastenings.
4. Section 05 50 00 for grout and bituminous paint.
5. Section 08 13 13 for standard hollow metal doors
6. Section 08 81 00 for glass and fire-rated glazing.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. AHJ: Authority (Authorities) Having Jurisdiction.
2. HDG: Hot Dip Galvanized.
3. MSG: Manufacturer’s Standard Gage for Sheet Metal.
4. SCAQMD: South Coast Air Quality Management District.
5. SDI: Steel Door Institute.

B. Definitions:
1. Frames: Means formed hollow metal frames.
2. Manufacturer: Means the hollow metal frame manufacturer, unless otherwise indicated.
3. Manufacturer’s Standard Gage for Sheet Steel: Means the thickness of steel sheet based on a weight of 41.82 pounds per square foot per inch of thickness.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the chemical and adhesive compatibility of the metal frame manufacturer's standard baked on rust inhibitive primer with field-applied paint specified in Section 09 91 00.

B. Sequencing: Before related construction starts, furnish related trades with setting diagrams, templates, and manufacturer-published instructions for installing anchorages for hollow metal frames.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details and other information necessary to demonstrate compliance with specified requirements. Include door construction and material descriptions, fire-protection ratings, temperature-rise ratings and finish information.
   2. Shop Drawings:
      a. Submit dimensioned drawings including frame elevations showing materials construction, finishes, and anchoring details for each frame type.
         1) Label and identify individual components by manufacturer's product name, and indicate material gages, required clearances, and methods of field installation.
         2) Identify locations and sizes of reinforcement and preparations for hardware.
         3) Distinguish between factory- and field-assembled work.
      b. Submit Project-specific, minimum 1-1/2-inch scale dimensioned details showing attachments and connections to adjacent construction for each different opening condition. Use the same reference numbers for details as shown on the Contract Drawings.

B. Informational Submittals:
   1. Test Reports: Submit testing results or affidavit from the manufacturer evidencing that
      a. furnished products comply with specified reference standards;
      b. furnished products meet or exceed specified performance and testing requirements;
      c. testing results or affidavits are based on comprehensive testing of current manufactured units, components, and accessories; and
      d. testing is performed by a qualified testing agency acceptable to AHJ and is in compliance with specified test procedures.
   2. Installation Instructions:
      a. Before starting work, submit manufacturer-published instructions for the proper installation of each frame type.
      b. If the manufacturer's instructions are either unavailable or do not reflect Project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions and promptly distribute copies to the Architect before proceeding with the work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain frames used for the Project through one source from the same manufacturer.

B. Regulatory Requirements:
   1. Fire-Rated Assemblies: Provide frame assemblies conforming to NFPA 80 that are listed and labeled by a quality testing agency acceptable to the AHJ, for fire- protection ratings and temperature-rise limits indicated, based on testing at positive pressure in conformance with NFPA 252 or UL 10C.
      a. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to the AHJ, based on testing in conformance with UL 1784 and installed in compliance with NFPA 105.
   2. Fire-Rated, Borrowed-Light Assemblies: Provide borrowed-light frame assemblies conforming to NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to the AHJ for fire-protection ratings indicated, based on testing in conformance with NFPA 257 or UL 9.

C. Quality Standard Requirements: Comply with the requirements of ANSI/SDI publication A250.8, “Recommended Specifications for Standard Steel Doors and Frames” unless more stringent requirements are indicated.

D. Manufacturer’s Qualifications: Obtain frames only from a manufacturer that is a current member of SDI.

1.6 HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Across the bottom of welded frames, provide a minimum of at least 2 removable spreader bars tack welded to jambs and mullions.
   2. Palletize, wrap, or crate frames to provide protection during transit and site storage. Un-vented plastic tarpaulins are not permitted.

B. Delivery and Acceptance Requirements:
   1. Delivery: Transport frames in a manner consistent with their shape and design, and in a position to prevent damage or excessive stresses that could cause damage.
      a. Provide adequate dunnage and bracing during transport.
      b. Support units on non-staining, shock-absorbing material.
   2. Acceptance at the Site:
      a. Inspect frames and accessories delivered to the site for damage.
      b. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:
   1. Storage:
      a. Store frames indoors and off the floor on pallets, within dry, well-ventilated, broom-cleaned and partially-controlled or permanently-enclosed storage areas,

where "wet work" such as concrete and plastering within the storage area has been completed and cured to a condition of equilibrium.

b. Store in a manner to prevent bending, warping, twisting or other physical damage.
   1) Place off the floor in a vertical position up with heads up, on minimum 4-inch high wood blocking or pallets, and in maximum stacks of not more than 5 units.
   2) Provide minimum 1/2-inch spacers between each stored unit in order to permit air circulation around all surfaces.
   3) Prevent contact with wet or damp surfaces, and otherwise prevent staining, cracking, distortion, warping or other physical damage.
   4) Protect with breathing-type covers. Un-vented plastic is not permitted.

2. Handling: Handle frames in compliance with the manufacturer's and SDI's recommendations, and in a manner that will prevent bending, warping, twisting or other damage.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, corroded, or otherwise damaged.
   1. Remove and dispose of damaged items at a disposal location away from the Project site.
   2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

1.7 PROJECT CONDITIONS

A. Measurements: Field-verify measurements before fabrication and indicate field measurements on Shop Drawings.
   1. Where field measurements cannot be made without delaying the Work, establish working dimensions that accommodate installation and fabrication tolerances, as well as related tolerances specified for the Work of other sections, and proceed with fabrication without field measurements.
   2. Coordinate construction of adjacent work to ensure actual dimensions correspond to and respect previously established working dimensions.
   3. Provide enough additional material during fabrication to allow for proper trimming and fitting at the Project site.

PART 2 - PRODUCTS

2.1 HOLLOW METAL FRAMES

A. Product: Design is based on "F-16 Series Flush Frames" by Steelcraft; an Ingersoll-Rand company. Other acceptable manufacturers include the following.

1. Ceco Door Products.
2. Curries Company.
3. Or equal.

B. Items must conform to the following:

1. Exterior Frames: Fabricate from at least 0.0598-inch (MSG 16) base-metal thickness metallic-coated steel sheet.
2. Interior Frames:
   a. Door Frames at Wet Locations, such as Shower Rooms and Toilet Rooms: Fabricate from at least 0.0598-inch (MSG 16) base-metal thickness metallic- coated (galvannealed) steel sheet.
   b. Door Frames Located Elsewhere: Fabricate from minimum 0.0598-inch (MSG 16) uncoated steel sheet, unless otherwise noted. Provide minimum 0.0747-inch (MSG 14) uncoated steel sheet at maximum duty door frames as indicated in floor plans (such as Ground Level corridors).
   c. Sidelight and Transom Frames: Fabricate from same material and thickness as adjacent door frame.
3. Profile: Provide double rabbet frames.
   a. Jamb Depth: As indicated by wall or partition type.
   b. Face Dimension:
      1) Frames at CMU Construction Where Required to Maintain Masonry Module: Provide 4-inch face dimension at heads; provide 2-inch face dimension at jambs.
      2) Frames Located Elsewhere: 2-inch face dimension.
   c. Rabbit Dimension: 1-15/16 inches for 1-3/4 inch doors.
   d. Stop Dimension: 3/4-inch.
   e. Frame Return: 1/2-inch.
4. Corners: Square-cut set-up arc welded (SUA) and ground smooth corner connections.
5. Hardware Preparations: Provide mortised and weld-in reinforced universal hinge preps with mortal guards and strike preps with mortar guards complying with ANSI A115.1 and ANSI A115.2 fabricated from minimum 0.0747-inch (MSG 14) base- metal thickness metallic-coated steel sheet.

2.2 ACCESSORIES

A. Head Reinforcement: Provide minimum 0.0747-inch (MSG 14) thick steel channel or angle stiffeners for opening widths greater than 48 inches wide.

B. Anchors:

1. Masonry Anchors: Either minimum 3/16-inch diameter galvanized carbon steel masonry wire anchors or minimum 0.0478-inch (MSG 18) base-metal thickness metallic-coated steel sheet masonry tee anchors.
2. Stud Anchors: Minimum 0.0478-inch (MSG 18) base-metal thickness metallic-coated steel sheet stud anchors.

3. Base Anchors: Minimum 0.0478-inch (MSG 18) base-metal thickness metallic-coated steel sheet stud anchors.

C. Silencers: Provide loose, 1/8-inch thick by 1/2-inch wide, pressure-sensitive-adhesive- backed polychloroprene (Neoprene) or ethylene propylene diene monomer (EPDM) rubber silencers for field installation. Furnish a minimum of 3 per strike jamb and 2 per double door head.

D. Filler: Material conforming to the requirements of ANSI/SDI publication A250.8, "Recommended Specifications for Standard Steel Doors and Frames". Use UL listed materials in frames scheduled to have a fire-resistance rating.

E. Other Accessories: Provide other accessories and similar secondary items as provided, required, recommended, approved, or accepted by the manufacturer.

2.3 FINISH

A. Uncoated Steel Frames: Provide manufacturer's standard shop-applied phosphate pre- treatment and baked on rust inhibitive primer. Primer must be compatible with field- applied paint specified in Section 09 91 00.

B. HDG Steel Frames: Provide manufacturer's shop-applied bonderized pre-treatment and standard baked on rust inhibitive primer. Primer must be compatible with field-applied paint specified in Section 09 91 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

1. Examine substrates supporting frame assemblies, and other conditions under which such items are installed.
2. Verify that work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance;

B. Evaluation and Assessment:

1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.
2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 PREPARATION

A. Prior to installation, adjust and securely brace welded frames for squareness, alignment, twist, and plumbness to the following tolerances:
   1. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16-inch, measured at jambs on a perpendicular line from head to floor.

B. Drill and tap frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General:
   1. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   2. Set items plumb, level, and square, without panel warp or rack, with flush well-fitted joints, and in alignment with adjacent construction.

B. Special Techniques:
   1. Install frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions. Install frames of size and profile indicated.
      a. Install fire-resistance rated frames in compliance with NFPA 80 and the requirements of the AHJ.
      b. Install other frames in compliance with of ANSI/SDI A250.11 and ANSI/DHI A115-IG.
   2. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. Install frames with removable glazing stops located on secure side of opening.
      b. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      c. Install door silencers in frames before grouting.
      d. Wherever possible, leave welded-in shipping spreaders installed at factory intact until frames are set square and plumb within specified tolerances, and all anchors are securely attached and grouted where required.
         1) Remove frame spreader bars only after frames have been properly set and secured.
         2) Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. Ceiling Struts: Except where anchored to masonry or to other structural support at each jamb, extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame.
   a. Bend top of struts to provide flush contact for securing to supporting construction.
   b. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Glazing: Comply with installation requirements in Section 08 81 00 and with frame manufacturer's written instructions.
   a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches O.C. and not more than 2 inches O.C. from each corner.

C. Installation Tolerances: Adjust frames for squareness, alignment, twist, and plumb to the following tolerances:
1. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16-inch, measured at jambs at floor.

D. Attachment: Securely attach frames and accessories in place to supporting construction.

3.4 CORRECTION AND REPAIR

A. Correction:
1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and

3) similar documentation and visual depictions of Contractor-proposed corrections.

c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.

d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon

1) corrections being performed skillfully,

2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;

3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and

4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and reinstalling or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer’s field representative and the Architect.

B. Repair:

1. Repair or refinish items that

a. are damaged, loose, chipped, broken, stained, or corroded;

b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or

c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.

2. Repair damaged galvanized coatings as specified in Section 05 05 12.

3. Repair damaged primer as specified in Section 05 05 13.

4. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.5 CLEANING

A. Cleaning Installed Work:

1. Remove protective materials after installation.

2. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering

3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.

a. Protect other work from staining or damage caused by cleaning operations.

b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.

4. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.

5. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to or against installed frames unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use frame surfaces as work surfaces.

D. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 08 13 13 – STANDARD HOLLOW METAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hinged or pivoting doors manufactured of metal and installed within frames.
   2. Supplementary accessories and detail work necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 08 71 00 for door hardware.
   2. Section 08 81 00 for glazing.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AHJ: Authorities Having Jurisdiction.
   2. HDG: Hot Dip Galvanized.
   3. HM: Hollow Metal.
   4. SDI: Steel Door Institute.

B. Definitions:
   1. Manufacturer: Means the door manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the chemical and adhesive compatibility of the metal frame manufacturer's standard baked on rust inhibitive primer with field-applied paint specified in Section 09 91 00.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details and other data necessary to demonstrate compliance with specified requirements. Include door construction and material descriptions, fire-protection ratings, temperature-rise ratings and finish information.

2. Shop Drawings:
   a. Submit schedule indicating opening identification symbol, type of door, material, fire protection rating requirements, hardware group, undercuts and finish. Use the same reference numbers for openings as shown on Contract Drawings.
   b. Submit dimensioned drawings, including door and frame elevations showing, materials construction, finishes, anchoring details, and vision panel sizes and locations for each door type.
      1) Label and identify individual components by manufacturer's product name, and indicate material gages, required clearances and methods of field installation.
      2) Identify locations and sizes of reinforcement and preparations for hardware.
      3) Distinguish between factory- and field-assembled Work.
   c. Submit project-specific, minimum 1-1/2-inch scale dimensioned details showing attachments and connections to adjacent construction for each different opening condition. Use the same reference numbers for details as shown on Contract Drawings.
3. Samples:
   a. Submit 12-inch square fabrication sample of specified materials and construction. Show vertical-edge, top and bottom construction, core construction, and hinge and other hardware reinforcement. Include separate section showing glazing.
   b. Submit 8-inch square face sheet material samples in specified color and finish.

B. Informational Submittals:
1. Test Reports: Submit testing results or affidavit from the manufacturer evidencing furnished products comply with specified reference standards and meet or exceed specified performance and testing requirements, based on comprehensive testing of current manufactured units, components and accessories performed by a qualified testing agency in compliance with specified test procedures.
2. Installation Instructions:
   a. Submit manufacturer-published instructions concerning proper installation.
   b. If manufacturer's instructions are either unavailable or do not apply to Project- specific conditions, then consult with manufacturer's technical representative and obtain manufacturer-prepared installation requirements, recommendations or instructions in writing, and promptly distribute copies to the Architect before proceeding with work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain doors used for the Project through one source from the same manufacturer.

B. Regulatory Requirements:
1. Fire-Protection Rating: Within fire-resistance rated assemblies, provide fire- protection-rated doors complying with NFPA 80 that are tested in compliance with NFPA 252 and UL 10B or UL 10C for doors at atmospheric (neutral) pressure,

performed by a qualified testing and inspecting agency, or qualified national testing organization, acceptable to authorities having jurisdiction.

2. Temperature Rise Rating: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg. F. above ambient after 30 minutes of standard fire-test exposure.
3. Smoke-Control Door Assemblies: Provide opening protectives complying with the requirements of with NFPA 80 that are tested in compliance with NFPA 105 or UL 1784.

C. Quality Standard Requirements:
1. ASNI/SDI publication "ANSI/SDI A250.8" requirements for standard HM fabrication, unless more stringent requirements are indicated.
2. Door Construction: Comply with ANSI/SDI A250.8, with smooth surfaces and no visible joints or seams on exposed faces unless otherwise indicated.
3. Hardware Preparations and Reinforcement: Comply with ANSI/SDI A250.6, with reinforcing plates fabricated from the same material as door face sheets.

D. Manufacturer's Qualifications: Members of SDI.

1.6 HANDLING

A. Packing, Shipping, Handling and Unloading: Palletize, wrap, or crate doors to provide protection during transit and site storage. Un-vented plastic tarpaulins are not permitted.

B. Delivery and Acceptance Requirements:
1. Delivery: Transport doors in a manner consistent with their shape and design, and in a position to prevent damage or excessive stresses that could cause damage.
   a. Provide adequate dunnage and bracing during transport.
   b. Support units on non-staining, shock-absorbing material.
2. Acceptance at the Site:
   a. Inspect doors and accessories delivered to the site for damage.
   b. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:
1. Storage:
   a. Store doors indoors and off the floor on pallets, within dry, well-ventilated, broom-cleaned and partially-controlled or permanently-enclosed storage areas, where "wet work" such as concrete and plastering within the storage area has been completed and cured to a condition of equilibrium.
   b. Store in a manner to prevent bending, warping, twisting or other physical damage.
      1) Place off the floor in a vertical position up with heads up, on minimum 4-inch high wood blocking or pallets, and in maximum stacks of not more than 5 units.

2) Provide minimum 1/2-inch spacers between each stored unit in order to permit air circulation around all surfaces.
3) Prevent contact with wet or damp surfaces, and otherwise prevent staining, cracking, distortion, warping or other physical damage.
4) Protect with breathing-type covers. Un-vented plastic is not permitted.

c. At no cost to the Owner, remove from the Project site and replace corroded, deteriorated, stained, or damaged units, as determined by the Architect.

2. Handling: Handle doors in compliance with the manufacturer's and SDI's recommendations, and in a manner that will prevent bending, warping, twisting or other physical damage.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

PART 2 - PRODUCTS

2.1 STEEL DOORS

A. Description: Heavy- and Extra-heavy duty commercial and institutional seamless door constructions.

B. Manufacturer: Design is based on welded steel stiffened doors manufactured by Steelcraft Co. Other acceptable sources of comparable products include the following.

1. Ceco Door Products.
2. Curries Co.
3. Or equal.

C. Products: Provide "B-Series" welded steel stiffened standard HM doors manufactured by Steelcraft Co., or equal, unless otherwise indicated or specified.

1. Interior Doors: "B-16" doors.
2. Exterior Doors: "B-14" doors.
3. Temperature Rise Rated Doors: "T-14" laminated doors by Steelcraft.

D. Items must conform to the Following:

1. Construction: SDI 108 Level II or Level III as indicated, Model 2.
2. Type: SDI 106, Type F (seamless).
3. Thickness: 1-3/4 inches.
4. Face Sheets:

a. Exterior Doors: Fabricate from minimum 0.0598-inch (16-gage USS) base-metal thickness metallic-coated steel sheet.
b. Interior Doors:
1) Doors at Wet Locations, such as Shower Rooms and Toilet Rooms: Fabricate from minimum 0.0478-inch (16-gage USS) base-metal thickness metallic- coated steel sheet.
2) Doors Located Elsewhere: Fabricate from minimum 0.0478-inch (16-gage USS) uncoated steel sheet.

5. Core Construction:
a. Fire-Resistance Rated Doors: Manufacturer’s standard core required to provide specified fire-resistance and temperature-rise ratings indicated.
b. Exterior Insulated Doors: Maximum thermal transmittance (U-factor) value of not more than 0.50 BTU per hour per square foot per deg. F, when tested in compliance with ASTM C 1363.
c. Other doors: Provide manufacturer's standard Provide manufacturer's standard phenol-formaldehyde (Phenolic) resin impregnated kraft-paper honeycomb core.
6. Core Material: Urea formaldehyde-free and minimum 20% recycled content.
7. Vertical Edges: Manufacturer's standard edge with mechanical edge seam welded and finished prior to priming.
8. Top and Bottom Edges: Close edges with flush or inverted minimum 0.0747-inch (14-gage USS) end closures or channels fabricated from same material as face sheets. Provide snap-on caps at exterior doors.

E. Accessories:
1. Filler: Material conforming to the requirements of SDI document SDI 100. Use UL listed materials in doors scheduled to have a fire-resistance rating.
2. Other Accessories: Provide other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the HM door manufacturer.

2.2 FINISHES

A. Uncoated Steel Doors: Provide manufacturer’s standard shop-applied phosphate pre- treatment and baked on rust inhibitive primer. Primer must be compatible with field- applied paint specified in Section 09 91 00.

B. HDG Steel Doors: Provide manufacturer’s shop-applied bonderized pre-treatment and standard baked on rust inhibitive primer. Primer must be compatible with field-applied paint specified in Section 09 91 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

1. Examine substrates supporting door assemblies, and other conditions under which such items are installed.
2. Verify that work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance.

B. Evaluation and Assessment:
1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.
2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 PREPARATION

A. Drill and tap doors to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General:
1. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items plumb, level, and square, without panel warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Install doors properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
4. Fit doors accurately in frames, within clearances specified below. Shim as necessary.

B. Special Techniques:
1. Non-Fire-Rated Standard Steel Doors:
   a. Jambs and Head: 1/8-inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8-inch plus or minus 1/16-inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8-inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4- inch.
2. Fire-Rated Doors: Install doors with clearances in conformance with NFPA 80.
3. Smoke-Control Doors: Install doors in conformance with NFPA 105.
4. Glazing: Comply with installation requirements in Section 08 8100 and with the door manufacturer's written instructions.

C. Attachment: Securely attach doors and accessories in place to supporting construction.

3.4 CORRECTION AND REPAIR

A. Correction:
   1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
      a. Correction of defective work is only permitted when both performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
      b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
         1) descriptions and locations of defective work;
         2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
         3) similar documentation and visual depictions of Contractor-proposed corrections.
      c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
      d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
         1) corrections being performed skillfully,
         2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
         3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
         4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
   2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
   1. Repair or refinish items that
      a. are damaged, loose, chipped, broken, stained, or corroded;
      b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
      c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
   2. Repair damaged galvanized coatings in conformance with ASTM A 780, Annex A2 using galvanizing repair paint specified in Section 05 05 12.

3. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.5 ADJUSTING

A. Lubricate and adjust operating parts and hardware as necessary to function properly and provide a smooth, quiet operation, free from warp, twist, or distortion.

B. Test and adjust doors and hardware.
   1. Verify safe, easy, and reliable operation.
   2. Confirm that latches and locks engage accurately and securely without forcing or binding.

C. Rehang or replace doors that do not swing or operate freely.

D. Remove and replace damaged, defective, malfunctioning, or unsafe materials, units, components, accessories, and parts.

3.6 CLEANING

A. Cleaning Installed Work:
   1. Remove protective materials after installation.
   2. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering
   3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
      a. Protect other work from staining or damage caused by cleaning operations.
      b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
   4. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
   5. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.7 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to or against installed doors unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use door surfaces as work surfaces.

D. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 14 16 – FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Doors and fixed panels manufactured of wood and installed within frames.
   2. Supplementary accessories and detail work necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 08 71 00 for door hardware.
   2. Section 08 81 00 for glazing.

1.2 REFERENCES

A. Abbreviations:
   1. DHI: Door Hardware Institute.
   2. NFPA: National Fire Protection Association.
   3. UBC: Uniform Building Code.
   4. UL: Underwriter's Laboratories.
   5. WDMA: Wood Door Manufacturers Association.

B. Definitions:
   1. Manufacturer: Means the door manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Before related construction starts, furnish related trades with setting diagrams, templates and manufacturer-prepared instructions for installing anchorages for HM doors.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Submit a list of proposed products, materials and components to be provided for shop-applied finish, along with manufacturer's product data, specifications, and other data as necessary to demonstrate compliance with the specified requirements for each item listed.

b. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
c. Submit sample copies of warranty to be furnished under this Section with terms, conditions, and time periods for the warranty clearly defined.

2. Shop Drawings:
   a. Submit door schedule indicating opening identification symbol, door and frame types and sizes including thickness, swing, label requirements and undercuts.
   b. Use same reference numbers for openings and details as Contract Drawings.
   c. Furnish door elevations and details showing standard door construction and fabrication methods. Indicate materials, construction, finish, and accessories.
   d. Indicate location and size of blocking for finish hardware.
3. Samples: Submit 8-1/2-inch by 11-inch samples of each facing type, color and finish. Label each sample for Project location and indicate exposed, semi-exposed or concealed surface.

B. Informational Submittals:
1. Manufacturer's Instructions:
   a. Submit manufacturer-prepared instructions concerning the proper installation of wood doors.
   b. If manufacturer-prepared instructions are either unavailable or do not apply to project-specific conditions, then consult with manufacturer's technical representative and obtain manufacturer-prepared installation requirements, recommendations or instructions in writing, and promptly distribute copies manufacturer-prepared requirements, recommendations or instructions to Architect before proceeding with work.

1.5 QUALITY ASSURANCE

A. Source Limitations: The same manufacturer shall make all wood doors for the Project.

B. Regulatory Requirements: Provide fire-resistive doors, listed and labeled by a testing and inspecting agency acceptable to AHJ based on testing according to NFPA 252 or UL 10Cwith the fire-resistive rating required for the construction into which they are installed.
1. Test Pressure: Positive pressure.
2. Label: Approved label or listing mark, indicating the fire-protection rating, shall be permanently affixed at the factory where fabrication and assembly is done. Include UL "S" and "Positive Pressure Test" listing.

C. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

D. Forest Certification: Provide doors made with all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

E. Quality Standard: WDMA I.S.1-A.

F. Fire-Rated Wood Doors: Labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing per NFPA 252 at neutral pressure.

1.6 HANDLING

A. Delivery:
1. Deliver doors unitized, palletized and factory-wrapped in polyethylene bags. Shrink- wrap each pallet and provide corner guards for protection.
2. Mark each door with architectural opening number in distribution and installation.
3. Do not deliver doors to the Project site until proper storage space is available.

B. Storage:
1. Store doors in an assigned space having controlled temperature and humidity as recommended by WDMA.
2. Store doors flat on factory pallets or three full 2-by-4s, one centered and the other two 12 inches from each end.
3. Protect doors from construction activity with plywood and store away from direct sunlight.

C. Handling:
1. Handle doors with clean hands, except that doors to receive a transparent finish shall be handled with clean white gloves.
2. Do not drag doors across one another.
3. Maintain factory packaging or other means of protection of doors until Substantial Completion.

1.7 PROJECT CONDITIONS

A. Environmental Requirements: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period.

1.8 WARRANTY

A. Manufacturer’s Warranty: Provide manufacturer’s standard warranty against doors delaminating, telegraphing core through face veneer and against non-conformance with tolerance limitations of referenced quality standards.

B. Remedy: Include reinstallation that may be required due to repair or replacement of defective doors, during the warranty period, when defect was not apparent prior to hanging.

PART 2 - PRODUCTS

2.1 FLUSH WOOD DOORS

A. Description: Interior solid core Architectural flush wood doors.

B. Products: Provide products from one of the following.
   1. Algoma Hardwoods, Inc.
   2. Eggers Industries.
   3. Oshkosh Architectural Door Co.
   4. Or equal.

C. Items must conform to the following:
   1. WDMA I.S.1-A Performance Grade: Heavy Duty unless otherwise indicated.
   2. Thickness: 1-3/4 inches.
   3. Construction: 5-ply.
   4. Face Sheets: AS SELECTED BY THE ARCHITECT.
   5. Edge Construction: Particleboard, structural composite lumber (SCL), or hardwood lumber stiles and rails securely bonded to core components and machine calibrated before veneering, with edge banding veneer matching face veneer species and grade.
   6. Meeting Edge: Beveled.
   7. Core Construction: Particleboard (PC) core.
   8. Hardware Blocking Options: As required by hardware manufacturer.
   9. Lite Frames: Factory-painted steel frames approved for use in doors of fire- protection rating indicated. Hardware used to install steel frames must match frame finish.

2.2 FABRICATION

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. Factory fit doors to suit frame-opening sizes indicated.
   1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   2. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3.

D. Transom Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
   1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
   2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

E. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be factory finished.
   3. Louvers: Factory install louvers in prepared openings. PART 3

- EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine substrates supporting door assemblies, and other conditions under which such items are installed.
   2. Verify that work performed as part of the work of other Sections conforms to the manufacturer’s installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance;

B. Evaluation and Assessment:
   1. Reject work that does not conform to the manufacturer’s installation requirements.
      The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct or improve deficient conditions and to conform to the manufacturer’s installation requirements.
   2. Proceeding with installation stipulates the Installer’s acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the manufacturer’s installation requirements.

3.2 PREPARATION

A. Condition doors to average prevailing humidity in installation area prior to hanging.

B. Drill and tap doors to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General:
   1. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   2. Set items plumb, level, and square, without panel warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
   3. Install doors properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

4. Fit doors accurately in frames, within clearances specified below. Shim as necessary.

B. Special Techniques:
1. Factory-Fitted Doors:
   a. Align in frames for uniform clearance at each edge.
   b. Hang doors to operate freely for their entire travel, but not loosely, without sticking or hinge binding, with hardware adjusted and functioning properly.
2. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
3. Glazing: Comply with installation requirements in Section 08 8100 and with the door manufacturer's written instructions.
4. Non-Fire-Rated Standard Steel Doors:
   a. Jambs and Head: 1/8-inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8-inch plus or minus 1/16-inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8-inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4- inch.
5. Fire-Rated Doors: Install doors with clearances in conformance with NFPA 80.
6. Smoke-Control Doors: Install doors in conformance with NFPA 105.

C. Attachment: Securely attach doors and accessories in place to supporting construction.

3.4 CORRECTION AND REPAIR

A. Correction:
1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. Corrected work must also be inspected by the Owner's testing agency and re- tested, as applicable.
   e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon

1) corrections being performed skillfully,
2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
   c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.5 ADJUSTING

A. Lubricate and adjust operating parts and hardware as necessary to function properly and provide a smooth, quiet operation, free from warp, twist, or distortion.

B. Test and adjust doors and hardware.
1. Verify safe, easy, and reliable operation.
2. Confirm that latches and locks engage accurately and securely without forcing or binding.

C. Rehang or replace doors that do not swing or operate freely.

D. Remove and replace damaged, defective, malfunctioning, or unsafe materials, units, components, accessories, and parts.

3.6 CLEANING

A. Cleaning Installed Work:
1. Remove protective materials after installation.
2. Remove from exposed wood surfaces anything that might interfere with uniform oxidation or weathering
3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.

a. Protect other work from staining or damage caused by cleaning operations.
b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.

4. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
5. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.7 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to or against installed doors unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use door surfaces as work surfaces.

D. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

SECTION 08 31 16 – ACCESS PANELS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal access panel assemblies.
2. Gypsum access panel assemblies.
3. Concealed hardware access panel assemblies.
4. Supplementary components and accessories necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. AA: Aluminum Association.
2. HDG: Hot Dip Galvanized.
3. MSG: Manufacturer’s Standard Gage for Sheet Metal.
4. USSG: United States Steel Gage.

B. Definitions:
1. Manufacturer: Means the access panel manufacturer, unless otherwise indicated.
2. Manufacturers' Standard Gage for Sheet Steel: Means the thickness steel sheet based on a weight of 41.82 pounds per square foot per inch of thickness.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Determine specific locations and sizes for all panels doors needed to gain access to concealed plumbing, mechanical, or other concealed work, whether or not such items are indicated on the Drawings.
2. Coordinate the chemical and adhesive compatibility of the access panel manufacturer’s standard baked on rust inhibitive primer with field-applied paint specified in Section 09 91 00.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: Submit a list of manufactured units, components and accessories to be provided, along with their manufacturer’s product data, specifications, typical

installation details and other data necessary to demonstrate compliance with specified requirements for each item listed.

2. Shop Drawings:
   a. Submit schedule indicating opening identification symbol, type of door, location, frame size and material, fire protection rating requirements, latching or locking provisions, and other data pertinent to installation.
   b. Submit dimensioned drawings, including plans showing outline of layouts of access panels and sections.
      1) Label and identify individual components by manufacturer's product name, and indicate material gages, weights, design loads, required clearances and methods of field installation.
      2) Distinguish between factory- and field-assembled Work.
   c. Submit project-specific, minimum 1-1/2-inch scale dimensioned details showing attachments to other work and flashing terminations not detailed on manufacturer's product data.
   d. Show connections to supporting construction and range of travel.
3. Samples: Submit 8-inch square face sheet material samples in specified finish.

B. Informational Submittals:
1. Installation instructions:
   a. Submit manufacturer-prepared instructions concerning proper access door installation.
   b. If manufacturer-prepared instructions are either unavailable or do not apply to project-specific conditions, then consult with manufacturer's technical representative and obtain manufacturer-prepared installation requirements, recommendations or instructions in writing, and promptly distribute copies manufacturer-prepared requirements, recommendations or instructions to Architect before proceeding with work.

C. Closeout Submittals:
1. Keying: Deliver to the Owner before Final Completion at least 6 keys for each locked access panel. Properly label keys with individual tags indicating lock locations.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access panel assemblies used for Project through one source from the same manufacturer.

B. Regulatory Requirements: Within fire-resistance rated assemblies, provide fire- protection-rated access doors conforming to NFPA 80 that are tested in compliance with NFPA 252 or UL 10B for vertical access doors and frames, and ASTM E 119 or UL 263 for horizontal access doors and frames at atmospheric (neutral) pressure, performed by a qualified testing and inspecting agency, or qualified national testing organization, acceptable to authorities having jurisdiction.

1.6 HANDLING

A. Packaging Requirements: Each delivery must include with it a copy of manufacturer- prepared instructions for the proper storage, handling, installation and protection of each product delivered.

B. Delivery and Acceptance Requirements:
1. Delivery:
   a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery; in original unopened containers

clearly marked with intact and legible identification labels indicating
1) manufacturer's name and trademark; and
2) product type, size, grade, use, lot or batch number, and quantity;

b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.

c. During transport and delivery, protect items from (1) exposure to weather; (2) becoming wet; and (3) other sources of deterioration or damage.

2. Acceptance at the Site:
   a. Inspect for damage all items delivered to the Project site.
   b. Reject the delivery of items that show damage or have damaged containers.
   c. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:
1. Storage:
   a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage.
   b. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Unvented polyethylene tarpaulins may not be used.
      1) Incline stored items to provide maximum drainage of accumulated moisture.
      2) Provide spacers to separate stored items and allow air to circulate around all surfaces.
      3) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.
      4) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture, or to ultraviolet radiation in excess of the manufacturer's recommended exposure limits.
      5) Store materials and place equipment in a manner to avoid permanent deflection of floor or roof decks.
      6) Protect access panel assemblies from construction activity with plywood and store away from direct sunlight.

D. Handling: Handle access panel assemblies in a manner that will prevent bending, warping, twisting or other physical damage.

E. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.
1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

F. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

PART 2 - PRODUCTS

2.1 METAL ACCESS PANEL ASSEMBLIES

A. Description: Opening assemblies in walls and ceilings to provide access to concealed spaces.
1. Manufacturer: Design is based on access panels and accessories manufactured by Nystrom Building Products. Other acceptable manufacturers include the following.

a. JL Industries.
b. Karp Associates, Inc.
c. Nystrom Building Products
d. Or equal.

B. Products:
1. General: Unless otherwise indicated on the Drawings, provide minimum 24-inch square or larger openings where servicemen need to enter spaces accessible through access panel; elsewhere, provide minimum 12-inch square openings.
2. Non-Rated Access Panels:
a. Assemblies Having Specified Ceramic Tile Finish:
1) Product: Design is based on "RU" series.
b. Other Assemblies:
1) Product: AS SELECTED BY THE ARCHITECT.
3. Fire-Resistance Rated Access Panels:
a. Product: AS SELECTED BY THE ARCHITECT.

2.2 ACCESSORIES AND MATERIALS

A. Accessories:
1. Locking Devices:
a. Areas accessible to the public: Provide flush, key-operated cam lock. Key all locks alike, unless otherwise noted.
b. In other areas: Where shown or scheduled, provide one mortise cylinder lock per access door. Key all locks alike, unless otherwise noted.

c. For panels 24 inches or more in any dimension: Provide interior latch mechanism to allow door to be opened from the inside without a key.
2. Gaskets: Apply manufacturer's optional gasketing to frame doorstops of units that do not come standard with gaskets.
3. Other Accessories: Provide other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the manufacturer.

B. Materials:
1. Hot-Rolled Steel Rods, Bars, and Shapes: ASTM A 36 (mild steel), merchant quality.
2. Uncoated Steel Coil, Sheet, and Strip: Finished cold-rolled steel coil, sheet, and strip conforming to ASTM A 1008, CS Type B (commercial steel), unexposed (interior items) and exposed, temper rolled (exterior items), regular matte finish (40 to 59 AA), mill phosphatized, tension-leveled to a flatness of 5 I-units or less.
3. Stainless Steel Sheet: ASTM A 666 (annealed and tempered), Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 4 (soft) temper (hardness not more than Rockwell B-65; can be bent flat upon itself in any direction), tension-leveled to a flatness of 5 I-units or less.

C. Finishes:
1. Uncoated Steel: Provide manufacturer's standard shop-applied phosphate pre- treatment and baked on rust inhibitive primer for field-applied finish. Primer must be compatible with field-applied paint specified in Section 09 91 00.
2. Stainless Steel:
a. Items Indicated to have an Uncoated (Bare) or Natural Finish: Furnish materials having a No. 4 finish.

b. Items Indicated to have a Painted Finish: Furnish materials having a No. 2D (matte) finish.

2.3 GYPSUM ACCESS PANEL ASSEMBLIES

A. Description: Glass fiber reinforced gypsum ceiling access panel assemblies consisting of a surround frame with pre-drilled fastener holes and a drop-in door.

B. Products: Design is based on “Stealth Access Panels” by Wind-Lock, or equal.

C. Items must conform to the following:
1. Shell Thickness 1/8- to 3/16-inch.
2. Fastener Test Pull Out (metal stud): 215 pound average.
3. Fastener Push Through Test: 350 pound average.
4. Fuel Contribution (ASTM E84-80) 0.
5. Flame Spread (ASTM E84-80): 0.
6. Smoke Index (ASTM E84-80): 0.
7. Combustion (ASTM E84-80) Non-combustible.
8. Class A Non-Rated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
1. Examine substrates supporting access panel assemblies, and other conditions under which such items are installed.
2. Verify that work performed as part of the work of other Sections conforms to the manufacturer’s installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance.

B. Evaluation and Assessment:
1. Reject work that does not conform to the manufacturer’s installation requirements.
The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer’s installation requirements.
2. Proceeding with installation stipulates the Installer’s acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer’s installation requirements.

3.2 INSTALLATION

A. General:
1. Comply with the manufacturer’s installation instructions.
2. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
3. Set units true to line, to required levels and lines, plumb, level, square, and fitted without warp or rack of frames and panels; with flush well-fitted joints; and in alignment with adjacent construction, without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

4. Install the Work of this Section as necessary for an accurate fit. Perform required drilling and fitting for a complete installation.

B. Special Techniques:
1. Install access panels to fit substrates and to result in watertight performance.
   a. Securely fasten access panel assemblies in place, using fasteners, separators, sealants, and other miscellaneous items as required for a complete installation.
2. Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   a. Coat concealed side of access panel with bituminous coating specified in Section 05 50 00 where in contact with wood, ferrous metal, or cementitious construction.
3. Seal joints with elastomeric sealant as recommended or approved by the manufacturer.

C. Attachment: Securely attach access panel assemblies and accessories in place to supporting construction.

3.3 CORRECTION AND REPAIR

A. Correction:
1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
      3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
      4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;

b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or

c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.

2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 ADJUSTING

A. Lubricate and adjust operating parts and hardware as necessary to function properly and provide a smooth, quiet operation, free from warp, twist, or distortion.

B. Test and adjust doors and hardware.

1. Verify safe, easy, and reliable operation.
2. Confirm that latches and locks engage accurately and securely without forcing or binding.

C. Replace access panel doors that do not swing or operate freely.

D. Remove and replace damaged, defective, malfunctioning, or unsafe materials, units, components, accessories, and parts.

3.5 CLEANING

A. Cleaning Installed Work:

1. Remove protective materials after installation.
2. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.
3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
   a. Protect other work from staining or damage caused by cleaning operations.
   b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
4. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
5. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

1. Provide protection items supplied, required, recommended, approved, or accepted by the manufacturer.
2. Use protection methods that do not void manufacturer’s warranties.

B. Do not store anything adjacent to or against installed panels unless they are adequately protected from damage, as determined by the Architect.

C. Do not use panel surfaces as work surfaces.

D. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 08 32 13 – ALUMINUM-FRAMED SLIDING GLASS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Sliding glass doors, complete with hardware.
   2. Glass and glazing for the work of this Section.
   3. Supplementary parts and components such as inserts, clips, fasteners, anchors, and other miscellaneous supports and accessories required for a complete installation.

1.2 SUBMITTALS

A. Product data: Submit the following:
   1. Door construction details and fabrication methods.
   2. Door profiles and dimensions of individual components.
   3. Product data on hardware, accessories, and finishes.
   4. Recommendations for maintenance and cleaning of surfaces.

B. Shop Drawings: Submit large scale, dimensioned shop drawings showing information not fully detailed in manufacturer's standard product data and the following.
   1. Layout and installation details, including anchors.
   2. Elevations of units at 3/4-inch scale.
   3. Full-size section details of typical composite members, including reinforcement.
   4. Hardware including operators.
   5. Glazing details.
   6. Accessories.

C. Certification:
   1. Certification by a recognized independent testing laboratory or agency showing that each type, grade, and size of unit complies with performance requirements indicated.
   2. Where reports are not available, engage a recognized independent testing laboratory or agency to perform tests specified. Provide certified test results showing that unit complies with performance requirements indicated.

1.3 QUALITY ASSURANCE

A. Installer's qualifications: Firm who has completed installation of sliding glass doors similar in design and extent to those required for the Project and whose work has resulted in construction with a record of successful in-service performance.

B. Uniformity: Provide all sliding aluminum doors from one source and produced by a single manufacturer.

PART 2 - PRODUCTS

2.1 ALUMINUM-FRAMED SLIDING GLASS DOORS

A. Manufacturers: Acceptable sources of comparable products include the following.
   1. Arcadia Architectural Products.
   2. Metal Window Corporation.

B. Items must conform to the following:
   1. Model: AS SELECTED BY THE ARCHITECT.
   2. Sizes: AS INDICATED ON THE DRAWINGS.
   3. Finish: AS SELECTED BY THE ARCHITECT.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by the manufacturer for strength and application of required finish, complying with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate.

B. Fasteners: Aluminum, non-magnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum members, trim, hardware, anchors, and other components of units.
   1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125-inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
   2. Exposed fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners.
      a. For the application of hardware, use fasteners that match the finish of member or hardware being fastened.
      b. Provide Phillips flat-head machine screws for exposed fasteners.

C. Anchors, Clips, and Accessories: Fabricate of aluminum, non-magnetic stainless steel, hot-dip zinc-coated steel or iron, complying with the requirements of ASTM B 633; provide sufficient strength to withstand design pressure indicated.

D. Compression Weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

E. Sliding Weatherstripping: Manufacturer's standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

F. Glass and Glazing Materials: As indicated on the Drawings and specified in Section 08 81 00.

G. Sealants and Back-Up rods:
   1. Within assemblies: Manufacturer's standard non-drying, non-skinning sealant complying with AAMA 809.2.
   2. Between assemblies and adjacent materials: As specified in Section 07 92 00.
   3. Glazing Sealants: Refer to Section 08 81 00.

H. Glazing Gaskets: Manufacturer's standard black gaskets.

I. Hardware: Manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.

J. Insect Screens:
   1. Design door and hardware to accommodate screen in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screen on outside of door assembly and provide for each operable panel.
   2. Aluminum wire fabric screen, charcoal gray 18-by-16 mesh of 0.011-inch diameter, coated aluminum wire.
   3. Extruded-aluminum or aluminum tubular framing sections not less than 0.050-inch wall thickness.

2.3 CONSTRUCTION

A. Door Fabrication:
   1. Fabricate frame and sash square, without rack, and with flush, hairline joints.
   2. Equip ventilators with weatherstripping to prevent water and air infiltration.

B. Screen Fabrication:
   1. Assemble aluminum framing sections with flush, hairline, mitered, reinforced corners.
   2. Insert screen in frame groove and stretch taut. Lock in place with continuous spline.
   3. Finish: Match aluminum window members.

C. Finish:
   1. Sight-exposed aluminum surfaces: clear anodized to match exterior storefronts.
   2. Steel brackets: Prime with rust-inhibitive primer.

D. Glazing: Factory-glaze doors. Comply with glass manufacturer's recommendations and requirements of Section 08 81 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Verify that openings are within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface.

C. Correct conditions detrimental to the proper or timely completion of this work before proceeding with installation.

3.2 INSTALLATION

A. Do not install components that are bowed, dented, abraded, broken or otherwise defective.

B. Install doors level, plumb, square and with tight fitting joints. Attach to supporting construction with non-staining and non-corrosive shims, anchors, fasteners and spacers.

C. Install sills in a full bed of sealant.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with the requirements specified under "Dissimilar Materials" in the Appendix to AAMA 101.

E. Provide all accessories such as fasteners, sealants and concealed anchorage needed for a complete, weatherproof installation.

3.3 ADJUSTING

A. Adjust operating panels, screens, and hardware to provide a tight fit at contact points and weatherstripping for smooth operation and weathertight closure.

B. Weatherstrips shall not bind or prevent sash or ventilator from closing easily and tight with weathertight contact between metal.

C. Lubricate hardware and moving parts.

3.4 CLEANING

A. Clean aluminum surfaces immediately after installing sliding aluminum-framed glass doors. Avoid damaging finish.

B. Remove protective coating and excess glazing and sealants, dirt, and other substances.

C. Clean glass immediately after installing doors. Comply with manufacturer's recommendations for final cleaning and maintenance. Remove nonpermanent labels from glass surfaces.

D. Remove and replace glass broken, chipped, cracked, abraded, or damaged during the construction period.

END OF SECTION

SECTION 08 41 13 –ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aluminum-framed standard-manufactured storefront assemblies.
2. Aluminum-framed glass entrance doors.
3. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
1. Section 08 44 15 for curtain walls and glazed assemblies, including definitions for failure, water leakage, and water penetration; performance requirements; and required site tests.
2. Section 08 81 00 for glass glazing.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. AAMA: American Architectural Manufacturer's Association.
2. GANA: Glazing Association of North America.
3. NFRC: National Fenestration Rating Council.
4. SSG: Structural Sealant Glazing.
5. STC: Sound Transmission Class.
6. USSG: United States Standard Gage.

B. Definitions:
1. Manufacturer: Means the either the entrance or storefront manufacturer, as applicable, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate storefront assembly fabrication and installation with the work of related trades for necessary rough-in work, backing, supports and anchorage. Deliver backing and embedment, templates, and installation instructions to related trades before affected work begins.

B. Delegated Design Requirements:

1. System Description: Drawings of entrances and storefronts are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.

2. Design Requirements:
   a. Engineer, fabricate, assemble, and install entrances and storefronts to meet or exceed the specified performance criteria; conform to the profiles indicated and to other requirements of the Contract Documents; satisfy the requirements of the AHJ; and provide structurally sound, assemblies that accommodate, resist, distribute, or transfer, as applicable, the minimum specified in-service loads and thermal, seismic, wind sway, and other types of movement without incipient or catastrophic failure.
   b. Maintain the visual design concept indicated, including member sizes, profiles, and alignment of components. Deviation from the visual design concept indicated is not permitted without prior written authorization from the Architect.
3. Performance Requirements: As specified in Section 08 44 15 for curtain walls.

C. Pre-installation Meeting: To review conditions and items required for the work of this Section, and to coordinate the work of this Section with the work of related trades, schedule a pre-installation meeting between the Contractor, the Architect, the manufacturer's field representative, the installer, and related trades.
1. Hold the meeting after submittals have been reviewed and returned by the Architect, and at least 10 business days before ordering materials or starting work, including preparation.
2. If more than one trade is responsible for the work of this Section, then those trades must also attend the meeting.
3. During the meeting, review
   a. the Drawings and Specifications, approved submittals, the manufacturer's installation instructions, project conditions, and proposed methods and procedures related to glazed assembly installation;
   b. special details, corner conditions, drainage, penetrations, accessories, components, and similar conditions, along with and adjacent construction that might impact or otherwise affect glazed assembly installation;
   c. construction indicated as supporting Storefronts to verify conformance to (1) the specified requirements, and (2) the manufacturer's tolerance requirements;
   d. the limitations of floor and roof deck for structural loading both during and after installation;
   e. governing regulations and specified requirements for certificates, testing and inspection, reports, and closeout submittals;
   f. the sequence of surface preparation and installation; and
   g. Temporary protection procedures for protection of stored and installed Storefronts both during and after installation.
4. Identify conditions detrimental to proper surface preparation and installation.
5. Finalize the construction schedule, and verify that materials, applicator's personnel, equipment, and facilities are available to permit adherence to the construction schedule
6. Record significant meeting discussions, including discussions on the subject of required corrective measures and actions that must be taken before starting work.

   No later than 3 business days after meetings, distribute copies of the minutes of that meeting to the Architect, to each party that was present, and to parties that should have been present.
7. Do not proceed with installation until disagreements resulting from meetings are successfully resolved to the satisfaction of the disagreeing parties. Instead, initiate necessary actions to remove impediments to executing the work of this Section and reconvene the meeting at the earliest available date to resolve outstanding disagreements.

D. Sequencing:

1. Before starting related work, furnish related trades with location shop drawings, setting diagrams, templates, and installation instructions.
2. Provide backings, loose connection hardware, anchorage, and similar items to related trades at appropriate times during the Work.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
2. Shop Drawings: Submit large-scale dimensioned drawings showing entrances and storefront layout, geometry, materials, joints, profiles, edge conditions, attachments to other work, and finishes.
   a. Label individual components with the manufacturer's product name. Indicate material thickness design loads, required clearances, and methods of field installation.
   b. Include elevation drawings of each vertical surface in which entrances and storefronts are installed. All such drawings must show the horizontal and vertical location and sizes of all entrances and storefront units installed in each surface.
   c. Include project-specific, at least 1-1/2-inch scale dimensioned detail drawings showing profiles, shapes, and dimensions, including conditions either not detailed on the product data, or that are detailed on the product data, but in a manner that is not specific to the Project. Furnish edge details where specified items abut adjacent items.
   d. Indicate method of attaching to adjacent supporting construction.
      1) Show fasteners, brackets, clips, mounting devices, and similar attachments to other work.
      2) Label each attachment type the manufacturer's product name;
      3) Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
   e. Include medium-scale 3-D pictorial oblique or axonometric projection drawings for conditions too difficult to illustrate as two-dimensional multi-view orthographic projection drawings. Perspective projections do not meet the requirements for 3-D drawings and are returned without review.
3. Samples: Submit a 12-inch long sample of each entrances and storefront and frame profile in the same material and finish specified for the Work.

B. Informational Submittals:

1. Test and Evaluation Reports: Submit evidence showing that proposed entrances and storefronts have been tested or listed by a qualified national testing organization, conform to the specified reference standards, and either meet or exceed the specified performance requirements, based on comprehensive testing of the manufacturer's current manufactured units.
2. Installation Instructions:

a. Submit manufacturer-prepared instructions for the proper installation of each entrance and storefront assembly.

b. If the manufacturer's instructions are either unavailable or do not specifically apply to project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect for feedback before proceeding with the work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of entrances and storefront and accessories through one source from a single manufacturer.

B. Certification:

1. Energy Certification: Storefronts must be rated, certified, and labeled in conformance with NFRC publication NFRC-700, "Product Certification Program".

C. Qualifications:

1. Manufacturer: Must be a legal business entity with at least 10 consecutive years' experience manufacturing Storefronts similar in material, design, complexity, and extent to this Project, and whose products have resulted in installations with a record of successful in-service performance.
2. Installer:
   a. Must be a company and individuals with at least 10 consecutive years' experience in the installation of identical Storefronts on comparable projects similar in material, design, complexity, and extent to this Project that have resulted in installations with a documented record of successful in-service performance.
   b. Must be a company authorized, certified, licensed, or otherwise qualified by the manufacturer as having the necessary experience, personnel, and training to install the manufacturer's products.
      1) The manufacturer must certify the applicator before the start of installation.
      2) Only personnel trained and certified by the manufacturer in the proper installation techniques may perform any of the work of this Section.

D. Mockups: Along with portions of the building enclosure system specified in other sections, including backup wall construction, exterior cladding, insulation, ties and other penetrations and flashings, construct an integrated mockup (pre-submittal, *ex situ* integrated/composite mockup).

1. Required mockups are indicated on the Drawings.
2. Before starting work, including bulk purchase and delivery of products, submit drawings of the proposed mockup to the Architect for information.
3. After the Architect's review of the submitted mockup drawings, construct mock up to
   a. review construction techniques;
   b. coordinate the work of multiple sections;
   c. train the trades involved in the work;
   d. demonstrate aesthetic effects, quality of materials, and fabrication and installation (workmanship); and
   e. serve as a platform for preconstruction testing.

4. At a minimum, comply with the following:
   a. Where directed by the Architect, demonstrate patching techniques, and materials and techniques proposed for repair of surfaces to match adjacent undamaged surfaces.
5. The Architect reviews the mockup to determine if the work falls within an acceptable range for
   a. visual appearance;
   b. mottling, sheen, color and texture variation, and evenness of finish;
   c. integration of the work of different trades;
   d. installation tolerances;
   e. quality and fabrication and installation (workmanship);
   f. compliance with the specified requirements; and
6. The Architect either rejects or approves mockups as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
7. If a mockup is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
   a. Repeat mockups until the Architect approves them.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by the Owner in writing.
8. When the mockup is approved, protect the approved mockup until removal is authorized in writing by the Architect. After removal is authorized by the Architect, dismantle, remove, and dispose of the mockup at a disposal location away from the Project site.
9. Field Testing:
   a. Engage a qualified independent testing agency to perform testing. Perform field tests on 10% of the assemblies that are installed to verify if they meet the performance requirements, including air and water infiltration. The units tested should be selected by the Architect. Test in accordance with AAMA 501.2 as means of quality control.
   b. Advise test schedule to the Architect for observations.
   c. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

1.6 HANDLING

A. Packaging Requirements: To prevent damage during delivery and storage, comply with the applicable requirements of ASTM B 660 for packaging aluminum items.

B. Delivery and Acceptance Requirements:
   1. Delivery:
      a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery, and in original unopened containers clearly marked with intact and legible identification labels indicating
         1) manufacturer's name and trademark;
         2) product type, size, grade, use, lot or batch number, and quantity;
         3) shelf life and expiration date; and
         4) ASTM designation or UL classification.

b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.

c. During transport and delivery, protect items from (1) exposure to weather; (2) becoming wet; and (3) other sources of deterioration or damage.

2. Acceptance at the Site:

a. Inspect for damage all items delivered to the Project site.

b. Reject the delivery of items that show damage or have damaged containers.

c. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:

1. Storage:

a. Store items as shipped, in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage. Provide adequate dunnage and bracing during storage. Store roll goods standing up with identification labels clearly visible and in a manner that facilitates inspection.

b. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.

1) Incline stored items to provide maximum drainage of accumulated moisture.

2) Provide spacers to separate stored items and allow air to circulate around all surfaces.

3) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.

4) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.

2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. Field-verify measurements before preparing entrances and storefront submittals and indicate those field measurements on the shop drawings.

2. If field measurements cannot be made without delaying the Work, establish working dimensions that accommodate installation tolerances, as well as related tolerances specified for the Work of other sections, and indicate those working dimensions on the shop drawings.

3. Coordinate the installation of adjacent work to ensure the actual dimensions accommodate the previously established working dimensions.

1.8 WARRANTY

A. Manufacturer's Warranty: Storefronts must be covered by a written warranty that protects the Owner against defective products, materials, components, and accessories for at least the following warranty periods.
   1. Entrances: At least 5 years from the date of Substantial Completion.
   2. Curtain Walls and Glazed Assemblies: At least 10 years from the date of Substantial Completion.

B. Installer's Warranty: Glazed assembly installation must be covered by a written warranty that protects the Owner for at least 5 years after Substantial Completion against
   1. improper substrate preparation;
   2. improper installation;
   3. patent or latent defects; and
   4. incipient or catastrophic failure.

C. Terms:
   1. Defects include
      a. non-conformance with the requirements of the Contract Documents;
      b. patent or latent defects; and
      c. incipient or catastrophic failure.

D. Related Warranties:
   1. Joint Sealant Manufacturer's and Installer's Warranty: As specified in Section 07 92 00.
   2. Glazing Warranties: As specified in Section 08 81 00.

E. Remedy: If a product fails within specified warranty period, then the manufacturer shall replace items or assemblies that do not conform to the specified requirements or that are not weather tight.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Acceptable sources of comparable products include the following, contingent on conformance to specified requirements.
   1. Arcadia.
   2. Kawneer Co., Inc.
   3. Wausau Window and Wall Systems.
   4. Or equal.

2.2 ALUMINUM-FRAMED STOREFRONTS

A. Description: Pre-engineered, thermally broken, center plane, screw spline glazed wall opening framing system.

B. Product: AS SELECTED BY THE ARCHITECT.

C. Items must conform to the following:

1. Framing Members: 6-inch deep, thermally-broken center-set extruded aluminum, having 2-inch sightline, of thickness and reinforced as required to support imposed loads.
2. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with shims for aligning system components.
3. Mullion Reinforcement: Steel with surface preparation and shop primer applied in compliance with Section 05 05 13.

2.3 GLAZED ALUMINUM ENTRANCES

A. Products: AS SELECTED BY THE ARCHITECT.

B. Items must conform to the following:

1. Construction: Minimum 0.125-inch thick extruded aluminum tubular rail and stile members. Provide high-performance plastic connectors to separate aluminum members exposed to the exterior from members exposed to the interior.
2. Type: AS SELECTED BY THE ARCHITECT.
   a. Bottom Rail Height: 10-1/4 inches at accessible entrance doors; 6-1/4 inches elsewhere, unless otherwise indicated.
3. Door Thickness: 2-inch overall thickness.
4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets. Provide non-removable glazing stops on outside of door.

2.4 MATERIALS

A. Steel:

1. Hot-Rolled Steel Rods, Bars, Shapes, and Plate: ASTM A 36 (mild steel), merchant quality.
2. Finished Cold-Rolled Steel Coil, Sheet, and Strip: ASTM A 1008, CS Type B (commercial steel) or SS Grade 30 (structural steel), exposed, temper rolled, light matte finish (25 to 39 AA), tension-leveled (produces superior flatness) to a flatness of not more than 5 I-units, and mill phosphatized.
3. Steel Pipe: ASTM A 53, black pipe, Type and Grade as indicated below, size and weight class, schedule number, or outside diameter indicated and wall thickness as required by engineering calculations for type of use indicated.
   a. Utilitarian Items of Primary Visual Importance: Type S (seamless).
   b. Utilitarian Items of Secondary Visual Importance: Type E (electric-resistance-welded seam).
   c. Bending: Provide Grade A pipe when cold bending is required; otherwise provide Grade B pipe.
4. Steel Tubing:
   a. Steel Structural Tubing: ASTM A 500, Grade A, black, round or shaped hot-formed tubing as indicated, outside diameter or dimensions as indicated, and calculated wall thickness as required by engineering calculations for type of use indicated.
      1) Utilitarian Items of Primary Visual Importance: Provide seamless pipe.

2) Utilitarian Items of Secondary Visual Importance: Provide welded pipe.

b. Mechanical Tubing: ASTM A 513, black, Type and Grade as indicated below.

1) Utilitarian Items of Primary Visual Importance: Type 5 M.D. (mandrel drawn or Drawn over a Mandrel).

2) Utilitarian Items of Secondary Visual Importance: Type 2 A.W.C.R ("as welded" from cold rolled steel).

B. Aluminum:

1. Extruded Aluminum Bars and Shapes: ASTM B 221.

a. Alloy and Temper: 6063-T5 or T6 for primary components; 6063-T5 or T6, 6005- T5, 6105-T5 or 6061-T6 for structural components.

b. Minimum Thickness: At least 0.125-inch.

2. Aluminum Sheet and Plate: ASTM B 209.

a. Alloy and Temper: 5005-H32 (for anodic finishing), or alloy 3003-H14 (for painted or unfinished sheet).

b. Minimum Thickness: At least 0.060-inch.

C. Glass and Glazing Accessories: As specified in Section 08 81 00.

2.5 ACCESSORIES

A. Spacers: Elastomeric silicone rubber spacers for structural silicone glazing conforming to ASTM C 1115, CH6S1, unless otherwise supplied required, recommended, approved, or accepted by both the glass fabricator and sealant manufacturer.

B. Steel Reinforcement: When required by engineering calculations, provide hot rolled steel shapes and bent steel plates as specified in Section 05 12 00 or Section 05 50 00, as applicable.

C. Exposed Flashing: At least 0.060-inch thick aluminum sheet. Provide welded side panels.

D. Concealed Flashing: Stainless steel sheet conforming to ASTM A 240 (annealed) Type 04 (for all other applications), No. 2D (matte) finish, annealed, No. 4 (soft) temper (hardness not more than Rockwell B-65; can be bent flat upon itself in any direction).

E. Brackets: High-strength aluminum, non-magnetic stainless steel, or steel brackets and reinforcements conforming to ASTM A 386.

F. Movement Joints: Slip-joint linings, slip pads, spacers, and sleeves of material and type supplied, required, recommended, approved, or accepted by the by the manufacturer.

G. Anchors:

1. Anchor Bolts (Anchor Rods): Cast-in-place anchors specified in Section 05 05 23 having a minimum tensile strength of at least 60 ksi.

2. Other Anchors:

a. Three-way adjustable anchors that accommodate fabrication and installation tolerances; material and finish compatible with adjoining materials; and recommended by the manufacturer.

b. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel

inserts complying with ASTM A 123 or ASTM A 153 requirements

H. Fasteners: Provide fasteners that resist rotation and withstand shear stress resulting from thermal expansion and contraction.

1. Exposed Fasteners: Uncoated stainless steel fasteners specified in Section 05 05 23.
2. Concealed Fasteners: Uncoated stainless steel fasteners specified in Section 05 05 23.
3. Retaining Cap Fasteners: ASTM A 193, Series 300 stainless-steel screws; type as recommended by manufacturer.
4. Connections to Supporting Structure: ASTM A 307, zinc-coated steel fasteners.

I. Cleaning Agent and Cloth: As supplied, required, recommended, approved, or accepted by the structural sealant manufacturer.

J. Joint Sealants: As specified in Section 07 92 00.

K. Other Accessories: Provide other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the manufacturer.

2.6 FINISHES

A. Shop Priming:

1. Concealed Steel Items: Comply with the requirements of Section 05 05 13 for preparing surfaces and applying shop-applied primer
2. Concealed Aluminum Items: Coat aluminum surfaces in contact with masonry, concrete, or steel with bituminous paint specified and in conformance with Section 05 50 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

1. Examine supporting and adjacent construction and other conditions under which entrances and storefronts are installed.
2. Verify that
   a. framing members are straight and aligned;
   b. openings have been framed or formed within allowable tolerances; are square plumb, level, and true to line; and provide sound anchoring supports; and
   c. work performed as part of the work of other Sections conforms to the entrances and storefront manufacturer’s installation tolerance requirements; provides true, flat, and level bearing surfaces; and satisfies all other conditions relating to the quality of entrances and storefront installation, durability, appearance, and performance.

B. Evaluation and Assessment:

1. Reject work that does not conform to the entrances and storefront manufacturer’s installation

requirements. The Contractor shall either perform or arrange and pay costs for all remedial work necessary to correct or improve deficient conditions and to conform to the entrances and storefront manufacturer's installation requirements.

2. Proceeding with installation stipulates the installer's acceptance of existing conditions. After starting work, the installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the entrances and storefront manufacturer's installation requirements.

3.2 PREPARATION

A. Metal Protection:

1. Alkali-Resistant Coating: Coat aluminum surfaces in contact with masonry, concrete, or steel with alkali-resistant coating specified in Section 05 50 00.

2. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with potentially corrosive substrates as specified in Section 05 50 00.

3.3 INSTALLATION

A. General:

1. Comply with the glazed assembly manufacturer's installation instructions.
2. Use materials and methods required, recommended, approved, or accepted by the entrances and storefront manufacturer, along with manufacturer-recommended accessories and techniques.
3. Set units true to line, to required levels and lines, plumb, level, square, and fitted without warp or rack of frames and panels; with flush well-fitted joints; and in alignment with adjacent construction
4. Scribe and cope the Work of this Section as necessary for an accurate fit. Perform required cutting, drilling, and fitting for a complete installation

B. Special Techniques:

1. Use concealed fasteners and anchorages where possible. Provide washer head fasteners with bonded sealing washers where required to protect metal surfaces and to make a weather tight connection.
2. Form closely-fitted joints with exposed connections accurately located and secured.
3. Provide uniform-width perimeter reveals and openings sealants and joint fillers as indicated.
4. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so that no evidence remains of corrective work. Return to the factory those items that either cannot be refinished in the field, or that contain components that cannot be refinished in the field; make required alterations; and either refinish the entire item or provide a new item.
5. Install concealed gaskets, flashings, and joint fillers as the entrances and storefront installation progresses. Comply with the requirements of Section 07 92 00 for installing sealants during entrances and storefront installation.

C. Interface with Other Work: Securely attach entrances and storefront assemblies in place, and provide measures necessary to accommodate, resist, distribute, or transfer, as applicable, the

minimum specified in-service loads and thermal, seismic, wind sway, or other types of movement without incipient or catastrophic failure.

D. Installation Tolerances: Install glazed assemblies to conform to the more stringent of the manufacturer's or the following maximum tolerances:

1. Plumb: 1/8-inch in 10 feet; 1/4-inch in 40 feet.
2. Level: 1/8-inch in 20 feet; 1/4-inch in 40 feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2-inch wide, limit offset from true alignment to 1/16-inch for aluminum- framed curtain walls and 1/16-inch for steel-framed curtain walls.
   b. Where surfaces are separated by reveal or protruding element from 1/2- to one inch wide, limit offset from true alignment to 1/16-inch for aluminum-framed curtain walls and 1/8-inch for steel-framed curtain walls.
   c. Where surfaces are separated by reveal or protruding element of one inch wide or more, limit offset from true alignment to 1/8-inch for aluminum-framed curtain walls and 1/4-inch for steel-framed curtain walls.
4. Location: Limit variation from plane to 1/8-inch in 12 feet; 1/2-inch over total length.

E. Attachment: Securely attach storefront and entrance assemblies and accessories in place to supporting construction.

3.4 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. Corrected work must also be inspected by the Owner's testing agency and re- tested, as applicable.
   e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,

2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
1. Repair or refinish items that
a. are damaged, loose, chipped, broken, stained, or corroded;
b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

C. Conformance: Completed work must match the approved mockup, as determined by the Architect.

3.5 FIELD QUALITY CONTROL

A. Site Tests and Inspections: As specified in Section 08 44 13.

3.6 ADJUSTING

A. Lubricate and adjust operating parts and hardware as necessary to function properly and provide a smooth, quiet operation, free from warp, twist, or distortion.

B. Test and adjust doors and hardware.
1. Verify safe, easy, and reliable operation.
2. Confirm that latches and locks engage accurately and securely without forcing or binding.

C. Rehang or replace entrance doors that do not swing or operate freely.

D. Remove and replace damaged, defective, malfunctioning, or unsafe materials, units, components, accessories, and parts.

3.7 CLEANING

A. Cleaning Installed Work:

1. Remove protective materials after installation.
2. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.
3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
   a. Protect other work from staining or damage caused by cleaning operations.
   b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
4. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
5. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas around the project site free from debris, materials, equipment, and related items.

3.8 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to or against installed entrances and storefronts unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use entrance and storefront surfaces as work surfaces.

Remove protection when it’s no longer needed and before Substantial Completion

END OF SECTION

SECTION 08 51 13 – ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aluminum windows.
   2. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:
   1. Manufacturer: Means the window manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate window fabrication and installation with the work of related trades for necessary rough-in work, backing, supports and anchorage. Deliver backing and embedment's, templates, and installation instructions to related trades before affected work begins.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
   2. Shop Drawings: Submit large-scale dimensioned drawings showing window layout, geometry, materials, joints, profiles, edge conditions, attachments to other work, and finishes.
      a. Label individual components with the manufacturer's product name. Indicate material thickness design loads, required clearances, and methods of field installation.
      b. Include elevation drawings of each vertical surface in which windows are installed. All such drawings must show the horizontal and vertical location and sizes of all window units installed in each surface.
      c. Include project-specific, at least 1-1/2-inch scale dimensioned detail drawings showing profiles, shapes, and dimensions, including conditions either not detailed on the product data, or that are detailed on the product data, but in a manner that is not specific to the Project. Furnish edge details where specified items abut adjacent items.

d. Indicate method of attaching to adjacent supporting construction.
   1) Show fasteners, brackets, clips, mounting devices, and similar attachments to other work.
   2) Label each attachment type the manufacturer's product name;
   3) Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
e. Include medium-scale 3-D pictorial oblique or axonometric projection drawings for conditions too difficult to illustrate as two-dimensional multi-view orthographic projection drawings. Perspective projections do not meet the requirements for 3-D drawings and are returned without review.

3. Samples: Submit a 12-inch long sample of each window and frame profile in the same material and finish specified for the Work.

B. Informational Submittals:
1. Test and Evaluation Reports: Submit evidence showing that proposed windows have been tested or listed by a qualified national testing organization, conform to the specified reference standards, and either meet or exceed the specified performance requirements, based on comprehensive testing of the manufacturer's current manufactured units.
2. Installation Instructions:
   a. Submit manufacturer-prepared, published instructions for the proper installation of each window assembly.
   b. If the manufacturer's instructions are either unavailable or do not specifically apply to Project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect proceeding with the work.

1.5 QUALITY ASSURANCE

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

1.6 HANDLING

A. Packaging Requirements: Each delivery must include with it a copy of manufacturer- prepared instructions for the proper storage, handling, installation and protection of each product delivered.
1. Deliver windows unitized, palletized and factory-wrapped in polyethylene bags. Shrink-wrap each pallet and provide corner guards for protection.
2. Mark each door with architectural opening number in distribution and installation.

B. Delivery and Acceptance Requirements:
1. Delivery:
   a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery; in

original unopened containers clearly marked with intact and legible identification labels indicating

1) Manufacturer's name and trademark; and
2) Product type, size, grade, use, lot or batch number, and quantity;

b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.

c. During transport and delivery, protect items from (1) exposure to weather; (2) becoming wet; and (3) other sources of deterioration or damage.

2. Acceptance at the Site:

a. Inspect for damage all items delivered to the Project site.

b. Reject the delivery of items that show damage or have damaged containers.

c. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:

1. Storage:

a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage.

b. Store windows flat on factory pallets or three full 2-by-4s, one centered and the other two 12 inches from each end.

a. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.

1) Incline stored items to provide maximum drainage of accumulated moisture.
2) Provide spacers to separate stored items and allow air to circulate around all surfaces.
3) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.
4) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture, or to ultraviolet radiation in excess of the manufacturer's recommended exposure limits.
5) Store materials and place equipment in a manner to avoid permanent deflection of floor or roof decks.
6) Protect windows from construction activity with plywood and store away from direct sunlight.

2. Handling:

a. Handle windows with clean hands, except that windows to receive a transparent finish shall be handled with clean white gloves.

b. Do not drag windows across one another.

c. Maintain factory packaging or other means of protection of windows until Substantial Completion.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.
   1. Remove and dispose of damaged items at a disposal location away from the Project site.
   2. Replace removed items with undamaged new items.

E. Packaging Waste Management:Remove and dispose of construction waste at a disposal location away from the Project site.

1.7 PROJECT CONDITIONS

A. Existing Conditions:
   1. Field-verify measurements before preparing window submittals and indicate those field measurements on the shop drawings.
   2. If field measurements cannot be made without delaying the Work, establish working dimensions that accommodate installation tolerances, as well as related tolerances specified for the Work of other sections, and indicate those working dimensions on the shop drawings.
   3. Coordinate the installation of adjacent work to ensure the actual dimensions accommodate the previously established working dimensions.

PART 2 - PRODUCTS

2.1 ALUMINUM WINDOWS

A. Description: Thermally-broken window units that have been tested and labeled for conformance to AAMA/WDMA/CSA 101/I.S.2/A440.

B. Manufacturers: Acceptable sources of comparable products include the following.
   1. Metal Window Corporation.
   2. Milgard Windows & Doors.

C. Items must conform to the following:
   1. Model: AS SELECTED BY THE ARCHITECT.
   2. Style: AS SELECTED BY THE ARCHITECT.
   3. Sizes: AS INDICATED ON THE DRAWINGS.
   4. Finish: AS SELECTED BY THE ARCHITECT.

D. Materials:
   1. Extruded Aluminum Bars and Shapes: ASTM B 221.
   2. Aluminum Sheet and Plate: ASTM B 209.

E. Components:

1. Frames and Sashes: At least 0.125-inch thick extruded aluminum tubular rail and stile members with high-performance plastic connectors to separate aluminum members exposed to the exterior from members exposed to the interior.
2. Glass and Glazing Accessories: As specified in Section 08 81 00.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets. Provide non-removable glazing stops on outside of door.

2.2 ACCESSORIES

A. Hardware: Manufacturer's standard factory-installed operating hardware.

B. Insect Screens: Description: 18x14 vinyl-coated fiberglass mesh screening fabric woven from 0.013-inch diameter permanent glass yarn.

C. Other Accessories: Install or apply other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the window manufacturer.

2.3 FINISHES

A. Shop Priming:
1. Concealed Steel Items: Comply with the requirements of Section 05 05 13 for preparing surfaces and applying shop-applied primer
2. Concealed Aluminum Items: Coat aluminum surfaces in contact with masonry, concrete, or steel with bituminous paint specified and in conformance with Section 05 50 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
1. Examine supporting and adjacent construction and other conditions under which windows are installed.
2. Verify that
   a. framing members are straight and aligned;
   b. openings have been framed or formed within allowable tolerances; are square plumb, level, and true to line; and provide sound anchoring supports; and
   c. work performed as part of the work of other Sections conforms to the manufacturer’s installation tolerance requirements; provides true, flat, and level bearing surfaces; and satisfies all other conditions relating to the quality of window installation, durability, appearance, and performance.

B. Evaluation and Assessment:

1. Reject work that does not conform to the window manufacturer's installation requirements. The Contractor shall either perform or arrange and pay costs for all remedial work necessary to correct deficient conditions and to conform to the window manufacturer's installation requirements.
2. Proceeding with installation stipulates the installer's acceptance of existing conditions. After starting work, the installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 PREPARATION

A. Protect unpainted galvanized and nonferrous metal surfaces from corrosion and galvanic action when contacting concrete, masonry, or dissimilar metals, as specified in
Section 05 50 00 for dissimilar metal protection.

3.3 INSTALLATION

A. General:
1. Comply with the manufacturer's installation instructions.
2. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
3. Set units true to line, to required levels and lines, plumb, level, square, and fitted without warp or rack of frames and panels; with flush well-fitted joints; and in alignment with adjacent construction
4. Scribe and cope the Work of this Section as necessary for an accurate fit. Perform required cutting, drilling, and fitting for a complete installation

B. Special Techniques:
1. Use concealed fasteners and anchorages where possible. Provide washer head fasteners with bonded sealing washers where required to protect metal surfaces and to make a weathertight connection.
2. Form closely-fitted joints with exposed connections accurately located and secured.
3. Provide uniform-width perimeter reveals and openings sealants and joint fillers as indicated.
4. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so that no evidence remains of corrective work. Return to the factory those items that either cannot be refinished in the field, or that contain components that cannot be refinished in the field; make required alterations; and either refinish the entire item or provide a new item.
5. Install concealed gaskets, flashings, and joint fillers as the window installation progresses. Comply with the requirements of Section 07 92 00 for installing sealants during window installation.

C. Interface with Other Work: Securely attach window assemblies in place, and provide measures necessary to accommodate, resist, distribute, or transfer, as applicable, the

minimum specified in-service loads and thermal, seismic, wind sway, or other types of movement without incipient or catastrophic failure.

3.4 CORRECTION AND REPAIR

A. Correction:
   1. Correct deficiencies that do not conform to the Drawings or specified appearance criteria and other requirements, as determined by the manufacturer's field representative and the Architect.
   2. Arrange and pay costs for either removing and reinstalling, or replacing items that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
   1. Repair or refinish items that
      a. have damaged, loose, chipped, broken, stained, or corroded components, accessories, and similar items; or
      b. do not match the appearance of specified finishes, as determined by the Architect.
   2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the manufacturer's field representative and the Architect.

3.5 ADJUSTING

A. Lubricate and adjust operating parts and hardware as necessary to function properly and provide a smooth, quiet operation.

B. Verify an uninterrupted, close-fitting, closure around the entire perimeter and safe, easy, and reliable operation,
   1. Unit shall be weather tight when closed.
   2. Weather stripping must not bind or prevent sash or ventilator from closing easily and tight with weather tight contact between metal

C. Remove and replace damaged, defective, malfunctioning, or, unsafe materials, units, equipment, components, accessories, parts, and controls.

3.6 CLEANING

A. Cleaning Installed Work:
   1. Remove manufacturer's protective materials after installation.
   2. Clean surfaces of window assemblies using cleaning agents, equipment, tools, and procedures furnished, required, recommended, approved, or accepted by the manufacturer. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.

3. Replace items that cannot be satisfactorily cleaned, as determined by the manufacturer's field representative and the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.7 PROTECTION

A. Protect installed window assemblies from corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to or against the installed window assemblies unless they are adequately protected from damage and staining, as determined by the manufacturer's field representative and the Architect.

Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1. 1.1 SUMMARY

A. This Section includes the following:

1. Door hardware.

a. Security system components may be incorporated into the door and frame openings at the Owner's option.

b. Provision and installation of access control system is under separate contract by Owner.

1) Connection and integration of access control system to electrified door security hardware is under separate contract by Owner.

2) Provide one copy of each reviewed door, frame, and hardware submittal to Owner for distribution to Security Installer.

c. Where the integration of a security system into the door and frame openings is required, the Contractor shall be responsible for the total and complete coordination of the hardware installation and the security system components into the Work.

2. Cylinders for doors specified in other Sections.

3. Boxed Power Supplies for electrified hardware that will not be supplied with low voltage electrical power provided under Electrical, Security, or other Sections.

4. Related Requirements:

a. Section 08 12 13 for hollow metal frames.
b. Section 08 13 13 for hollow metal doors
c. Section 08 14 16 for flush wood doors.
d. Section 08 42 29 for automatic sliding automatic entrances.
e. Section 08 41 13 for aluminum-framed entrances.
f. Section 08 71 13 for automatic door operators.
g. Division 8 Section for tubular steel gates and gate posts.
h. Section 09 22 16 for backing in non-structural metal frame partitions.
i. Section 09 31 00 for stone thresholds provided in tiling work.
j. Section 09 91 00 for field painting of hardware where indicated in hardware sets.
k. Section 28 31 00 for electrified hardware controlled by initiation of fire and smoke detection system.

l. Division 26 Sections for provision of 120 volt AC power to boxed power supplies.

m. Division 28 Sections for access control.

1. 1.2 SUBMITTALS

A. Basis for Submittals: Confirm that General Contractor has provided up-to-date copies of the Architect's drawings and specifications for preparation of Hardware Submittal.

B. Action Submittals:

1. Provide 2 inch by 3 inch clear spaces on cover page for Architect's and Contractor's submittal review stamps.

2. Product Data: Submit hardware manufacturers' current product data including installation details, material descriptions, dimensions of individual components and profiles, and finishes.

a. Organize product data pages in the sequence of devices for hanging, securing, trimming, controlling, protecting, stopping, and accessorizing the doors.

3. Shop Drawings: Submit shop drawings with details of electrified door hardware indication the following:

a. Wiring Diagrams: Detail wiring for power, signal, and control systems, and differentiate between manufacturer-installed and field-install wiring.

1) System schematic.
2) Point to point wiring diagram.
3) Riser diagram.
4) Elevation of each door.

b. Detail interface between electrified door hardware and fire alarm, access control, security, and building control system.

4. Samples: Submit samples of exposed door hardware in specified finish for each type listed below. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets.

a. Door Hardware:

1) Locksets and latchsets.
2) Operating trim

b. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

5. Door Hardware Schedule: Submit Door Hardware Schedule prepared by or under the supervision of door hardware supplier's Architectural Hardware Consultant. Coordinate the final

door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware. The Architect's review of schedule shall neither be construed as a complete check nor shall it relieve the Contractor of responsibility for errors, deviations, or omissions from the specified requirements to provide complete door hardware for the project.

a. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

1) Organize the hardware sets in same order as in the Door Hardware Schedule following the end of Part 3.

b. Content: Include the following information:

1) Identification number, location, hand, fire rating, and material of each door and frame.

2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.

3) Complete designations of every item required for each door or opening including name and manufacturer.

4) Fastenings and other pertinent information.

5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

6) Explanation of abbreviations, symbols, and codes contained in schedule.

7) Mounting locations for door hardware. Supply templates to door and frame manufacturer(s) to enable proper and accurate sizing and locations of cutouts and preparations for hardware.

8) Door and frame sizes and materials.

9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

10) List of related door devices specified in other Sections for each door and frame.

c. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

6. Keying Schedule: Submit Keying Schedule prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

7. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

C. Informational Submittals:

1. Installation Instructions: Provide a copy of manufacturers' installation instructions for each type of hardware device installed on project for Architect's reference at jobsite during construction and for Owner's use at completion of construction.

2. Maintenance Tools and Instructions: Provide a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, removal, and replacement of door hardware.

3. Warranty: Submit special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer trained by the primary product manufacturers, who has completed hardware installations similar in design, material, and extent to that indicated for this Project, and whose work has resulted in construction with a record of successful in-service performance.

1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

2. Installer shall have warehousing facilities in Project's vicinity.

3. Scheduling Responsibility: Preparation of door hardware and keying schedules.

4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Supplier Qualifications: Commercial door hardware supplier, who has completed a minimum of three projects over the last five years which are similar in material, design, and extent to that indicated for this project as determined by Architect and which have resulted in construction with a record of successful in-service performance, and who is or employs a qualified Architectural Hardware Consultant (AHC) who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

1. Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Regulatory Requirements: Comply with the following:

1. Provide hardware products complying with the applicable provisions for accessibility by the disabled in compliance with the Americans with Disabilities Act (ADA).
2. 2010 California Building Code.
3. NFPA 101: Comply with applicable provisions for means of egress doors.
4. Electrified Door Hardware: Listed and classified by Underwriter's Laboratories, Inc. or by a testing agency acceptable to Authorities Having Jurisdiction, as suitable for the purpose indicated.

F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252. Doors in fire rated walls and partitions shall be positive latching and self- closing, with smoke seals tested in accordance with NFPA 252 or UL-10C. Exit devices in fire-rated door assemblies shall be UL labeled as "Fire Exit Hardware".

G. Electrified Door Hardware: Listed and labeled by Underwriters Laboratories, Inc. or by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Construction Manager, and Contractor, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant.
Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address and requirements for delivery of keys.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of electrified door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final door

hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver as applicable permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner in accordance with instructions determined in the "Keying Conference".

1.5 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing 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.

B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.

C. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast In Place Concrete".

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of operators and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, except as follows:

   a. Hinges: Life span of building.
   b. Mechanical Locksets and Latchsets: Five years from date of Substantial Completion.
   c. Tubular Latchsets in apartments: Lifetime finish and mechanical warranty
   d. Electromagnetic Locks: Five years from date of Substantial Completion.
   e. Exit Devices: Five years from date of Substantial Completion.
   f. Manual Closers: Ten years from date of Substantial Completion.
   g. Concealed Floor Closers: Ten years from date of Substantial Completion.
   h. Electromechanical Door Hardware: Two years from date of Substantial Completion.

1.7 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.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section. Door hardware sets are keyed to each scheduled door in the Door Schedule, and the Door Hardware Schedule after the end of Part 3 of this section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.

2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

3. The hardware supplier shall review each hardware set and compare it with the door types, sizes, and details as shown, and verify each hardware item for function, hand, backset, and any other requirements indicated in the Door Schedule and the Architect’s drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES AND PIVOTS

A. General Hinge and Pivot Requirements: Provide hinges with leaves of sufficient width to clear applications where door jamb or trim projection will conflict with standard hinge width, and where required degree of door swing is impeded by projection of door mounted hardware.

1. Hinges and pivots at fire rated doors and doors with closers or power door operators shall have ball bearings, or anti-friction bearings complying with the requirements of NFPS 80.

B. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.

2. Interior Hinges: Steel, with steel pin.

3. Hinges for Fire-Rated Assemblies: Steel, with steel pin; or Stainless steel, with stainless-steel pin.

C. Electrified Functions for Hinges: Comply with the following:

1. Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle. Hinge wires shall be of sufficient quantities to properly service the electrical functions for the electrified hardware devices to be installed in the applicable doors, and wires shall be of proper gauge to service the electrical loads imposed by the applicable

electrified hardware devices.

D. Fasteners: Comply with the following:

1. 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.

E. Butt Hinge and Offset Pivot quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

F. Butt Hinges: Provide template hinges conforming to ANSI/BHMI A156.1. Full mortise type three knuckle hinges with square corners. Hinges at locked outswinging doors shall have non-removable pins (NRP), and hinges at all other doors shall have non-rising pins. All butt hinges shall have button tips.

1. Butt Hinge Sizes: 4-1/2 inches high by 4-1/2 inches wide for doors up to 36 inches wide; and 5 inches high by 4-1/2 inches wide for doors over 36 inches in width unless larger sizes are indicated in Hardware Schedule. Template Requirements: Provide template hinges conforming to ANSI/BHMI A156.7.

2. Butt Hinge Manufacturers:

a. Bommer Industries, Inc. (BOM).
b. Hager Companies (HAG).
c. McKinney Products Company; an ASSA ABLOY Group company (MCK).
d. Stanley Security Solutions, Inc. (STA).

G. Pivots and Pivot Hinges: Provide pivots and pivot hinges conforming to BHMA A156.4.

1. Offset pivots: Mortised mounted, handed, ¾ inch offset pivots unless otherwise indicated, with sealed bearings, properly sized for weight of door, with extended spindles where required for compatibility with Architect's details.

2. Center Hung Pivots: Mortised mounted, handed, center hung pivots, with sealed bearings, properly sized for weight of door, with extended bottom spindles where required for compatibility with Architect's details, and extended top spindles for applications in known earthquake zones.

3. Manufacturers:

a. DORMA Architectural Hardware; Member of DORMA Group North America (DOR).
b. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).

2.3 CONTINUOUS HINGES

A. Standard: BHMA A156.26, Grade 1, hinge weight tested for for specified door weight.

B. General: Minimum 0.120-inch thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

1. Fire Pins: Steel pins to hold labeled fire doors in place if required by tested listing.

C. Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a pin that extends entire length of hinge, tested by UL to standard UL 10C for up to a 3-hour fire listing; factory sized for door heights; and with concealed electric through-wires where schedule.

1. Hager Companies (HAG).
2. Markar Architectural Products, Inc.; a Subsidiary of Adams Rite Manufacturing Co. (MAR).
3. Stanley Security Solutions, Inc. (STA).
4. Select Products Limited (SPL).

D. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves; joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings; tested by UL to standard UL 10C for up to a 3-hour fire listing.

1. Hager Companies (HAG).
2. Pemko, an Assa Abloy Company (PEM).
3. Select Products Limited (SPL).
4. Zero International (ZER).

2.4 LOCKS AND LATCHES

A. General Lock and Latch requirements: Locks and Latches for means of egress doors shall not require use of a key, tool, or special knowledge for operation. Locksets and Latchsets for fire rated doors shall be UL listed for 3-hour fire door.

B. Electrified Locking Devices: Comply with BHMA A156.25.

C. Bored Cylindrical Lock and Latch Sets: BHMA A156.~~13~~2, Series 4000, Grade 1 heavy duty with lever trim, deadlocking brass or stainless steel latchbolts with ½ inch latch bolt throw, UL listed for 3 hour single doors. Provide strike with strike box for each latch bolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set. Provide lever style and lock functions as indicated in hardware sets.

1. Corbin-Russwin CL3300 Series, Corbin-Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
2. Sargent 10 Line, SARGENT Manufacturing Company; an ASSA ABLOY Group company (SAR).
3. Schlage ND Series, Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

D. Bored Tubular Latch Sets: BHMA A156.2, Series 4000 Grade 2 with plated levers and rosettes, 2-3/4 inch backset, and latch bolt with minimum 1/2-inch bolt throw. Provide strike with strike box for each latch bolt, with curved lip extended to protect frame,finished to match door hardware set. Provide lever style and latch functions as indicated in hardware sets.

1. Schlage F Series, Schlage Lock Company; an Ingersoll-Rand Company (SCH).

E. Bored Tubular Interconnected Lock Sets: BHMA A156.12, Grade 2 medium duty with lever trim supported by individual torsion springs, deadlocking brass or stainless steel latchbolts with ½ inch latch bolt throw, 1 inch throw deadbolt with hardened steel roller, interconnected linkage escutcheon housing at secured side, UL listed for 3 hour single doors. Provide strike with strike box for each latch bolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set. Provide lever style and lock functions as indicated in hardware sets.

1.1. Schlage S200 Series, Schlage Lock Company; an Ingersoll-Rand Company (SCH)

2.5 DOOR BOLTS

A. Manual Flush Bolts: BHMA A156.16; designed for mortising into door edge of inactive leaf, with 1” wide face plates, provide in paired top and bottom sets, or singly as top or bottom bolt only as indicated in Hardware Schedule.

B. Automatic Flush Bolts: BHMA A156.3; designed for mortising into door edge of inactive leaf. When the active leaf is opened, the inactive leaf shall be capable of being pushed open, and when it closes, the bolt latches automatically by the closing of the active leaf, and is held latched by the closed active leaf. Shall be provided in paired top and bottom sets at fire rated doors, or as top bolt only with auxiliary fire bolt as specified in hardware sets. UL fire rated for 3 hours.

C. Self-Latching Flush Bolts: BHMA A156.3; designed for mortising into door edge of inactive leaf. Spring driven top bolt shall automatically engage with curved lip strike each time inactive door is closed, and shall remain engaged until retracted by means of control device flush bolt faceplate in edge of door. Self-latching flush bolts installed in lockable door assemblies shall have dead-latching capability for reverse handed doors and for doors without an overlapping astragal. Shall be provided in paired sets with top self-latching flush bolt and bottom automatic flush bolt at fire rated doors, or as top bolt only with auxiliary fire bolt as specified in hardware sets. UL fire rated for 3 hours.

D. Auxiliary Fire Bolts: Spring driven fire bolts may be used in lieu of bottom automatic flush bolts in fire rated door assemblies where indicated in Hardware Schedule. Fire bolts shall be flush mounted in meeting stile edge of doors in accordance with manufacturer’s fire label instructions, and shall engage with strike cutout in meeting stile edge of opposite door leaf when exposed to temperature of 450 degrees. Strike cutout shall have semi-flush cap which weakens under heat exposure prior to engagement of fire bolt. UL listed for use on fire rated doors.

E. Dustproof Strikes: BHMA A156.16; provide with adjustable screw anchored rectangular face plate for installation at carpeted floors, and without face plate at hardware surface floors and at thresholds. Provide shims under rectangular faceplates to prevent faceplate deflection under heavy cart loads.

F. Flush Bolt and Dustproof Strike Manufacturers:

1. Door Controls International (DCI).
2. Ives Hardware; an Ingersoll-Rand Company (IVE).
3. Trimco (TRI).

2.6 EXIT DEVICES

A. Exit Devices: BHMA A156.3, Grade 1, type and functions as specified in hardware sets. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation for egress.

B. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

C. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

D. Removable Mullions: BHMA A156.3.

E. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

F. Outside Trim: Match design for locksets and latchsets, unless otherwise indicated.

G. Push Pad Style Exit Device: One of the following, function and trim as scheduled:

1. 98 Series; Von Duprin (VD).

H. Push Pad Style Exit Device for Narrow Style Aluminum Doors: One of the following, function and trim as scheduled:

1. 8400 Series rim exit device; Adams Rite. Provide with optional end caps to match push pad finish.

2.7 LOCK CYLINDERS

A. Standard Lock Cylinders: BHMA A156, Grade 1.

1. Everest 29 S Family, open keyways; Schlage Commercial Lock Division; an Ingersoll- Rand Company (SCH).

B. High-Security Lock Cylinders: BHMA A156.30, Grade 1. For use at unit entry doors, and all perimeter doors.

1. Everest 29 R Family, restricted keyways; Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

C. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.

D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

E. Construction Keying: Comply with the following:

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

a. Replace construction cores with permanent cores as directed by Owner.
b. Furnish permanent cores to Owner for installation.

2.8 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.

B. Keys: Nickel silver.

1. Quantity: In addition to one extra key blank for each lock, provide the following:

a. Cylinder Change Keys: Three.
b. Master Keys: Five.

2.9 KEY CONTROL SYSTEM

A. Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 125 percent of the number of locks. Coordinate final selection of Key Control Cabinet model and manufacturer with owner during keying conference meeting.

1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2. Key Control Cabinet Manufacturers:

a. Key Systems, Inc.
b. Lund Equipment Co., Inc.
c. Telkee, Inc.

B. Key Lock Boxes: Designed for storage of quantity of keys to be determined , with tamper switches to connect to intrusion detection system.

1. Knox Company (KNX).

1. 2.10 ELECTRIC STRIKES

A. BHMA A156.31, Grade 1. Provide electric strikes that are compatible with the specified doors, frames, and latching/locking devices. Coordinate voltage requirements with applicable trade(s) responsible for providing electrical power to strikes. Provide fail- secure electric strikes with fire-rated devices.

1. HES, Inc.; an ASSA ABLOY Group company (HES).
2. Security Door Controls (SDC).
3. Von Duprin; an Ingersoll-Rand Company (VD).

1. 2.11 OPERATING TRIM

A. Door Pulls: BHMA A156.6, pull types, lengths, and grip diameters as specified in Hardware Sets.

1. Pulls mounted back to back shall have concealed mounting with conehead through- bolts retained by set screws at underside of mounting posts.
2. Single mounted pulls at locations where push side of aluminum or hollow metal doors is visible to the public shall have concealed mounting with conehead rivet nuts retained by set screws at underside of mounting posts.
3. Single mounted pulls at closet doors shall be through-bolted with flush washers at back side of door.

1.

B. Push Plates: BHMA A156.6, push plate sizes as specified in Hardware Sets. Push plates shall be fabricated from minimum 0.050” thick sheet material with four beveled edges, and attached with countersunk screws.

C. Materials: Fabricate from stainless steel, unless otherwise indicated.

D. Operating Trim Manufacturers:

1. Forms + Surfaces (FS).
2. Hager Companies (HAG).
3. IVES Hardware; an Ingersoll-Rand Company (IVS).
4. Rockwood Manufacturing, an Assa Abloy Company (RM).
5. Trimco (TRI).

1. 2.12 ACCESSORIES FOR PAIRS OF DOORS

A. Tubular Flat Bar Coordinators: BHMA A156.3 Type 21A, UL listed for use on fire rated doors. Provide with filler bar of length required to close the header. Provide coordinators with extenders at active door leaf levers where required to clear overlapping astragals due to operation specified hinges. Provide mounting brackets at stop mounted hardware.

1. Door Controls International (DCI).
2. Ives Hardware; an Ingersoll-Rand Company (IVE).
3. Trimco (TRI).

B. Overlapping Astragals: Provide 2 inch wide by 1/8 inch thick continuous prime coated steel astragal with 5/8" overlap of opposite door leaf and gap. Surface apply with countersunk fasteners at interior doors, and with sex bolts at exterior doors. Install in conjunction with smoke seal at smoke labeled doors.

1. Pemko; and Assa Abloy Company (PEM).
2. Ives Hardware; an Ingersoll-Rand Company (IVE).
3. Trimco (TRI).

1. 2.13 CLOSERS

A. Surface Closers: BHMA A156.4, Grade 1 certified to a minimum of 10,000,000 cycles. Closers shall have adjustable spring power, adjustable hydraulic backcheck, independent valves for closing speed and latching speed; solid forged steel arms and high strength cast cylinder; and full rack and pinion; and cushion and integral stop where scheduled. Provide drop plates, brackets, special factory templating, and other accessories as needed for indicated application and installation requirements. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

1. LCN 4000 Series; LCN Closers; an Ingersoll-Rand Company (LCN).
2. Norton 7500 Series; Norton Door Controls; an ASSA ABLOY Group company (NOR).
3. Sargent 281 Series; Sargent Manufacturing Company; an ASSA ABLOY Group company (SAR).

B. Overhead Concealed Closers: BHMA A156.4, Grade 1. Closers shall have adjustable hydraulic backcheck; separate independent valves for closing speed and latching speed adjustment; end load bottom arm; and extended spindles where installed with threshold.

LCN Closers; an Ingersoll-Rand Company (LCN).

C. Shallow Depth Floor Closers: BHMA A156.4, Grade 1. Closers shall have mechanical backcheck; separate independent valves for closing speed and latching speed adjustment; arm and concealed track assembly for independently hung gates; and cover plates to match finished gate hardware.

1. Dorma BTS 80; Dorma Door Controls~~C.R. Laurence Company.~~

1. 2.14 PROTECTIVE TRIM UNITS

A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.

B. Fasteners: Manufacturer's standard machine or self-tapping screws.

C. Metal Protective Trim Units: BHMA A156.6; beveled f; fabricated the following material unless otherwise indicated in Hardware Sets:

1. Material: 0.050-inch thick stainless steel.

a. Hager Companies (HAG).
b. IVES Hardware; an Ingersoll-Rand Company (IVS).
c. Rockwood Manufacturing Company (RM).
d. Trimco (TRI).

2.15 STOPS AND HOLDERS

A. Floor Stops and Bumpers: BHMA A156.16 Grade 1. Cast half dome design with rubber bumper, finish as scheduled. Provide manufacturer's standard riser heights as required for carpeted areas, and where required to compensate for heights of thresholds. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

1. IVES Hardware; an Ingersoll-Rand Company (IVS).
2. Rockwood Manufacturing Company (RM).
3. Trimco (TRI

B. Wall Mounted Bumper Stops: BHMA A156.16 Grade 1. Cast disc type with concave bumper where used with bored locksets, and convex bumper at all other locations, having a 1-1/2 inch diameter base with nominal 1" projection and concealed attachment to substrate.

1. IVES Hardware; an Ingersoll-Rand Company (IVS).
2. Rockwood Manufacturing Company (RM).
3. Trimco (TRI

C. Overhead Stops and Holders: BHMA A156.8, Grade 1. Heavy duty, concealed or surface mounted types as scheduled, slide track design with heavy duty spring shock absorber providing 5 to 7 degree compression before dead stop, 110 degree maximum opening. Provide stop or hold open functions as scheduled.

1. Architectural Builders Hardware Mfg., Inc. (ABH).
2. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
3. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).

D. Silencers for Wood Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 5/8 by 3/4 inch fabricated for drilled-in application to frame.

E. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame.

F. Silencer Manufacturers:

1. Hager Companies (HAG).
2. IVES Hardware; an Ingersoll-Rand Company (IVS).
3. Rockwood Manufacturing Company (RM).
4. Trimco (TRI).

2.16 DOOR GASKETING

A. General: Provide gasketing on exterior doors and provide smoke or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated for installation at heads and jambs of doors. Install seals according to manufacturers' instructions to provide positive contact against doors and sill conditions.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

2. Meeting Style Gasketing: Fasten to meeting stiles, forming seal when doors are closed

3. Door Bottoms, Door Shoes, and Door Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

a. Type 1: Continuous self adhesive flexible silicone perimeter gasketing for installation at heads and jambs of doors.

1) Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784. Provide smoke-labeled gasketing on 20-minute-rated doors and all fire-rated doors

b. Type 2: Continuous aluminum extrusion retaining continuous silicone type gasket for installation at heads and jambs of doors. Provide heavy duty head section application where a parallel arm closer bracket or other hardware attachment is required. Field cut to lengths requires to provide continuous uninterrupted seal.

c. Type 3: Continuous self adhesive flexible silicone gasketing for installation at meeting stiles of doors.

1) Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction,

for smoke-control ratings indicated, based on testing according to UL 1784. Provide smoke-labeled gasketing on 20-minute-rated doors and all fire-rated doors

d. Type 4: Continuous door bottom aluminum extrusion retaining continuous silicone type gasket for compression seal against top of saddle threshold or other raised sill condition. Field cut to lengths required and attach to door in manner to provide positive contact with threshold without binding door.

e. Type 5: : Continuous door bottom aluminum extrusion retaining continuous nylon brush sweep for seal against exterior edge of raised threshold. Field cut to lengths required and attach to door in manner to provide positive contact with threshold without binding door.

4. Manufacturers:
   a. National Guard Products (NGP).
   b. Pemko Manufacturing Co. (PEM).
   c. Zero International (ZRO).

2.17 THRESHOLDS:

A. Provide thresholds complying with BHMA A156.21, Category J in BHMA's "Certified Product Directory."

B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act" ADA.

1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds with maximum ¼ inch vertical rise and ¼ inch beveled rise, overall height shall not exceed ½ inch
2. Provide threshold types as scheduled.

C. Manufacturers:

1. National Guard Products (NGP).
2. Pemko Manufacturing Co. (PEM).
3. Zero International (ZRO).

2.18 SLIDING DOOR HARDWARE

A. General: BHMA A156.14; consisting of complete sets including upper track, hangers with double rollers, 2 track mounted stops, floor guide, and accessories indicated.

1. Pocket Sliding Door Kit and Hardware: Rated for doors weighing up to 150 pounds.

   a. 9630 Series, Hager Companies.

2. By-passing Sliding Door Hardware: Rated for doors weighing up to 150 pounds.

a. 9674 Series, for opening width as required, Hager Companies.

3. Bi-folding Door Hardware: Rated for doors weighing up to 125 pounds.

a. 9570 Series, for opening width as required, Hager Companies.

2.19 MISCELLANEOUS DOOR HARDWARE

A. Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.

B. Lock Bolt Protectors: Fabricate lock bolt protectors from 13 gauge stainless steel through-bolted with no exposed fasteners on face of lock bolt protector. Protectors shall be formed to clear strike projections and adequately sized to cover lock bolt area while clearing rosette or escutcheon lock trim.

1. LG Series Lock Guards; Ives, and Ingersoll Rand Company (IVE)

2.20 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Steel Machine or Wood Screws: For the following fire-rated applications:

   a. Mortise hinges to doors.
   b. Strike plates to frames.
   c. Closers to doors and frames.

3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:

   a. Surface hinges to doors.
   b. Closers to doors and frames.
   c. Surface-mounted exit devices.

4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

5. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.21 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

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

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

A.

components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 Series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations. Confirm all mounting heights and positions with Architect prior to preparation of doors and frames for hardware devices.

1. Locksets and Latchsets: 38 inches from finish floor to center of lever.
2. Deadbolts: Not more than 44 inches above finish floor to operating trim.
3. Exit Devices: 40 inches above finish floor to center of touch bar, 38 inches above finish floor to center of cross bar.
4. Door Pulls: 44 inches from finish floor to center of grip, unless otherwise indicated in drawings. Pull bases centered on stiles, unless otherwise indicated. Backset shall be as indicated on drawings for doors without stiles.
5. Push Plates: 44 inches from finish floor to center of plate. Coordinate with pull location.
6. Horizontal Push Bar: 42 inches from finish floor to center of bar.
7. Butt Hinges: 10 inches from bottom of lowest hinge from finish floor, 5 inches to top of upper hinge from top of door; space intermediate hinges equally between top and bottom hinges.
8. Offset Pivot Hinges: Space intermediate hinges equally between floor mounted bottom pivot and head mounted top pivot.
9. Flush Bolt Operating Mechanisms: Top bolt, 66 to 72 inches from finish floor, bottom bolt, 12 to 18 inches from finish floor.

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule. Install key control storage system where directed by the Owner.

D. Boxed Power Supplies: Coordinate locations of power supplies with Architect and Security Integrator. Consult with power supply manufacturer and confirm appropriate wire gauges for distance of each power supply from the locking device(s) to be served.

1. Configuration: Provide one power supply for each door opening unless indicated otherwise in Hardware Schedule.

E. Thresholds: Thresholds shall be secured with a minimum of one fastener per foot of threshold length spaced in accordance with threshold manufacturer's instructions with a minimum of 3 fasteners. Fasteners shall be stainless steel or non-ferrous metal with a finish compatible with threshold. Minimum screw size shall be Number 10 length with a minimum of ¾ inch thread engagement in the floor or anchoring device being used. Set thresholds for exterior doors, acoustical doors, and doors in parking garages in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.

2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

B. Occupancy Adjustment: Approximately [three] [six] <Insert number> months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SETS

A. Hardware Schedule follows at end of this Section.

END OF SECTION 087100

SECTION 08 81 00 – GLASS GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. General and special purpose glass glazing.
2. Fire-resistance rated glazing.
3. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. AHJ: Authority (Authorities) Having Jurisdiction.
2. CBC: California Building Code.
3. GANA: Glazing Association of North America.
4. IGCC: Insulating Glass Certification Council.
5. IGMA: Insulating Glass Manufacturers Alliance.
6. IGU: Insulating Glass Unit.
7. NGA: National Glass Association.
8. SGCC: Safety Glazing Certification Council
9. SIGMA: Sealed Insulating Glass Manufacturers Association.
10. VOC: Volatile Organic Compound.

B. Definitions:
1. Fabricator: Means the glass fabricator, unless otherwise indicated.
2. Manufacturer: Means the primary glass manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:
1. System Description: Drawings of glazing are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.
2. Design Requirements:
   a. Engineer, fabricate, assemble, and install glazing to meet or exceed the specified performance criteria; conform to the profiles indicated and to other requirements of the Contract Documents; satisfy the requirements of the AHJ;

   and provide structurally sound, assemblies that accommodate, resist, distribute, or transfer, as applicable, the minimum specified in-service loads and thermal, seismic, wind sway, and other types of movement without incipient or catastrophic failure, including loss or glass breakage attributable to
   1) defective manufacture, fabrication, and installation;
   2) deterioration of glazing materials;
   3) failure of glazing sealants or gaskets to remain watertight and airtight; and
   4) other defects in construction.

b. Maintain the visual design concept indicated, including member sizes, profiles, and alignment of components. Deviation from the visual design concept indicated is not permitted without prior written authorization from the Architect.

3. Glass Thickness: The glass thicknesses indicated are estimates used for design intent, detailing purposes, and concept only.
   a. Analyze the project loads and in-service loading conditions, and either confirm the glass thicknesses indicated, or determine the actual required glass thicknesses required.
   b. Provide glazing materials conforming to ASTM E 1300 and the 2010 California Building Code and at least the nominal thicknesses indicated for each opening size, but not less than the actual thicknesses and strength required to meet or exceed the following performance requirements.
      1) General: Glass must be designed to resist seismic and dead loads as indicated in CBC Section 2404.
      2) Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
   c. Unless otherwise indicated or specified, the overall thickness of each glass type and composite thickness of multiple layer glass types must be consistent throughout the Project.
      1) The glass thickness for exterior lites may not be less than 10mm (nominal 3/8-inch).
      2) The minimum glass thicknesses must be such that the probability of breakage at the design pressure does not exceed 8 lights per 1,000 lights (SF 2.5) based on a 3-second gust wind load duration, and the reflectance and shading indicated.
4. Glass Bite Depth: Unless otherwise recommended by the glass and glazing material manufacturer or fabricator, provide at least a 3/8-inch nominal glass bite depth for monolithic lites and at least a 1/2-inch nominal glass bite depth for insulating glass units.
   a. Where joint movement may result in a variable glass bite depth, increase the nominal bite to provide at least a 3/8-inch glass bite depth and at least a 1/4- inch edge clearance.
   b. Installed glass must be free from rattle.
5. Safety Glazing Requirements: Provided either laminated or fully tempered glass conforming to ANSI Z97.1 requirements for Drop Height Class A wherever safety glazing is required by the AHJ. Wire glass is not permitted.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit a comprehensive list of all items necessary for a complete installation, along with manufacturer's or fabricator's product data, specifications, typical installation details, and other data necessary to demonstrate each item's conformance to the specified requirements.
      a. If substantiating probability of breakage data is not otherwise available as part of the manufacturer's product data, then submit such data.
      b. Include sample copies of the complete terms of all warranties covering items furnished or installed under this section.
   2. Glazing Schedule: Using the same designations indicated on Drawings for glazed openings, prepare and submit a glazing schedule listing the glass type, size, and thicknesses for each opening or location.
   3. Material Samples:
      a. Submit at least 12-inch square samples of each scheduled glass type. Provide each sample with a fabricator's label stating material, thickness, and manufacturer's products used in the assembly.

B. Informational Submittals:

1. Calculations: Submit structural calculations thermal stress analysis sealed and signed by a California-licensed structural engineer, and demonstrating that glazing conforms to the requirements of the Contract Documents.
2. Product Certificates:
   a. Submit certificates signed by the glass manufacturer or glazing fabricator certifying that the items furnished conform to the specified requirements.
   b. For solar-control low-E-coated glass, provide documentation demonstrating that the coated glass manufacturer or fabricator is certified by coating manufacturer.

1.5 QUALITY ASSURANCE

A. Quality Standard Requirements: Unless more stringent requirements are indicated or specified, comply with the following, and refer to these publications for glazing terms not otherwise defined in this Section.
   1. IGMA publication SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

B. Certification Labels:
   1. Safety-Rated Glazing:
      a. Permanently mark safety-rated glazing with SGCC certification label or other certification agency label acceptable to the AHJ. Label must indicate
         1) the glass manufacturer's name;
         2) the type of glass, thickness; and
         3) the safety glazing standard with which the glass complies.
      b. Where Safety glass label would be covered by adjacent construction, place label at alternate location as directed by the Architect and acceptable to the AHJ.
   2. Fire-Rated Glazing: Permanently mark fire-rated glazing with the certification label of a testing agency acceptable to the AHJ. Labels must indicate
      a. the glazing manufacturer's name;
      b. the test standard;
      c. whether the glazing is certified for use in fire doors or other openings;
      d. whether or not the glazing passes the hose-stream test;
      e. whether or not the glazing has a temperature rise rating of 450 deg. F; and
      f. the fire-resistance rating in minutes.
   3. IGU Certification: Permanently mark on either the spacers or at least one component lite an appropriate certification label from either the IGCC or Associated Laboratories, Inc.

C. Qualifications:
   1. Manufacturer and Fabricator: Must each be a legal business entity with at least 10 consecutive years' experience fabricating or manufacturing] glazing items similar in material, design, complexity, and extent to this Project, and whose products and fabrications have resulted in applications with a record of successful in-service performance.
   2. Installer: Must be a company and individuals with at least 5 consecutive years' experience in the installation of glazing on projects similar in material, design, complexity, and extent to this Project that have resulted in applications with a documented record of successful in-service performance.
      a. Individual glass installers must be employees of the Installer, and must be certified under the NGA's Certified Glass Installer Program.
      b. Verify that installers designated to perform any of the work of this Section are current in their certification.

c. If any of those installers need re-certification, then cause the re-certification of those installers prior to performing the work of this Section.

D. Mockups: Along with portions of the building enclosure system specified in other sections, including backup wall construction, exterior cladding, insulation, ties and other penetrations and flashings, construct an integrated Type A mockup (pre-submittal, *ex situ* integrated/composite mockup).

1. Required mockups are indicated on the Drawings.
2. Before starting work, including bulk purchase and delivery of products, submit drawings of the proposed mockup to the Architect for information.
3. After the Architect's review of the submitted mockup drawings, construct mock up to
   a. review construction techniques;
   b. coordinate the work of multiple sections;
   c. train the trades involved in the work;
   d. demonstrate aesthetic effects, quality of materials, and fabrication and installation (workmanship); and
   e. serve as a platform for preconstruction testing.
4. At a minimum, comply with the following:

   a. Where directed by the Architect, demonstrate patching techniques, and materials and techniques proposed for repair of surfaces to match adjacent undamaged surfaces.
5. The Architect reviews the mockup to determine if the work falls within an acceptable range for
   a. visual appearance;
   b. mottling, sheen, color and texture variation, and evenness of finish;
   c. integration of the work of different trades;
   d. installation tolerances;
   e. quality and fabrication and installation (workmanship);
   f. compliance with the specified requirements; and
6. The Architect either rejects or approves mockups as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
7. If a mockup is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
   a. Repeat mockups until the Architect approves them.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by the Owner in writing.
8. When the mockup is approved, protect the approved mockup until removal is authorized in writing by the Architect. After removal is authorized by the Architect, dismantle, remove, and dispose of the mockup at a disposal location away from the Project site.

1.6 WARRANTY

A. Manufacturer’s Warranty: All glazing must be covered by a written warranty that protects the Owner during the warranty period against

1. deterioration;
2. defective products, materials, manufactured units, components, accessories, assemblies, and fabrications;
3. patent or latent defects; and
4. incipient or catastrophic failure.

B. Warranty Periods:

1. Coated-Glass: At least 10 years after Substantial Completion.

2. IGUs: At least 10 years after Substantial Completion.

C. Coated Glass Warranty Terms:
1. Coated glass deterioration includes the development of defects during normal use that are not attributed to glass breakage, or to maintaining and cleaning coated glass contrary to the manufacturer's or fabricator's written instructions.
2. Defects include peeling, cracking, and other indications of coating degeneration.

D. IGU Warranty Terms:
1. IGU deterioration is defined as the failure of a unit's hermetic seal under normal use that is not attributed to glass breakage, or to maintaining and cleaning the IGU contrary to the fabricator's written instructions.
2. Defects include the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

E. Remedy: If a product, fabrication, or installation fails within the specified warranty period, then the manufacturer, fabricator, or installer, as applicable, shall replace glazing, f.o.b. the nearest shipping point to the project site.

PART 2 - MATERIALS

2.1 GLASS MANUFACTURERS

A. Provide products manufactured by one of the following.
1. Guardian Industries Corp.
2. Pilkington North America, Inc.
3. PPG Industries.
4. Saint-Gobain Glass.

2.2 ANNEALED GLASS

A. Clear Annealed Vision Glass: Description: ASTM C 1036, Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).

2.3 GLAZING FABRICATORS

A. Provide products fabricated by one of the following.
1. PPG.
2. Viracon.

2.4 STRENGTHENED GLASS

A. Heat-Strengthened Glass:
1. Description: ASTM C 1048, Kind HS (heat strengthened), Condition A (uncoated surfaces), Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
2. Items must conform to the following:
   a. Minimum Surface Compression Strength: At least 5,000 psi, plus or minus 1,500 psi.
3. Fabrication:

a. Fabricate tempered glass by horizontal (roller hearth) process with roll wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
b. Do not exceed 1/2 the published maximum bow and warp tolerances indicated in ASTM C 1048 Table 2.
c. Provide ground and arrised edges; provide polished edges at butt joints and where exposed.

B. Fully-Tempered (Toughened) Glass:
1. Description: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
2. Items must conform to the following:
a. Minimum Surface Compression Strength: At least 10,000 psi.
3. Fabrication:
a. Fabricate tempered glass by horizontal (roller hearth) process with roll wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
b. Provide glazing materials that are free from bubbles, smoke vanes, air holes, scratches and other defects, having ground and arrised edges; provide polished edges where exposed.
4. Source Quality Control: For all tempered glass, provide individual glass lites that have been fully heat soak tested.

2.5 COATED GLASS

A. Vacuum Deposition-Coated (Sputter-Coated) Vision Glass:
1. Description: ASTM C 1376, Kind CV (coated vision – if glass can be approached within 10 feet or less) or CO (coated overhead – if distance is greater than 10 feet) as applicable; and ASTM C 1048, Kind HS (heat strengthened) or FT (fully tempered) as indicated, Condition C (other coated glass), Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
2. Coating: Either spectrally selective or hybrid low-emissivity coating (low-E coating) scheduled at the end of this Section.

2.6 FABRICATED GLAZING ASSEMBLIES

A. Insulating Glass Units:
1. Description: IGU assemblies conforming to IGMA publications TB-3000, “North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use” and TB-3001, “IGMA Guidelines for Sloped Glazing”.
2. Items must conform to the following:
a. Glass Panes: Greylite 14 tint.
b. Interspace Content: Air.
c. Spacer Material: Polypropylene-covered stainless steel; color Satin Finish
d. Spacer Corner Construction: Provide spacers with no visible seams, and with soldered/welded corners.
e. Desiccant: Either molecular sieve or silica gel, or a blend of both, provided on all four sides.
f. Seals: Polyisobutylene primary sealant; silicone secondary sealant.

2.7 FIRE-RESISTANCE RATED GLAZING

A. Description: Fire-rated and impact safety-rated glazing material fabricated as a multiple laminate of ultra-clear (clear) annealed vision glass and transparent intumescent interlayers.,

B. Manufacturers: Provide “Pilkington Pyrostop” manufactured by Nippon Sheet Glass Co., Ltd., and distributed by Technical Glass Products, or equal.

C. 20-Minute Fire-Rated Glazing:
   1. Application: Doors.
   2. Products: Provide “Pilkington Pyrostop 45-200”.
   3. Items must conform to the following:
      a. Supply Form: Single Glazing.
      b. Thickness: 5/16-inch.
      c. Fire Rating: 20 minutes.

D. 45-Minute Fire-Rated Glazing:
   1. Application: Other than doors.
   2. Products: Provide “Pilkington Pyrostop 45-200”.
   3. Items must conform to the following:
      a. Supply Form: Single Glazing.
      b. Thickness: 3/4-inch.
      c. Fire Rating: 90 minutes.

2.8 ACCESSORIES

A. Shoes: Provide aluminum top and bottom rail/shoes manufactured by C.R. Laurence, or equal, for butt-glazed glazing installations.

B. Spacer Shims: Continuous shims fabricated from load-bearing, non-leaching, high-impact polystyrene.

C. Setting Blocks, Spacers and End Blocks: Provide the following, unless another type, hardness, class, or surface is supplied, required, recommended, approved, or accepted by the glass installer.
   1. Setting Blocks: Elastomeric silicone rubber conforming to ASTM C 1115, CH9.
   2. Spacers for Structural Silicone Glazing: Elastomeric silicone rubber conforming to ASTM C 1115, CH6S1.

D. Glazing Gaskets:
   1. Firm, Dense Gaskets: Elastomeric silicone rubber conforming to ASTM C 1115, CH7S2 unless another type, hardness, class or surface is supplied, required, recommended, approved, or accepted by the glass installer.
   2. Soft, Closed Cell Gaskets: ASTM C 509. Provide silicone rubber with pre-molded corners.

E. Factory- or Shop-Applied Structural Sealant:
   1. Description: High modulus, 2-component, neutral cure, room-temperature vulcanizing (RTV) silicone sealant conforming to ASTM C 920, Type S, Grade NS, Class 12-1/2,

Use NT, G, A or O, as applicable.

2. Products: Provide “983” by Dow Corning Corp. No substitutions.
3. Color: Black.

F. Backer Rod for Butt Joints: Square bi-cellular backer rod; color matching silicone sealant.

G. Cleaners, Primers, Sealers, and Other Accessories: Provide other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the glass manufacturer or glazing fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

1. Examine substrates and other conditions under which glazing is installed.
2. Verify that
   a. work performed as part of the work of other Sections conforms to the manufacturer’s installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of gypsum sheathing installation, durability, appearance, and performance; and
   b. framing members are straight and aligned.
   c. openings are properly framed, are true to line, plumb, square and within allowable tolerances, and will provide solid anchoring surfaces.
   d. spaces between framing members are thoroughly cleaned of debris.
3. With the glazing installer present, examine openings and framing for
   a. conformance to manufacturing and installation tolerances, including those for size, squareness, and offsets at corners;
   b. the presence and functioning of weep system;
   c. minimum required face or edge clearances; and
   d. effective sealing between joints of glass-framing members.
4. Examine glazing units and locate exterior and interior surfaces.
   a. Label or mark units as needed so that exterior and interior surfaces are readily identifiable.
   b. Do not use materials that leave visible marks in the completed work.

B. Evaluation and Assessment:

1. Reject work that does not conform to the manufacturer’s installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer’s installation requirements.
2. Proceeding with installation stipulates the Installer’s acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer’s installation requirements.

3.2 INSTALLATION

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and

other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation.
   1. Remove damaged glass from Project site and legally dispose of off Project site.
   2. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

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

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

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
   1. Locate spacers directly opposite each other on both inside and outside faces of glass.
   2. Install correct size and spacing to preserve required face clearances, unless gaskets are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   3. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width.

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

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

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.3 GASKET GLAZING

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.4 CLEANING

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

3.5 PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass.

1. Do not apply markers to glass surface.
2. Remove non-permanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, promptly remove substances as recommended in writing by the glass manufacturer.

C. At frequent intervals during construction, but not less than once a month, examine glass surfaces adjacent to or below exterior concrete and masonry surfaces for buildup of dirt, scum, alkaline deposits, or stains. Remove as recommended in writing by the glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 09 22 26 – SUSPENSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Lightgage metal framing suspension systems for gypsum board ceilings.
   2. Pre-engineered suspension systems.
   3. Supplementary accessories and components necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 05 40 00 for cold-formed metal framing, and for slotted channel framing (trapeze support assemblies).
   2. Section 09 51 13 for acoustical panel ceilings suspension systems.
   3. Section 09 54 22 metal ceilings.

1.2 ALTERNATES

A. Description: Provide an alternate for pre-engineered suspension systems in lieu of stick- built metal suspension systems.

B. Products: Design is based on “Donn Drywall Suspension System” by USG Corp (ICC-ES Report No. 1222). Other acceptable products include the following.
   1. “Drywall Grid Systems” by Armstrong World Industries. (ICC-ES Report No. 1289)
   2. “Drywall Furring System” by Chicago Metallic Corp. (ICC-ES Report No. 2631)
   3. Or equal.

1.3 REFERENCES

A. Abbreviations and Acronyms:
   1. AHJ: Authority (Authorities) Having Jurisdiction.
   2. AWS: American Welding Society.
   3. HDG: Hot Dip Galvanized.
   4. SWG: Steel Wire Gauge.

B. Definitions:
   1. Manufacturer: Means the metal framing manufacturer, unless otherwise indicated.
   2. Structural (Cold-Formed) Metal Framing: Means structural metal framing members having a base metal thickness range of between 118 mils (10-gage) and 33 mils
      (20-gage), and installed in transverse and axial load-bearing applications.

3. Non-Structural (Lightgage) Metal Framing: Means lightgage metal framing members having a base metal thickness of less than 30 mils (20-gage), and installed in non- load bearing interior construction assemblies supporting plaster or gypsum board.
4. Gage: Means the thickness of sheet metal based on weight measured in pounds per square foot per inch of thickness. For the purposes of this specification, gages are classified by the following Table. Thickness indicated in the first column is equivalent to 95 percent of the design thickness and is the minimum acceptable thickness of base metal delivered to the project jobsite.

Reference Gage	Minimum Thickness	Design Thickness (inch)
Non-Structural (Lightgage) Metal Framing specified in this Section		
25	18	0.0188
22	27	0.0283
20	30	0.0312
Structural (Cold-Formed) Metal Framing specified in Section 05 40 00		
20	33	0.0346
18	43	0.0451
16	54	0.0566
14	68	0.0713
12	97	0.1017
10	118	0.1242

5. Wire Gage (Steel Wire Gage): Means the diameter of steel wire, in inches, according to dimensions established by Washburn & Moen, Roebling, or American Steel and Wire Co.

Reference Gage	Design Diameter (inch)
16	0.062
12	0.106
10	0.135
8	0.162
6	0.192

1.4 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

1. System Description: Drawings of suspension systems are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.

2. Design Requirements:
   a. Engineer, fabricate, assemble, and install suspension systems to meet or exceed the specified performance criteria; conform to the profiles indicated and to other requirements of the Contract Documents; satisfy the requirements of the AHJ; and provide structurally sound, assemblies that accommodate, resist, distribute, or transfer, as applicable, the minimum specified in-service loads and thermal, seismic, wind sway, and other types of movement without incipient or catastrophic failure.
   b. Maintain the visual design concept indicated, including member sizes, profiles, and alignment of components. Deviation from the visual design concept indicated is not permitted without prior written authorization from the Architect.
3. Performance Requirements: Unless otherwise indicated, suspension systems must conform to the following.
   a. Perpendicular Deflection (Convexity and Concavity): Limit deflection under maximum design load to L/240, when measured in a direction normal to the assembly plane, and disregarding contribution of sheathing materials.

1.5 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Submit a list of proposed products, materials, and accessories to be provided, along with their manufacturer's product data, specifications, typical installation details and other data necessary to demonstrate compliance with specified requirements for each item listed.
      b. Along with the other required submittals for items furnished under this Section, combine copies of manufacturer's product data for items furnished under other Sections together with the product data required for the work installed under this Section.
      c. Include current test and evaluation reports from the International Code Council Evaluation Services (ICC-ES), or other qualified national testing organization acceptable to the AHJ evidencing the following items conform to the requirements of the AHJ.
         1) Steel sheet.
         2) Mechanical fasteners.
         3) Expansion anchors.
         4) Power-actuated fasteners.
         5) Miscellaneous structural clips and accessories.
   2. Shop Drawings:
      a. Submit Project-specific, minimum 1-1/2-inch scale dimensioned details showing the following.
         1) Layout, spacing, sizes, thicknesses, and types of suspension systems;
         2) Supplemental framing, strapping, bracing, bridging, splices, and accessories.
         3) Connection details and attachments to other work, including seismic bracing proposed for use, and edge of slab conditions.

4) Framed opening details.
5) Acoustical seals and tie-in conditions to fireproofing.
6) Inside and outside corner conditions.

b. Furnish 3-dimensional or isometric drawings for conditions too difficult to illustrate in 2-dimensional orthographic projections.

B. Informational Submittals:

1. Certificates:
   a. Steel Mill Certificates: Submit the supplier's mill certificates with each delivery of materials delivered to the Project site evidencing that the material furnished complies with the specified requirements, including base-metal thickness, yield strength, and HDG metallic coating thickness.
   b. Welder's Certificates: Submit copies of current welder's certificates for each welder designated to perform any of the work of this Section.
2. Delegated Design Submittals: Submit engineering calculations demonstrating conformance to the requirements of the Contract Documents.
   a. Calculations must be legible; must incorporate sufficient cross-references to the shop drawings to make the calculation readily understandable and reviewable; and must include
      1) design loads;
      2) analysis of framing members, including section-property computations;
      3) analysis of anchors; and
      4) the signature and seal of the licensed professional responsible for preparing the calculations.
   b. Test reports are not an acceptable substitute for calculations.
3. Installation Instructions:
   a. Submit manufacturer-published instructions for the proper installation of pre- engineered suspension systems, fasteners, and accessories.
   b. If the manufacturer’s installation instructions are either unavailable or do not specifically apply to Project conditions, then consult the manufacturer’s field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect before proceeding with the work.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain pre-engineered suspension systems and accessories through one source from a single manufacturer.

B. Regulatory Requirements:

1. Fire-Resistance Requirements: Where materials are part of a fire-resistance-rated assembly, provide metal framing within the assembly that is identical to or better than products indicated, as listed and tested in conformance with ASTM E 119 by a qualified testing and inspecting agency, or qualified national testing organization, acceptable to the AHJ.

2. Acoustic Requirements: Where materials are part of an STC-rated assembly, provide metal framing within the assembly that is identical to or better than products indicated, as listed and tested in conformance with ASTM E 90 and ATM E 413 by a qualified testing and inspecting agency, or qualified national testing organization, acceptable to the AHJ.

C. Qualifications:
1. Installer: Firm and individuals with at least 5 consecutive years' experience in the installation of specified assemblies, and whose installation has resulted in applications with a record of successful in-service performance on projects similar in material, design, complexity, and extent to this Project.
2. Welders: Qualify welding procedures and personnel in conformance with AWS "Qualification" requirements of AWS D1.1 (steel) and AWS D1.3 (sheet steel).
   a. Verify welders to be employed in this work have satisfactorily passed AWS qualification tests and are current in their certification.
   b. If re-certification is required, retesting shall be Contractor's responsibility.
3. Licensed Professional:
   a. Engineer Qualifications: Professional structural engineer legally qualified to practice in California, and having at least 10 consecutive years' providing engineering services of the kind indicated on projects similar in material, design, complexity, and extent to this Project.
   b. Engineering Responsibility: Shop drawings, design calculations, and other structural data must be prepared directly by, or under the direct supervision of, a qualified professional structural engineer.

1.7 HANDLING

A. Delivery: Protect materials from exposure to weather, contact with damp or wet surfaces, and other sources of moisture or corrosion during delivery.

B. Storage:
1. Store materials off the ground or floor on pallets, and protected from precipitation or other forms of moisture with breathing-type covers. Un-vented polyethylene tarpaulins are not permitted.
   a. Incline stored items to provide maximum drainage.
   b. Provide spacers to separate stored items and to provide air circulation around all surfaces.
   c. Protect stored items to prevent contact with the soil, to prevent staining, and to prevent cracking, distortion, warping, or other damage.
   d. Do not leave materials uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture.

C. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become corroded, deteriorated, contaminated, or otherwise damaged.
1. Remove and dispose of damaged items at a disposal location away from the Project site.

2. Replace removed items with undamaged new items.

D. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available manufacturers of acceptable products, components, and accessories that may be incorporated into the Work include the following.
1. CEMCO.
2. ClarkDietrich Building Systems.
3. The Steel Network, Inc.
4. Or equal.

2.2 MATERIALS

A. HDG Metallic-Coated Steel Sheet: ASTM A 1003 Non Structural Grade 33 (NS33), at least G40 coating designation with equal coating weight on both surfaces, or equivalent conforming to ASTM C 645.

B. Galvanized Carbon Steel Wire: Soft temper zinc-coated wire complying with ASTM A 641 Class 3 or A coating, and having a yield-stress load of 3 at least times the design load.

2.3 LIGHTGAGE METAL FRAMING SUSPENSION SYSTEMS

A. Wire: Galvanized carbon steel wire in the following gages.
1. Tie Wire: At least 0.062-inch diameter (SWG 16).
2. Hanger Wire: At least 0.162-inch diameter (SWG 8).
3. Diagonal Bracing Wire: At least 0.106-inch diameter (SWG 12).

B. Suspension Members:
1. Carrying Channels: At least 3/4-inch or 1-1/2-inch deep cold-rolled channels, as indicated, with at least 1/2-inch wide flanges manufactured from at least 97-mil base metal thickness (12-gage) HDG metallic-coated steel sheet.
2. Furring Channels:
a. Cold Rolled Channel (CRC): At least 3/4-inch deep cold-rolled channels with at least 1/2-inch wide flanges manufactured from at least 97-mil base metal thickness (12-gage) HDG metallic-coated steel sheet.
b. Hat Furring Channels:
1) Description: 7/8- or 1-1/2-inch deep channels, as indicated, manufactured from at least 27-mil base metal thickness (22-gage) HDG metallic-coated

steel sheet, and having a at least 1-1/4-inch web with at least 3/4-inch wide screw flanges.

2) Products: Design is based on "FC Series Furring Channel" by ClarkDietrich Building Systems. Other acceptable products include the following.
   a) "Prime Wall Furring Channel" by The Steel Network.
   b) Or equal.

c. Resilient Channels:
   1) Description: Single-leg resilient channels manufactured from at least 18-mil base metal thickness (25-gage) HDG metallic-coated steel sheet, and having at least a 1-1/4-inch wide screw flange. For resilient channels having a base metal thickness less than 27 mils (22-gage), provide hemmed flange legs.
   2) Products: Design is based on "High Performance Single Leg Resilient Channel (RCUR)" or "RC Deluxe" by ClarkDietrich Building Systems. Other acceptable products include the following.
      a) "Prime Wall Resilient Channel (RC1)" by The Steel Network.
      b) Or equal.

d. Studs:
   1) Description: Pre-punched C-shaped studs manufactured from at least 18-mil base metal thickness (25-gage) HDG metallic-coated steel sheet, having at least 1-1/4-inch wide stiffened flanges with at least 3/16-inch returns, and manufacturer's standard knockout sizing and spacing.
   2) Products: Design is based on interior drywall studs by ClarkDietrich Building Systems. Other acceptable products include the following.
      a) "PrimeWall Stud" by The Steel Network.
      b) Or equal.

2.4 ACCESSORIES

A. Flat Hangers (Straps): At least 2 inch wide, unless otherwise indicated, and manufactured from at least 97-mil base metal thickness (12-gage) HDG metallic-coated steel sheet.

B. Compression Struts:
   1. Description: Rigid materials selected and designed to have a maximum L/R ratio under maximum design load of not more than 200.
   2. Materials: Hot rolled steel angles, cold-rolled structural metal framing members, EMT or rigid conduit, or black iron.

C. Fasteners:
   1. Screw Fasteners: Provide at least 0.190-inch shank diameter (UTS #10) by at least one inch long hex-washer head clear or pigmented chromate finish, zinc-plated self- drilling, or self-piercing steel screw fasteners specified in Section 05 05 23.
   2. Power-Actuated Fasteners (PAF): As specified in Section 05 05 23.

D. Other Accessories: Provide other accessories and similar secondary items as supplied, required, recommended, approved, or accepted by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine adjacent construction; substrates to which framing attaches or abuts, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing; and other conditions under which the work of this Section is installed.
   2. Verify that work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance;

B. Evaluation and Assessment:
   1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform, or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.
   2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 INSTALLATION

A. General:
   1. Install suspension system components in sizes and spacing indicated on the Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated. Install pre-engineered suspension systems in compliance with the manufacturer's instructions.
   2. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

B. Special Techniques:
   1. Suspend hangers from building structure as follows:
      a. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
      b. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with locations of hangers required in order to support standard suspension system members, install supplemental suspension

members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

c. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

d. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

e. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

f. Do not connect or suspend steel framing from ducts, pipes, or conduit.

2. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

3. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

4. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross- furring members to each other and butt-cut to fit into wall track.

C. Installation Tolerances: Install suspension systems that are level to within 1/8-inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

D. Attachment: Securely attach suspension systems and accessories in place to supporting construction.

3.3 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.

a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.

b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include

1) descriptions and locations of defective work;

2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and

3) similar documentation and visual depictions of Contractor-proposed corrections.

c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.

d. Corrected work must also be inspected by the Owner's testing agency and retested, as applicable.

e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
   1) corrections being performed skillfully,
   2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
   3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
   4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and reinstalling or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
   c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
2. Repair damaged galvanized coatings in conformance with ASTM A 780, Annex A2 using galvanizing repair paint specified in Section 05 05 12.
3. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 CLEANING

A. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

END OF SECTION

SECTION 09 24 23 – PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Exterior Portland cement plaster.
2. Metal lath.
3. Plaster trim and accessories.
4. Supplementary accessories and detail work necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
1. Section 05 05 23 for metal fastenings.
2. Section 07 25 13 weather-resistive barriers.
3. Section 09 23 13 for acoustical gypsum plastering.

1.2 REFERENCES

A. Abbreviations:
1. AHJ: Authority (Authorities) Having Jurisdiction.
2. AR: Alkali Resistant.
3. AA: Aluminum Association.
4. WRB: Weather-Resistive Barrier.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Horizontal trims, joints, and accessories must be installed prior to installing lath.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: Submit a comprehensive list of all proposed metal lath, lathing accessories, and plaster materials and accessories necessary for complete installation, along with their manufacturer's product data typical installation details and other data necessary to demonstrate compliance with specified requirements for each item listed.
2. Shop Drawings: Provide elevation drawings of each vertical surface to be covered with plaster.
   a. Show location of all trim and accessories, including joint locations openings penetrations and items installed in each surface.
   b. Differentiate between and indicate extent of each specified finish.
3. Appearance Range Samples: Submit 12-inch square sample in specified color and finish mounted to hardboard or plywood backing and matching existing construction to establish a full and representative range of finish color, texture, and appearance variation expected in the final Work.

4. Manufacturer's Warranty: Submit sample copies of manufacturer's warranty indicating single-source responsibility for cement plaster scratch and brown coat, and finish coats as specified.

B. Informational Submittals:

1. Certificates: Submit producer's or supplier's certification that the metal lath was manufactured in conformance with ASTM C 847 and has been found to meet the specified requirements.
2. Test and Evaluation Reports: Submit current reports from the International Code Council Evaluation Services (ICC-ES) evidencing mechanical, expansion, and power- actuated fasteners conform to the requirements of the AHJ.
3. Installation Instructions:
   a. Submit manufacturer-published instructions concerning proper mixing and applying of selected scratch and brown products, and finish coat plaster.
   b. If manufacturer-published instructions are either unavailable or do not apply to project-specific conditions, then consult with manufacturer's technical representative and obtain manufacturer-prepared installation requirements, recommendations or instructions in writing, and promptly distribute copies to the Architect before proceeding with work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each plaster product, metal lath and metal trim used for the Project through one source from the same supplier. More than one approved source may be used for different items; however, all like items shall be from the same source.

B. Installer Qualifications: Must be a company and individuals with at least 5 consecutive years' experience in the installation of Portland cement plaster on projects similar in material, design, complexity, and extent to this Project that have resulted in applications with a documented record of successful in-service performance.

1.6 HANDLING

A. Delivery: Deliver materials to the Project site in original unopened packages or containers clearly marked with identification labels intact and legible, indicating the name, brand, and trademark of the manufacturer, material type, grade and lot or batch number, and shelf life and expiration date.

B. Storage:

1. Store materials as shipped, in their original containers, and in compliance with their manufacturer's published instructions for storage.
2. Protect against contact with damp or wet surfaces.
3. At no cost to the Owner, promptly remove from the Project site any materials that become deteriorated, contaminated or otherwise damaged, and legally dispose of off the Project site. Replace with undamaged new materials.

C. Handling:

1. Handle materials to avoid contamination and damage to their containers.
2. Rotate inventory. Do not use products whose shelf life has expired.

1.7 PROJECT CONDITIONS

A. Environmental requirements:
   1. Do not apply materials under adverse weather conditions, or when material or ambient temperature, relative humidity or other environmental requirements are beyond manufacturer's recommended limits. Do not apply in snow, rain, fog or mist.
   2. Proceed with application only when forecasted weather conditions are favorable for proper application, and when there is no threat of impending precipitation.
   3. Apply only as much material as can be made weather tight each day, including all flashing and detail work. Protect exposed edge of plaster at the end of each day's work.

B. Existing conditions: Surfaces indicated as receiving cement plaster must be sound, dry, and free of dust, dirt, laitance, efflorescence and other harmful contaminants. Should surface moisture or other harmful contaminants be observed or detected, provide necessary equipment to adequately dry and prepare the surface, as determined by manufacturer's field representative, prior to application.
   1. Substrate Dimensional Tolerances: Surfaces to receive cement plaster must be flat with 1/4 inch within any 10-foot radius.
   2. Deflection: Maximum deflection of substrate system under positive or negative design loads must not exceed L/360 of span.
   3. Expansion and Control Joints: Continuous expansion and control joints must be installed at locations in conformance with ASTM C1063 and ASTM C926.

1.8 WARRANTY

A. Manufacturer's Warranty: All joint sealants must be covered by a written warranty that protects the Owner for at least 5 years after date of manufacture against defective products, materials, and accessories.

B. Installer's Warranty: All joint sealants must be covered by a written warranty that protects the Owner for at least 2 years after Substantial Completion against
   1. improper substrate preparation;
   2. patent or latent defects;
   3. incipient or catastrophic failure.

C. Terms:
   1. Defects include
      a. adhesive or cohesive failure;
      b. discernible color changes beyond the manufacturer's published information relative to a control sample from the original application;
      c. cracking or brittleness, other than that caused by substrate movement.
   2. Warranties exclude damage, deterioration, or failure caused by
      a. movement of the structure resulting in stresses on the plaster exceeding the manufacturer's written specifications caused by structural settlement or errors attributable to design or construction;
      b. mechanical damage caused by individuals, tools, or other outside agents; and
      c. changes in plaster appearance caused by accumulation of dirt or other atmospheric contaminants.

3. Remedy: If a product fails before the warranty expires, then
   a. the manufacturer shall replace plaster products;
   b. the installer shall repair or replace installed plaster;
   c. or both.

PART 2 - PRODUCTS

2.1 SCRATCH AND BROWN COAT PLASTER PRODUCTS

A. Description: Pre-blended mixture conforming to ASTM C926, including cement, reinforcement fibers, hydrated lime, and proprietary ingredients for scratch and brown coats.

B. Products: Provide "Parex Fiber-47 Armourwall 300 Scratch and Brown Sanded or Concentrate" manufactured by Parex USA, Inc. Other acceptable sources of comparable products are limited to the following.
   1. Lahabra Stucco.
   2. El Rey Stucco.
   3. Omega Stucco.

C. Components:
   1. Cement: Portland cement conforming to ASTM C 150 Type I.
   2. Fine Aggregate: Dense graded (well-graded) air dry natural sands conforming to ASTM C 897 requirements for gradation, deleterious substances and organic impurities.
   3. Hydrated Lime: ASTM C 206, Type S (special finishing hydrated lime).
   4. Fiber Reinforcement: Nylon or polypropylene monofilament fibers conforming to ASTM C 1116 Type III (synthetic fiber-reinforced concrete or shotcrete). AR chopped glass fiber strands are not permitted.

D. Accessories:
   1. Water: Fresh, clean, clear, potable water suitable for domestic water consumption from a domestic source and free of oil, grease, waxy films, curing compounds, release agents and other deleterious materials, including salts, acids, alkalis, organic materials, detergents or other matter, which may negatively affect plaster quality, strength, durability or performance or which may interfere with plaster curing, color, or appearance.
   2. Admix and Bonding Agent: "Adacryl" 100-percent acrylic emulsion additive for Portland cement based products manufactured by Parex USA, Inc.

2.2 READY-MIXED FINISH-COAT

A. Description: Integrally-colored finish coat plaster consisting of factory-mixed Portland cement, aggregates, coloring agents, and proprietary ingredients.

B. Products: Design is based on "Premix" exterior stucco color coat by La Habra Products, Inc. Other acceptable products are limited to one of the following.
   1. "Premium Stucco Finish" by El Rey Stucco.
   2. "Highland Exterior Stucco" by Highland Stucco & Lime Products.
   3. "Color Coat Stucco" by Merlex Stucco.

C. Items must conform to the following:
   1. Finish: Match existing adjacent construction.
   2. Color: AS SELECTED BY THE ARCHITECT from manufacturer's standard colors. Provide materials for the Project with identical or consecutive batch numbers.

2.3 METAL LATH AND ACCESSORIES

A. Conform to ASTM C 847, ASTM C 933, ASTM C1032, ASTM C1063 and Appendix.

B. Welded Wire Lath:
   1. Description: Self-furring welded wire fabric lath fabricated for use as an alternative to 3.4 pound per square yard diamond mesh metal lath specified in ASTM C 847.
   2. Products: Provide "Mega Lath" manufactured by Structa Wire Corp. (ICC-ES Report No. ESR-2017), or equal.
   3. Items must conform to the following:
      a. Size: Minimum 28 inches wide by minimum 98 inches wide.
      b. Thickness: 17-gage.
      c. Style: Self-furring over continuous sheathing.
      d. Groove Depth: 1/4-inch.
      e. Double wire for screw penetration.

2.4 PLASTER TRIM AND ACCESSORIES

A. General: Items must conform to ASTM C 847, ASTM C 933, ASTM C1032, ASTM C1063 and Appendix.

B. Description: Provide Zinc-coated steel (galvanized) trim fabricated in conformance to the requirements of ASTM C 1063.

C. Products: Design is based on "Water Management System" manufactured by California Expanded Metals (CEMCO). Other acceptable sources of comparable products include the following.
   1. Clark Dietrich Building Systems.
   2. Frye Reglet.
   3. Stockton Products.
   4. Or equal.

D. Items must conform to the following:
   1. Size: Trim and accessories depths must match the thicknesses and number of plaster coats required.
   2. Horizontal Control Joint: "#15 Solid Leg" one-piece horizontal control joint.
   3. Vertical Control Joints: "#XJ15 Expanded Wing Control Joint (Double J)" used to relieve stresses in large plastered areas of walls, ceilings and plaster areas.
   4. Channel Screed Reveal: Refer to the drawings for assembly detail. "M-Slide Expansion Joint" 2-piece plaster accessories are not permitted.
   5. Casing Beads: "J-Series Casing Bead" non-perforated casing bead used as a stop to terminate

plaster edge in a clear straight line at head of plaster or jamb conditions of doors, windows. Casing bead at opening heads must extend at least one inch beyond the jambs.

6. Drip Edge: "#12 Soffit Drip Edge" used at soffits and recessed windows; provides drainage and drip edge.
7. Drip Head: "#6 Drip Head" for application above vents, doors, windows, joints, and as indicated on the Drawing; water can weep out of the slope leg and solid return leg used for sealant application.
8. Weep Screed:"#7 Extended" one-piece flashing weep screed for applications at decks were flashing is needed to protect waterproof membrane.
9. Foundation Weep Screed: where indicated, provide "#7 Foundation Sill Screed" with at least a 3-1/2-inch flange and no weep holes.
10. Cornerbeads: "#2A-Expanded Corner Bead" used for reinforcing exterior corners.
11. Strip Lath: Welded wire metal lath formed in minimum 4-inch wide strips with smooth outer edges. Used where small strips of lath are required so cutting is limited and around window and door frames as a butterfly reinforcement

E. Materials:

1. Metallic-coated steel sheet, hot dip galvanized (HDG): ASTM A 653, commercial steel (CS) Type B minimum G60 zinc (galvanized) coating designation on both surfaces, with equal coating weight on each surface; minimum 0.179-inch thick (26-gage USS) base metal thickness and supplied in longest obtainable single lengths to minimize joints

2. Recycled Content: Provide steel products having minimum average recycled steel product content such that the total post-consumer recycled content plus half the pre- consumer recycled content is not less than 25 percent.

F. Finish: Field painted with high performance steel coating specified in Section 09 97 13, color matching adjacent plaster finish.

2.5 ACCESSORIES

A. Tie Wire: Minimum 0.048-inch diameter (18-gage ASW) soft temper zinc-coated wire conforming to ASTM A 641 Class 3 or A coating.

B. Fasteners: Self-drilling, self-tapping, galvanized furring screws by Flannery, Inc., or equal. Comply with ASTM C 1063.

C. Other Accessories: Provide other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the plaster manufacturer.

2.6 MIXES

A. General:
1. Plaster products must be mixed in conformance with the manufacturer's published instructions.
   a. Ensure uniform consistency and product color in the mixer.
   b. Use the least amount of water necessary, producing uniform mixes having a workable consistency.
2. To facilitate conformance with ASTM C 926 mixing requirements, limit mixing to batch sizes that are applied within 1-1/2 hours of mixing.
3. Mixers must be maintained in a clean condition before, during, and after plaster preparation. Partially set and hardened plaster must be removed from mixer drums before any subsequent batch is prepared.

B. Mixing: Comply with ASTM C 926 for the in-service conditions indicated.
1. Mix products thoroughly, measuring as accurately as practicable.
2. Products must be added to the mixer from calibrated containers. The use of shovels for adding products to the mixer is prohibited.
3. The use of products that are caked, lumpy, dirty, or contaminated by foreign materials is prohibited.
4. Re-tempering of scratch and brown coat products is prohibited.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces scheduled to receive plaster, and conditions under which plaster is installed and ensure compliance with applicable building codes.

B. Verify openings are properly framed within allowable tolerances.

C. Verify surfaces indicated as receiving plaster are free from oil, grease, waxy films, curing compounds, release agents, and other deleterious materials that could negatively affect the quality of application, durability, and product appearance and performance.

D. Ensure flashing is installed in conformance with Section 07 60 00.

E. Correction: Correct conditions detrimental to proper and timely completion of the Work before proceeding with installation.

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster in conformance with ASTM C 926.

3.3 PLASTERING

A. General: Comply with ASTM C 926 and ASTM C 1063, except as specified below, and where the AHJ's requirements are more stringent.
   1. Provide sufficient manpower and equipment to ensure a continuous operation free of cold joints, scaffold lines, texture variations, and other objectionable conditions.
      a. Plaster surfaces full height and width between control joints in one operation once the application of any coat has begun.
      b. Stop plaster at control joints, edges, or corners only.
      c. Apply plaster flush with metal trim members and make corners square and true.
   2. Finish plaster in a true, plumb or level plane flush with grounds.

B. Plaster Accessories:
   1. General:
      a. Use single length pieces wherever length of run does not exceed longest standard stock length available.
      b. Miter or cope at corners with hairline joints, and seal with sealant specified in Section 07 92 00. Seal butt splices in the same manner.
      c. Install with surfaces and edges plumb, level and in alignment with a tolerance of not more than 1/8-inch in 5 feet. Shim as required and align joints with concealed splice or tie plates.
      d. Attach securely to supports with same fasteners and spacing as required for metal lath. Wire-tie at no less than 6-inches-on-center to metal lath.
   2. Install foundation weep screed.
   3. Install corner reinforcement.
   4. At plaster terminations, provide casing bead at the following locations:
      a. Where plaster termination abuts other finishes, isolate casing bead from contact with

adjacent finishes with 1/4-inch thick tape sealant specified in Section 07 92 00.

b. Where plaster termination is not covered by another finish or applied trim, provide cased opening by installing casing bead around perimeter of opening as indicated.

C. Control Joints:

1. Install control joints in specific locations indicated on the Drawings,, approved by Architect, and as follows.
   a. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
      1) Vertical Surfaces: 144 sq. ft.
      2) Horizontal and Other Non-Vertical Surfaces: 100 sq. ft.
   b. At distances between control joints of not greater than 18 feet on center
   c. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
   d. Where control joints occur in surface of construction directly behind plaster.
   e. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
2. Wire tie to metal lath at maximum 6 inches on center. Do not attach horizontal control joints to vertical control joints at intersections across the joint.
3. Install vertical control joint first, continuous from top to bottom of wall.
4. Install horizontal control joints last and split where it meets the vertical control joint.
5. Install joints plumb, level, evenly spaced, at locations and spacing indicated, and in one piece.

D. Metal Lath Installation:

1. Comply with the lath manufacturer's printed installation instructions, and with ASTM C 1063 and Appendix, and with applicable building codes.
2. Use products and methods required, recommended, approved, or accepted by the lath manufacturer, along with manufacturer-recommended accessories and techniques.
3. If there is a conflict between the lath manufacturer's printed installation instructions and the product's evaluation report, then the evaluation report governs.
4. Unless otherwise indicated, install all horizontal trims, joints, and accessories prior to installing lath.

E. Comply with the following, except where requirements of the AHJ are more stringent.

1. Apply metal lath in conformance with the manufacturer's published installation standards.
2. Apply lath taut with long dimension at right angle to supports.
3. Stagger vertical joints. Lap end joints at least one inch, and lap horizontal joints at least 1/2-inch.
4. Where end laps occur between framing members, wire-tie ends at not more than 9 inches on center.
5. Cut lath at expansion and control joint locations. Lath must be secured to expansion and control joints at each side of joints, and lapped or spliced at interior and exterior corners.

6. Hold lath 1/4-inch clear of items projecting through the plaster.

F. Fastening Metal Lath: Attach lath through WRB and sheathing into supporting construction at 6 inches on center.

3.4 PLASTER APPLICATION

A. General: Comply with ASTM C 926.
   1. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal. Apply sealant in grove to metal frame.
   2. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
   3. Protection Measures during Application and Cure:
      a. Protect plaster products in conformance with the manufacturer's published instructions.
      b. Protection measures must shield the completed scratch, brown and finish coat applications from direct sunlight and wind exposure (i.e., provide dark colored coverings or barriers).
      c. The combination of curing and protection measures that are employed must prevent drying, uneven or excessive evaporation and strong natural or artificial blasts of dry air during the curing period.

B. Scratch Coat: Apply with sufficient material to cover well and sufficient pressure to form good, full keys. Mix and apply scratch coat and admix and bonding agent products in conformance with manufacturer's published instructions.
   1. Minimum thickness of scratch coat shall be 3/8-inch when measured from backing to crest of scored plaster.
   2. Scratch before plaster hardens to provide sufficient mechanical key for brown coat. Moist cure continuously for a minimum of 48 hours in accordance with ASTM C 926 and building codes, including weekends and holidays.
   3. Score horizontally.

C. Brown Coat: Mix and apply brown coat and admix and bonding agent products in conformance with manufacturer's published instructions
   1. The surface of the scratch coat should be dampened with fog spray prior to application of the brown coat. Do not over-saturate.
   2. Apply the brown coat approximately 3/8-inch thick at a uniform thickness that matches the grounds of the accessories. Bring to a true, even surface by rodding and floating and leave slightly rough, uniform texture to receive the finish coat.
   3. Begin floating only after hydration of the cement has commenced, and sufficient moisture has evaporated so that surface sheen will disappear, but before plaster has become too rigid to be moved under the float.
   4. Moist cure continuously for a minimum of 48 hours in accordance with ASTM C 926 and building codes, including weekends and holidays.
      a. Specified moist curing period is a minimum requirement.
      b. Determine the most effective procedure for curing and time lapse between applications of coats based upon climatic and job conditions.

c. Fog as frequently as required to prevent loss of moisture from the plaster. Avoid erosion damage to the plaster surface.

D. Finish Coat: Apply finish coat not less than 7 days after brown coat has been applied. Dampen brown coat thoroughly and apply finish coat to a uniform minimum thickness of 1/8-inch to match approved mockup. Correct irregularities prior to application.

1. Types: Smooth troweled and 30/30 mesh light sand finished Portland cement plaster installed on metal lath; at least 7/8-inch total thickness, matching the approved mockups.
2. Batch, mix and apply factory-prepared finish coat stucco in accordance with the manufacturer's recommendations. Apply in consistency required to achieve and produce color and textured finish as approved in mockup.

E. Site Tolerances: Maximum deviation from true planes of finish plaster shall not exceed 1/4-inch in 10 feet when measured with a straightedge placed at any point on plaster surfaces.

3.5 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
   a. Correction of defective work is only permitted when visual appearance is not affected.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. Corrected work must also be inspected by the Owner's testing agency and re-tested, as applicable.
   e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
      3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
      4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
   1. Repair or refinish items that
      a. are damaged, loose, chipped, broken, stained, or corroded;
      b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
      c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
   2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.6 CLEANING

A. Cleaning Installed Work:
   1. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
      a. Protect other work from staining or damage caused by cleaning operations.
      b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
   2. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
   3. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.7 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to or against installed plaster finishes unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use plaster surfaces as work surfaces.

D. Remove protection when it’s no longer needed and before Substantial Completion.

3.8 CLEAN-UP

A. Remove and legally dispose of plaster assembly component debris from job site.

B. Clean exposed surfaces using materials and methods recommended by the manufacturer of the material or product being cleaned. Remove and replace work that cannot be cleaned to the satisfaction of the Architect or the Owner.

END OF SECTION

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SECTION 09 28 00 – TILE BACKING BOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass-mat faced gypsum backing boards.
   2. Joint treatment materials.
   3. Supplementary components and accessories necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 21 16 for gypsum board shaft wall assemblies.
   2. Section 09 29 00 for gypsum board panels.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AHJ: Authority (Authorities) Having Jurisdiction.
   2. FGD: Flue Gas Desulfurization.
   3. GA: Gypsum Association.
   4. MSG: Manufacturer's Standard Gage.

B. Definitions:
   1. Manufacturer: Means the tile backing board manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals:
   1. Submit a list of proposed products and accessories along with their manufacturer's product data and other data necessary to demonstrate conformance with the specified requirements for each item listed.

B. Informational Submittals:
   1. Installation Instructions:
      a. Before starting work, submit manufacturer-prepared, published instructions for proper backing board installation, including recommendations for joint treatment.
      b. If manufacturer-published instructions are either unavailable or do not apply to Project-specific conditions, then consult with the manufacturer's technical

representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing, and promptly distribute copies to the Architect before proceeding with the work.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of tile backing board and all related accessories, including joint treatment materials, through one source from a single domestic manufacturer.
   1. Gypsum panel products must be manufactured in North America by a domestic company from (a) gypsum mined in North America; (b) synthetic gypsum (FGD gypsum) recovered from coal-fired plants operating in North America; or (c) a combination of both.
   2. Panel products may not be manufactured outside of North America by a domestic company.
   3. Panel products may not be manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company.

B. Regulatory Requirements: Where materials are part of a fire-resistance-rated assembly, provide items within interior assemblies identical to those products tested in compliance with ASTM E 119 by a qualified testing and inspecting agency, or a qualified national testing organization acceptable to the AHJ.

1.5 HANDLING

A. General: Comply with the GA publication GA-801 “Handling Gypsum Board” and applicable requirements of ASTM C 1264 for the inspection, rejection, certification, packaging, marking, shipping, handling, and storage of gypsum panel products.

B. Packaging Requirements: Each delivery must include with it a copy of manufacturer- published or -prepared instructions for the proper storage, handling, installation, and protection of each product delivered.

C. Delivery and Acceptance Requirements:
   1. Delivery: Deliver items to the Project site clearly marked with intact and legible identification labels indicating(1) manufacturer’s name , brand name, and trademark; (2) the material type, grade, lot or batch number; and (3) the ASTM designation or UL classification.
   2. Acceptance at the Site:
      a. Inspect for damage all items delivered to the Project site.
      b. Reject the delivery of items that show damage or have damaged containers.
      c. With a minimum of handling, unload and store only undamaged items and items that have undamaged containers.

D. Storage and Handling Requirements:
   1. Storage: Keep materials dry and stored off the ground, covered with waterproof tarpaulins. Neatly stack tile backing board flat to prevent sagging.

a. Protect against contact with damp or wet surfaces.
b. Provide air circulation under covering and around stacks of materials.
c. If backing board is left unprotected and then installed, moisture in the backing board can provide conditions favorable for mold, mildew and fungus.
d. Store items and place equipment in a manner to avoid permanent deflection of floor or roof decks.

2. Handling: Handle tile backing board in a manner that prevents bending, twisting or other damage, and avoids chipping edges or damaging panels.

E. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become wet, deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

F. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

PART 2 - PRODUCTS

2.1 GLASS-MAT FACED GYPSUM BACKING BOARDS

A. Description: Mold- and moisture-resistant gypsum-based panels conforming to ASTM C 1178, enclosed in a moisture- and mold-resistant glass mat on both sides.

B. Product: Design is based on “DensShield Tile Backer” manufactured by GP Building Products. Other acceptable comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.

1. “GlasRoc Tile Backer” by CertainTeed Corp.
2. “Gold Bond e2 XP Tile Backer” by National Gypsum Co.

C. Items must conform to the following:

1. Size: Provide at least 4-foot by 8-foot sheets.
2. Thickness: 5/8-inch (Type X).
3. Edges: Square.

2.2 JOINT TREATMENT MATERIALS

A. Glass Mesh Tape: 2-inch wide, alkali-resistant, polymer-coated, glass-fiber mesh tape.
Paper and fiberglass tape is not permitted.

B. Joint Sealant: Provide low modulus single-component sealant specified in Section 07 92 00, unless otherwise supplied, required, recommended, approved, or accepted by the manufacturer.

C. Setting-Type Joint Compound:
   1. Description: Sandable, chemically setting powder compound conforming to ASTM C 475, and used for embedding joint tape, finishing interior gypsum panels, and laminating gypsum panels to gypsum panels.
   2. Products: Design is based on "ToughRock Sandable Setting Compound" manufactured by GP Building Products. All-purpose and drying type joint compounds are not permitted.

2.3 ACCESSORIES

A. Fasteners: Provide 0.1640-inch shank diameter (UTS #8) by 1-1/4-inch long Philips bugle head stainless steel, bi-metal, duplex anti-corrosive steel, 3-coat anti-corrosive steel, or ceramic-coated anti-corrosive steel screw fasteners specified in Section 05 05 23.

B. Other Accessories: Provide other components, accessories and similar secondary items selected by the Contractor, as supplied, required, recommended, approved or accepted by the backing board manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine substrates and other conditions under which backing boards are installed.
   2. Verify that
      a. work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of the tile backing board installation, durability, and performance; and
      b. items penetrating backing boards are installed;
      c. framing members are straight and aligned;
      d. openings are properly framed, are true to line, plumb, square and within allowable tolerances, and will provide solid anchoring surfaces; and
      e. spaces between framing members are thoroughly cleaned of debris.

B. Evaluation and Assessment:
   1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 INSTALLATION

A. Comply with manufacturer's installation instructions.
   1. Furnish units in longest available lengths to minimize end joints.
   2. Precut panels and make accurate cutouts for penetrations.
   3. Stagger joints with those of adjacent rows.

B. Position tile backing board next to framing with coated (gray) side away from studs.
   1. Fit ends closely.
   2. Cut panel to required size and make cutouts.
   3. Leave 1/8-inch gap between tub deck or shower pan and panel edge.

C. Space fasteners 6-inches on center along framing. Drive fasteners flush with coated surface, do not counter sink.

D. Joint Treatment:
   1. Corner Joints: Apply specified glass mesh tape and imbed with a bead of specified joint sealant. Bed tape on all joints and corners with material used to set tiles.
   2. Elsewhere:
      a. Promptly after tile backing board is installed, apply glass mesh joint tape centered over panel joints and around penetrating items. Provide minimum overlap at intersections equal to at least the tape width.
      b. Apply a skim coat of the same material used to set tiles, embedding tape in all joints and corners. Caulk or seal penetrations and abutments to dissimilar materials.

E. Fastener Treatment: Apply sealant to each exposed fastener; trowel level and smooth.

F. Interface With Other Work:
   1. Attachment: Securely attach tile backing boards and accessories in place to supporting construction.

G. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.3 CORRECTION AND REPAIR

A. Remove and replace wet, moisture-, or mold-damaged panels.
   1. Indications that panels are wet or moisture damaged include discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

B. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully; and
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces.
2. Arrange and pay costs for either removing and reinstalling or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

C. Repair:

1. Repair items that
   a. are damaged, loose, chipped, broken, or stained; or
   b. have damaged, loose, chipped, broken, or stained components, accessories, and similar items.
2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 PROTECTION

A. Do not store anything adjacent to or against installed tile backing boards unless they are adequately protected from damage as determined by the Architect.

END OF SECTION
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SECTION 09 29 00 – GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pre-rock gypsum board panels.
2. Various styles of gypsum board panels.
3. Joint treatment materials.
4. Panel trim.
5. Supplementary components, accessories, and detail work necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
1. Section 09 21 16 for gypsum board shaft wall assemblies.
2. Section 09 28 00 for tile backing boards.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. FGD: Flue Gas Desulfurization.
2. GA: Gypsum Association.
3. HDG: Hot Dip Galvanized.
4. STC: Sound Transmission Class.
5. MSG: Manufacturers' Standard Gage for Sheet Steel.
6. PAF: Power-Actuated Fasteners.
7. UNF: Unified Fine Thread Series.

B. Definitions:
1. Enclosure: Means a level of protective resistance to weather for interior spaces provided during the construction phase by either permanent construction or by substantial temporary closures. Other terms, including “enclosed” and similar terms, have the same meaning as “enclosure”.
   a. Uncontrolled Enclosure: Short-term limited temporary protection against wind for up to maximum of 6 months prior to permanent enclosure, as determined by Architect.
   b. Partially-Controlled Enclosure: Medium term limited temporary protection against wind and rain for up to maximum of 12 months prior to permanent enclosure, as determined by Architect.
   c. Permanent Enclosure: Complete permanent protection against wind, temperature, humidity, atmospheric pressure or precipitation, provided by

permanent or temporary insulated and weather tight roofing system, permanent insulated and weather tight exterior wall construction, and openings closed with permanent construction or substantial temporary closures, as determined by Architect.

2. Manufacturer: Means the gypsum board manufacturer, unless otherwise indicated.
3. Pre-Rock Installation: Means a limited installation of gypsum panel products on certain walls or ceilings either prior to the building being enclosed, or during the uncontrolled enclosure phase, usually for mechanical installation requirements.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Where items are installed or applied as part of fire-resistance-rated or STC-rated assemblies, items must be identical those products tested and listed as part of the selected UL or GA fire resistance and sound control system design designation.

B. Sequencing: Only mold-resistant pre-rock gypsum board panels may be delivered to the site and installed while the building is either unenclosed or has an uncontrolled enclosure in place. Do not deliver other gypsum panel types to the project site or begin installation of other gypsum panel types until the building has either a partially- controlled or permanent enclosure in place.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data:
   a. Submit a list of proposed products, materials and accessories to be provided, along with their manufacturer's product data, specifications, typical installation details and other data necessary to demonstrate compliance with specified requirements for each item listed.
   b. Along with the other required submittals for items furnished under this Section, combine copies of manufacturer's product data for items furnished under other Sections together with the product data required for the work installed under this Section.
2. Shop Drawings:
   a. Submit dimensioned elevation drawings showing materials and spacing of gypsum board control joints.
   b. Submit project-specific, minimum 1-1/2-inch scale dimensioned details showing acoustical seals and fireproofing tie-in conditions.
3. Samples: Submit at least 6-inch square samples of each gypsum board type.

B. Informational Submittals:
1. Installation Instructions:
   a. Before starting work, submit manufacturer-prepared, published instructions for proper gypsum board installation, including recommendations for joint treatment.
   b. If manufacturer-published instructions are either unavailable or do not apply to Project-specific conditions, then consult with the manufacturer's technical representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing, and promptly distribute copies to the Architect before proceeding with the work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of gypsum board and all related accessories, including joint treatment materials, through one source from a single domestic manufacturer.
1. Gypsum panel products must be manufactured in North America by a domestic company

from (a) gypsum mined in North America; (b) synthetic gypsum (FGD gypsum) recovered from coal-fired plants operating in North America; or (c) a combination of both.

2. Panel products may not be manufactured outside of North America by a domestic company.
3. Panel products may not be manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company.

B. Reference Standards:

1. Application Standards: ASTM C 840, “Application and Finishing of Gypsum Board”; and GA-216, “Application and Finishing of Gypsum Board”.
2. Finishing Standard: GA-214, “Levels of Gypsum board Finish”.

C. Field Samples (post-submittal, *in situ* visual mockups): Include field samples as part of the work of this Section.

1. Before starting work, including bulk purchase and delivery of products, prepare a field sample in a manner approved by the Architect to demonstrate the expected final visual effect of the planned installation.
2. At a minimum, comply with the following:
   a. Size: At least 8 feet wide by full height of wall centered on one inside corner.
   b. Illumination: Illuminate field samples with at least the same type and level of illumination maintained in the room or space after the building is occupied.
3. The Architect reviews field samples to determine if the work falls within an acceptable range for
   a. visual appearance;
   b. mottling, sheen, color, and texture variation;
   c. evenness of finish;
   d. integration of the work of different trades;
   e. installation tolerances;
   f. overall quality;
   g. fabrication and installation (workmanship); and
   h. conformance to specified requirements.
4. The Architect either rejects or approves field samples as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
   a. If a field sample is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
      1) Repeat field samples until the Architect approves them.
      2) Approval of field samples does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by Owner in writing.
   b. Upon written authorization from the Architect, field samples may remain part of the Work after being properly identified for future reference.

1.6 HANDLING

A. General: Comply with the GA publication GA-801 “Handling Gypsum Board” and applicable requirements of ASTM C 1264 for the inspection, rejection, certification, packaging, marking, shipping, handling, and storage of gypsum panel products.

B. Packaging Requirements: Each delivery must include with it a copy of manufacturer- published or -prepared instructions for the proper storage, handling, installation, and protection of each product delivered.

C. Delivery and Acceptance Requirements:

1. Delivery: Deliver items to the Project site clearly marked with intact and legible identification labels indicating(1) manufacturer's name , brand name, and trademark; (2) the material type, grade, lot or batch number; and (3) the ASTM designation or UL classification.
2. Acceptance at the Site:
   a. Inspect for damage all items delivered to the Project site.
   b. Reject the delivery of items that show damage or have damaged containers.
   c. With a minimum of handling, unload and store only undamaged items and items that have undamaged containers.

D. Storage and Handling Requirements:

1. Storage: Keep materials dry and stored off the ground, covered with waterproof tarpaulins. Neatly stack tile backing board flat to prevent sagging.
   a. Protect against contact with damp or wet surfaces.
   b. Provide air circulation under covering and around stacks of materials.
   c. If backing board is left unprotected and then installed, moisture in the backing board can provide conditions favorable for mold, mildew and fungus.
   d. Store items and place equipment in a manner to avoid permanent deflection of floor or roof decks.
2. Handling: Handle tile backing board in a manner that prevents bending, twisting or other damage, and avoids chipping edges or damaging panels.

E. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become wet, deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

F. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions:

1. Weather: Protect installed materials from drafts during hot, dry weather.
2. Temperature:
   a. Apply joint compound only if the temperature have been maintained within a range required, recommended, approved, or accepted by the manufacturer for at least 24 hours before application.
   b. Maintain ambient, material, and surface temperatures of at least 55 deg. F. while performing gypsum board finishing operations, and after application of joint compound until all joints are completely dry.
   c. Do not conduct gypsum board finishing operations when ambient, material, and surface temperatures are less than 55 deg. F.
3. Illumination: During installation, illuminate work areas with at least the same level of illumination as will occur in the room or space after the building is occupied, or as otherwise recommended or approved by the manufacturer to properly perform the Work.

PART 2 - PRODUCTS

2.1 PRE-ROCK GYPSUM BOARD PANELS

A. Description: Mold- and moisture-resistant gypsum-based panels conforming to ASTM C 1396, having a heavy-duty mold- and moisture-resistant paper face, back, and long edges.

B. Products: Design is based on "SHEETROCK Mold Tough" gypsum panels manufactured by USG Corp. Other acceptable comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
   1. "ProRoc Moisture and Mold Resistant Gypsum board with M2Tech" by CertainTeed Corp.
   2. "ToughRock Mold-Guard" by GP Building Products.
   3. "Gold Bond XP Gypsum Board" by National Gypsum Co.
   4. Or equal.

C. Items must conform to the following:
   1. Size: Provide at least 4-foot by 8-foot sheets.
   2. Thickness: AS INDICATED ON THE DRAWINGS.
   3. Edges: Tapered long edges; square ends.

2.2 GYPSUM BOARD PANELS

A. Regular Core Gypsum Wall Board:
   1. Description: Gypsum-based panels conforming to ASTM C 1396, with paper on the face side, back side, and around long edges.
   2. Products: Design is based on "SHEETROCK" gypsum panels manufactured by USG Corp. Other acceptable comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
      a. "ProRoc Regular" by CertainTeed Corp.
      b. "ToughRock Gypsum Wallboard" by GP Building Products.
      c. "Gold Bond Gypsum Board" by National Gypsum Co.
      d. Or equal.
   3. Items must conform to the following:
      a. Size: Provide at least 4-foot by 8-foot sheets.
      b. Thickness: AS INDICATED ON THE DRAWINGS.
      c. Edges: Tapered long edges; square ends.

B. Fire-Resistance Rated Gypsum Wall and Ceiling Board:
   1. Description: Gypsum-based panels conforming to ASTM C 1396, with paper on the face side, back side, and around long edges.
   2. Products: Design is based on "SHEETROCK FIRECODE Core" and "SHEETROCK FIRECODE C Core" gypsum panels manufactured by USG Corp. Other acceptable comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
      a. "ProRoc Type X" and "ProRoc Type C" by CertainTeed Corp.
      b. "ToughRock Fireguard" and "ToughRock Fireguard C" by GP Building Products.
      c. "Gold Bond Fire-Shield" and "Gold Bond Fire-Shield C" by National Gypsum Co.
      d. Or equal.
   3. Items must conform to the following:

a. Size: Provide at least 4-foot by 8-foot sheets.
b. Thickness: AS INDICATED ON THE DRAWINGS.
c. Edges: Tapered long edges; square ends.

C. Mold- and Moisture-Resistant Gypsum Board:
1. Description: Mold- and moisture-resistant gypsum-based panels conforming to ASTM C 1396, with a heavy-duty mold- and moisture-resistant paper on the face side, back side, and around long edges.

2. Products: Products: Design is based on "SHEETROCK Mold Tough" gypsum panels manufactured by USG Corp. Other acceptable comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
a. "ProRoc Moisture and Mold Resistant Gypsum board with M2Tech" by CertainTeed Corp.
b. "ToughRock Mold-Guard" by GP Building Products.
c. "Gold Bond XP Gypsum Board" by National Gypsum Co.
d. Or equal.
3. Items must conform to the following:
a. Size: Provide at least 4-foot by 8-foot sheets.
b. Thickness: AS INDICATED ON THE DRAWINGS.
c. Edges: Tapered long edges; square ends.

2.3 JOINT TREATMENT MATERIALS

A. Joint Tape:
1. Description: Nominal 2-inch wide gypsum panel joint and corner reinforcement conforming to ASTM C 475.
2. Products:
a. Fiberglass Joint Tape: "SHEETROCK Fiberglass Drywall Tape" manufactured by USG Corp., or equal.
b. Paper Joint Tape: "BEADEX Drywall Joint Tape" manufactured by USG Corp., Or equal.
c. Fiberglass Mesh Tape: Not permitted.

B. Setting-Type Joint Compound:
1. Applications:
a. Pre-Filling Gypsum Panel Joints Throughout the Project: Use setting-type compound for open joints, beveled panel edges, and at damaged surface areas and at all locations.
b. All Other Coats: Use for setting-type compound for embedding and first coat, fill coat, finish coat, and skim coat at wet locations, and at locations where panels are subject to moisture and high humidity.
2. Description: Sandable, chemically setting powder compound conforming to ASTM C 475, and used for embedding joint tape, finishing interior gypsum panels, and laminating gypsum panels to gypsum panels.
3. Products: Design is based on "SHEETROCK DURABOND" setting-type and "SHEETROCK Easy Sand" lightweight setting-type joint compounds manufactured by USG Corp. Other acceptable sources of comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
a. CertainTeed Corp.
b. GP Building Products.
c. Hamilton Drywall Products.

d. Murco Wall Products, Inc.
e. Or equal.

C. Drying-Type Joint Compound:
1. Application: Use for embedding and first coat, fill coat, finish coat, and skim coat at dry locations, and at locations where joints are not subject to moisture or high humidity.
2. Description: Vinyl-type compound conforming to ASTM C 475, and used for embedding joint tape, finishing interior gypsum panels, and hand-applying simple texturing.
3. Products: Design is based on "SHEETROCK All Purpose Joint Compound – SELECT" and "SHEETROCK Brand Plus 3 Lightweight All-Purpose Joint Compound" manufactured by USG Corp. Other acceptable sources of comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
   a. CertainTeed Corp.
   b. GP Building Products.
   c. Hamilton Drywall Products.
   d. Murco Wall Products, Inc.
   e. Or equal.

2.4 METAL TRIM

A. Steel Trim:
1. Description: Paper-faced galvanized steel sheet trim pieces conforming to ASTM C 1047.
2. Products: Design is based on "BEADEX" paper-faced metal bead and trim manufactured by USG Corp. Other acceptable sources of comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
   a. CEMCO.
   b. ClarkDietrich Building Systems.
   c. Clinch-On Cornerbead Co.
   d. Stockton Products.
   e. Or equal
3. Products:
   a. Corner Beads: Provide to protect exterior corners. Provide corner beads with notched or flexible flanges at curved edges.
      1) 90-degree Outside Corner Bead: Style "B1XW EL".
      2) 90-degree Inside Corner Bead: Style "B2".
   b. Casing Beads: Provide long-flanged L- or LC-beads at exposed panel edges indicated as receiving joint compound; provide short-flanged U-beads at exposed panel edges that do not receive joint compound.
      1) J Trims (J-shaped with exposed long flange): Style "B9J".
      2) L Trims (L-shaped with exposed long flange): Style "B4".

B. Decorative Aluminum Trim:
1. Manufacturers: Provide products manufactured by Fry Reglet Corp., or equal.
2. Products:
   a. Reveal Molding: AS SELECTED BY THE ARCHITECT.
   b. Drywall Molding End Closure: DMEC-4875" for 3-5/8-inch studs, unless otherwise

indicated.

c. Color: AS SELECTED BY THE ARCHITECT.

C. Metal Control Joints:

1. Description: One-piece solid zinc control joint supplied with factory-applied removable tape to ensure a clean joint.
2. Products: Design is based on "SHEETROCK Zinc Control Joint No. 093" manufactured by USG Corp. Other acceptable sources of comparable products are limited to one of the following, contingent on demonstrated conformance to the specified requirements, including the item description above.
   a. "Niles-093 Zinc Control Joint" by Niles Building Products Co.
   b. "NO93 Control Joint" by Alabama Metal Industries Corporation (AMICO) Building Products
   c. Or equal.
3. Items must conform to the following:
   a. Length: At least 10 feet long; provide longest possible lengths to avoid joints.

2.5 ACCESSORIES

A. Repair Clips: "SHEETROCK Drywall Repair Clips" manufactured by USG Corp., Or equal.

B. Fasteners: Provide at least 0.1640-inch shank diameter (UTS #8) by at least 1-1/4-inch long Philips bugle head phosphate-coated carbon steel screw fasteners specified in Section 05 05 23.

C. Sealant: Provide acoustical joint sealant specified in Section 09 81 33, unless otherwise supplied, required, recommended, approved, or accepted by the manufacturer.

D. Adhesive and Other Accessories: Provide adhesive, other accessories, and similar secondary items supplied, required, recommended, approved, or accepted by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

1. Examine substrates and other conditions under which gypsum board is installed.
2. Verify that
   a. work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of gypsum sheathing installation, durability, appearance, and performance; and
   b. items penetrating gypsum board are installed.
   c. framing members are straight and aligned.
   d. openings are properly framed, are true to line, plumb, square and within allowable tolerances, and will provide solid anchoring surfaces.
   e. spaces between framing members are thoroughly cleaned of debris.

B. Evaluation and Assessment:

1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work

necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 PREPARATION

A. Protection of In-Place Conditions:

1. Work Area Protection: Protect work areas from excessive dust and other airborne contaminants during surface preparation, adhesive and coating application, and while adhesives and coatings are curing, setting, or drying.

2. Adjacent Material Protection: Protect adjacent surfaces from staining, overspray, and damage. Use drop cloths, masking, and other items necessary to provide adequate protection.

3.3 INSTALLATION

A. General:

1. Comply with ASTM C 840.
2. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
3. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
4. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
5. Form control and expansion joints with space between edges of adjoining gypsum panels.
6. Cover both faces of support framing with gypsum panels as indicated on the drawings for each wall type construction.
   a. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   b. Fit gypsum panels around ducts, pipes, and conduits.
   c. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant, unless otherwise indicated with approved engineering judgment.
7. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
8. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
9. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant specified in Section 09 81 33. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically or horizontally, unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base- layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
2. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws. Do not glue multiple layers of gypsum board together.

D. Installing Trim Accessories:

1. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
2. Control Joints: Install control joints according to ASTM C 840 and in specific locations indicated or approved by the Architect for visual effect.
3. Trim: Install in the following locations.
   a. Cornerbead: Use at outside corners.
   b. LC-Bead or U-Bead: Use at exposed panel edges.

E. Finishing Gypsum Board:

1. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
2. Prefill open joints, beveled edges, and damaged surface areas.
3. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

F. Attachment: Securely attach gypsum board panels and accessories in place to supporting construction.

G. Conformance: Completed work must match the approved field samples, as determined by the Architect.

3.4 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
      3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
      4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:

1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
   c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.

2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.5 CLEANING

A. Cleaning Installed Work:

1. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
2. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to, on, or against installed gypsum board panels unless they are adequately protected from damage and staining, as determined by the Architect.

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

D. Remove protection when it’s no longer needed and before Substantial Completion.

3.7 GYPSUM BOARD FINISH SCHEDULE

A. General: Finish gypsum board surfaces with exposed joints, corners and edges reinforced or trimmed in compliance with ASTM C 840, GA-214 and the following.

B. Levels of Gypsum Board Finish:
1. Level 0: Use for first layer of multiple layer construction and gypsum board ledge guards in elevator shafts.
2. Level 1: Use in plenum areas above ceilings, interior faces of shafts, in attics, and in areas where the assembly will generally be concealed.
3. Level 2: Use where moisture-resistant gypsum backing board is used as a substrate for tile; and in storage and similar areas where surface appearance is not of primary concern.
4. Level 3: Use in areas where heavy grade wall coverings are to be applied as the final decoration.
5. Level 4: Use in areas where light texture or backed lightweight wall covering is applied.
6. Level 5 Skim coat (spray and roller-applied Level 5 finish products are not permitted): Use for all other areas to be painted unless otherwise noted.

END OF SECTION

SECTION 09 30 00 – TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Tile surfacing units.
2. Installation materials, including waterproofing /crack isolation membrane, mortar, and grout.
3. Floor transition profiles.
4. Trim units.
5. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
1. Section 07 92 00 for sealing joints in tile surfaces.
2. Section 09 05 16 for preparation of concrete slabs for tile flooring.
3. Section 09 28 00 for tile backing board.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. MVECS: Moisture Vapor Emission Control System.
2. MVER: Moisture Vapor Emission Rate.
3. SCAQMD: South Coast Air Quality Management District.
4. TCA: Tile Council of America.
5. VOC: Volatile Organic Compound.

B. Definitions:
1. Manufacturer: Means the tile manufacturer, or the mortar and grout manufacturer, as applicable, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Verify the chemical and adhesive compatibility of the selected waterproofing/crack isolation membrane with any applied curing compounds specified in Section 03 35 00 or MVECS specified in Section 09 05 16.

2. Obtain either testing results or an affidavit from the waterproofing/crack isolation membrane manufacturer and the curing compound or MVECS manufacturer, evidencing that the selected waterproofing/crack isolation membrane is chemically and adhesively compatible with the curing compound or MVECS to which it will be applied, based on current product formulations.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
   2. Shop Drawings: Submit medium-scale dimensioned drawings showing tile layout, materials, joints, profiles, edge conditions, attachments to other work, and finishes.
      a. Include plan and elevation drawings of each surface indicated as faced with tile. All such drawings must show
         1) plan locations of all components, accessories and trim, including joint locations, openings, penetrations, and items installed in each surface;
         2) extent of each different tile type; and
         3) widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
   3. Samples:
      a. Submit 24-inch square samples of each tile type and composition, for each specified color and finish, glued to hardboard backing. Grout all joints with specified grout.
      b. Submit full-size units of each type of trim and accessory for each specified color and finish.
      c. Submit 6-inch long samples of each threshold material.

B. Informational Submittals:
   1. Installation Instructions:
      a. Before starting work, submit manufacturer-published instructions for the proper storage, handling, mixing, installation, and protection of each tile and installation material type.
      b. If the manufacturer's instructions are either unavailable or do not reflect Project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared application requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect before proceeding with the work.
   2. Qualification Statements: Before starting work, submit written descriptions of experience, including a list of projects successfully completed by the manufacturer and Installer within the past 5 years that were similar in material, design, complexity, and extent to this Project.

C. Closeout Submittals:

1. Operation and Maintenance Data: Submit to the Owner a copy of the manufacturer's recommendations for maintenance, including
   a. Recommendations for care, repair, restoration, cleaning, protection, maintenance, and troubleshooting;
   b. Recommendations for periodic inspections and identification of common causes of damage;
   c. Recommendations for cleaning tile and grout, and warnings against using materials and methods that may be detrimental to the quality, durability, appearance, and performance; and
   d. Instructions for both permanent repair and for temporary repair until permanent repair can be made.

D. Maintenance Material Submittals: Deliver extra stock materials to the Owner before Final Completion.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
   2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.
   3. Properly package and identify extra stock materials for use for future maintenance, repair, or replacement.

1.5 QUALITY ASSURANCE

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

B. Regulatory Requirements:
   1. Allowable VOC Content: Provide adhesives, sealers, and waterproofing membrane materials that conform to SCAQMD's Rule 1113 requirements for maximum VOC material content.
   2. Minimum Static Coefficient of Friction Value: Not more than 0.6 for level floor or deck surfaces, nor 0.8 for sloped floor or deck surfaces, when tested in conformance with ASTM C 1028. (CBC section 1124B.1/ADA Standard 4.5.1)

C. Qualifications:
   1. Manufacturers: Must be legal business entities with at least 10 consecutive years' experience manufacturing tile, installation materials, thresholds, and related items similar in material, design, complexity, and extent to this Project, and whose products have resulted in installations with a record of successful in-service performance.
   2. Installer: Must be a company and individuals with at least 5 consecutive years' experience in the installation on projects similar in material, design, complexity, and extent to this Project that have resulted in installations with a documented record of successful in-service performance.

D. Field Samples (post-submittal, *in situ* visual mockups): Include field samples as part of the work of this Section.
   1. Before starting work, including bulk purchase and delivery of products, prepare a field sample in a manner approved by the Architect to demonstrate the expected final visual effect of the planned installation.
   2. At a minimum, comply with the following:
      a. Size: At least 8 feet wide by full height of wall , and at least 4 feet square on the floor, centered on one outside wall corner.
      b. Illumination: Illuminate field samples with at least the same type and level of illumination maintained in the room or space after the building is occupied.
   3. The Architect reviews field samples to determine if the work falls within an acceptable range for
      a. visual appearance;
      b. mottling, sheen, color, and texture variation;
      c. evenness of finish;
      d. integration of the work of different trades;
      e. installation tolerances;
      f. overall quality;
      g. fabrication and installation (workmanship); and
      h. conformance to specified requirements.
   4. The Architect either rejects or approves field samples as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
      a. If a field sample is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
         1) Repeat field samples until the Architect approves them.
         2) Approval of field samples does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by Owner in writing.
      b. Upon written authorization from the Architect, field samples may remain part of the Work after being properly identified for future reference.

1.6 HANDLING

A. Packaging Requirements:
   1. Tile packages must be labeled in conformance with the requirements of ANSI A137.1.
   2. Each delivery must include with it
      a. master grade certificates for each type and composition of tile, signed by the manufacturer, indicating the tile type and grade, and that the delivered tile conforms to ANSI A137.1; and
      b. a copy of manufacturer-published or -prepared instructions for the proper storage, handling, mixing, installation, and protection of each item delivered.

B. Delivery and Acceptance Requirements:
   1. Delivery:

a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery, and in original unopened containers.
b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.
c. During transport and delivery, protect items from sources of deterioration and damage.

2. Acceptance at the Site:
   a. Inspect for damage all items delivered to the Project site.
   b. Reject delivery of items that show damage or have damaged containers.
   c. With a minimum of handling, unload and store only undamaged items and items that have undamaged containers.

C. Storage and Handling Requirements:
1. Storage:
   a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage. Provide adequate dunnage and bracing during storage.
   b. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Unvented polyethylene tarpaulins may not be used.
      1) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other damage.
      2) Store materials and place equipment in a manner to avoid permanent deflection of floor or roof decks.
2. Handling: Handle tile in a manner that prevents breakage or other damage.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become damaged.
1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

PART 2 - PRODUCTS

2.1 TILE SURFACING UNITS

A. Description: Tile conforming to ANSI A136.1 requirements for Standard grade.

B. Products: AS SELECTED BY THE ARCHITECT.

2.2 INSTALLATION MATERIALS

A. Waterproofing / Crack Isolation Membrane:

1. Description: 2-coat, trowel-applied, fungus and micro-organism resistant, flexible waterproofing and crack isolation membrane system conforming to ANSI A118.10 requirements for both interior and exterior applications.
2. Products: Design is based on “Mapelastic HPG” with “Bio-Block” antimicrobial protection.” manufactured by Mapei Corp. Other acceptable sources of comparable products include the following, contingent on demonstrated conformance to the specified requirements, including the item description above..
   a. “Laticrete 9235 Waterproofing Membrane” with “Microban” antimicrobial product protection by Laticrete International, Inc.
   b. “TEC Triple Flex” by Specialty Construction Brands.
   c. Or equal.
3. Accessories:
   a. Fiberglass Mesh: “Fiberglass Mesh” alkali-resistant reinforcing mesh.
   b. Preformed Accessories: “Mapeband” preformed, rubber-coated, polyester cove roll, inside corners, outside corners and a drain flashing.
   c. Moisture Reduction Barrier
      1) Application: Apply only to those areas (a) where test results indicate slab relative humidity or MVER exceed the selected waterproofing/crack isolation membrane manufacturer’s recommended limits; and (b) that do not already have a MVECS installed.
      2) Description: 2-component solvent-free epoxy coating specially formulated to reduce concrete’s moisture vapor transmission rates of up to 15 pounds per 1,000 square feet per 24 hours to a rate of below 3 pounds per 1,000 square feet per 24 hours.
      3) Product: Design is based on “Planiseal MRB” by Mapei Corp., or equal.

B. Polymer-Modified Cementitious Mortar

1. Ceramic and Porcelain Tile Mortar:
   a. Description: Premium-grade, single-component, ultra high-performance, polymer-modified thin-set Portland cement mortar conforming to ANSI A118.4.
   b. Products: Design is based on “Ultraflex 3” manufactured by Mapei Corp. Other acceptable sources of comparable products include the following.
      1) Ardex.
      2) Custom Building Products.
      3) Laticrete International, Inc.
      4) Or equal.
   c. Color: White.

C. Polymer-Modified Cement Grout:

1. Ceramic and Porcelain Tile Grout:

a. Description: Premium-grade premixed sanded Portland cement tile grout complying with ANSI A118. 7 and having specifically tailored, proprietary, integrally-mixed antimicrobial agent.
b. Product: Design is based on "Ultracolor" with "Bio-Block" antimicrobial protection manufactured by Mapei Corp. Other acceptable sources of comparable products include the following.
   1) Ardex.
   2) Custom Building Products.
   3) Laticrete International, Inc.
   4) Or equal.
c. Colors: AS SELECTED BY THE ARCHITECT.

2.3 ACCESSORIES

A. Finishing and Edge-Protection Profile for Outside Corners: Provide "Schluter-QUADEC Item No. Q 80 EB" manufactured by Schluter Systems, or equal.
   1. Height: 5/16-inch.
   2. Material and Finish: Brushed stainless steel.

B. Floor Transition Profiles: Provide "Schluter-RENO-U" manufactured by Schluter Systems, or equal.
   1. Heights:
      a. 1/8-inch: AEU 35.
      b. 5/16-inch: AEU 80.
      c. 3/8-inch: AEU 100.
      d. 1/2-inch: AEU 125.
   2. Material and Finish: Satin anodized aluminum.

C. Wall-to-Floor Transition: Provide "Schluter-DILEX-HK" manufactured by Schluter Systems, or equal.
   1. Cove Section Color: AS SELECTED BY THE ARCHITECT.
   2. Height: Height as required.

D. Trim Units: Coordinate with sizes and coursing of adjoining flat tile where applicable. Provide shapes as indicated.

E. Thresholds: AS SELECTED BY THE ARCHITECT.

F. Water: Fresh, clean, clear potable water from a domestic source conforming to ASTM C 94 and free of oil, grease, waxy films, curing compounds, release agents and other deleterious materials, including salts, acids, alkalis, organic materials, detergents or other matter, which might negatively affect plaster quality, strength, durability or performance or which might interfere with plaster curing, color or appearance.

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

H. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

I. Other Accessories: Provide other components, accessories and similar secondary items, including cleaning agents selected by the Contractor, as supplied, required, recommended, approved, or accepted by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

1. Examine substrates supporting tile, and other conditions under which such items are installed.
2. Verify that work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance.

B. Evaluation and Assessment:

1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.
2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 PREPARATION

A. Protection of In-Place Conditions:

1. Work Area Protection: Protect work areas from excessive dust and other airborne contaminants during surface preparation, tiling installation, and while mortars, grouts, and sealants are curing, setting, or drying.
2. Adjacent Material Protection: Protect adjacent surfaces not indicated as receiving tile from staining, overspray, and damage. Provide drop cloths, shields, masking, barricades and other protection necessary to provide adequate protection against adjacent surfaces becoming damaged

B. Surface Preparation:

1. Test substrates for alkalinity (pH), MVER, and relative humidity as specified in Section 09 05 16.
2. Prepare substrates in conformance with the requirements of Section 09 05 16 and the manufacturer's installation instructions. In the event of conflict between the manufacturer's instructions and the requirements of Section 09 05 16, the manufacturer's instructions govern.
3. Remove substrate coatings and other substances that are incompatible with installation materials or that may negatively affect the quality of the installation, durability, appearance, or performance of either the tile or the installation materials.

3.3 INSTALLATION

A. General:

1. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
2. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
3. Comply with the manufacturer's installation instructions for installing tile.
   a. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   b. Set items plumb, level, and square, with flush well-fitted joints, and in alignment with adjacent construction
4. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
5. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile .
6. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
7. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile . Do not saw-cut joints after installing tiles.
   a. Locate joints in tile surfaces directly above joints in concrete substrates.
   b. Prepare joints and apply sealants to comply with requirements in Section 07 92 00.
8. Grout tile in conformance with the requirements of ANSI A108.10.

B. Special Techniques:

1. Waterproofing/Crack Isolation Membrane Installation:

a. Install waterproofing to comply with ANSI A108.13 and the waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
b. Install crack-suppression membrane to comply with the manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.
c. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

2. Floor Tile Installation
   a. General: Install tile in conformance with the requirements of the TCA installation methods and ANSI A108 Series of tile installation standards.
   b. Thresholds: Install thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
   c. Grout Sealer: Apply grout sealer to cementitious grout joints in conformance with the grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.
3. Wall Tile Installation: Install types of tile designated for wall installations in conformance with the requirements of the TCA installation methods and ANSI setting-bed standards.

C. Installation Tolerances: Installed tile must fall within the following tolerances.
   1. From True Position: 1/4-inch.
   2. From Plumb, Alignment, and Level: 1/8-inch.

D. Conformance: Completed work must match the approved field samples, as determined by the Architect.

3.4 CORRECTION AND REPAIR

A. Correction:
   1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
      a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
      b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
         1) descriptions and locations of defective work;
         2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
         3) similar documentation and visual depictions of Contractor-proposed corrections.
      c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.

d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
   1) corrections being performed skillfully,
   2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
   3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
   4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.

2. Arrange and pay costs for either removing and reinstalling or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
   c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.5 CLEANING

A. Cleaning Installed Work:
1. Remove protective materials after installation.
2. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
   a. Protect other work from staining or damage caused by cleaning operations.
   b. Remove grout residue from tile as soon as possible. Clean grout smears and haze from tile in conformance with the manufacturer's application instructions, but not sooner than 10 days after installation.
   c. Only use cleaners recommended by manufacturer, and only after determining that cleaners are safe to use by testing samples of tile and other surfaces.
   d. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   e. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
3. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
4. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

1. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit traffic on tile flooring for at least 48 hours after grouting is completed.

B. Do not store anything adjacent to, on, or against installed tiles unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use tiled surfaces as work surfaces.

Remove protection when it’s no longer needed and before Substantial Completion.

ADA CAST-IN-PLACE DETECTABLE/TACTILE WARNING TILE

SECTION 09305

PART 1 GENERAL

1. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specifications Section, apply to this Section.

2. DESCRIPTION

A. This Section specifies furnishing and installing Cast-In-Place Detectable/Tactile Warning Tiles where indicated.

3. SUBMITTALS

A. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.

B. Samples for Verification Purposes: Submit three (3) samples of full size cast-in-place detectable/tactile warning tiles of the kind proposed for use.

C. Shop drawings are required for products specified showing fabrication details; tile surface profile; fastener locations; plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.

D. Material Test Reports: Submit test reports from qualified independent testing laboratory indicating that materials proposed for use are in compliance with requirements and meet the properties indicated.

E. Maintenance Instructions: Submit copies of manufacturer's specified maintenance practices for each type of detectable/tactile tile and accessory as required.

4. QUALITY ASSURANCE

A. Provide cast-in-place detectable/tactile warning tiles and accessories as produced by a single manufacturer.

B. Installer's Qualifications: Engage an experienced Installer certified in writing by tactile flooring manufacturer as qualified for installation, who has successfully completed tile installations similar in material, design, and extent to that indicated for Project. Manufacturer's supervisor shall be present at all times.

C. Americans with Disabilities Act (ADA): Provide detectable/tactile warning surfaces which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title 49 CFR TRANSPORTATION, Part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES. In addition products must

comply with CALIFORNIA TITLE 24 requirements regarding patterns, color and sound on cane contact.

D. Vitrified Polymer Composite (VPC) Cast-in-Place Detectable/Tactile Warning tiles shall be an epoxy polymer composition with an ultra-violet coating employing aluminum oxide particles in the truncated domes:

E. Dimensions:
Tile: Nominal 2 ft. by 2 ft. by 1.375 inches thick; 1.575 inches thick at the domes, with 1-3/8" inch deep perimeter flange and seven 1 3/8" deep internal flanges.

Assembly: shall be held within the following dimensions and tolerances:

Length and Width:	:	24" x 72" nominal
Depth	:	1.400" ± 5% max.
Face Thickness	:	0.125" ± 5% max.
Warpage of Edge	:	± 0.5% max.

F. Vitrified Polymer Composite (VPC) Cast-in-Place Detectable/Tactile Warning Tiles adhered to concrete shall meet or exceed the following test criteria:

1. Water Absorption of Tile when tested by ASTM D 570-98 not to exceed 0.05%.

2. Slip Resistance of Tile when tested by ASTM C 1028-96 Wet/Dry Static Co-efficient of Friction values are not to be less than 0.80 on top of domes and field area.

3. Compressive Strength of Tile when tested by ASTM D 695-02 not to be less than 28,000 psi.

4. Tensile Strength of Tile when tested by ASTM D 638-03 not to be less than 19,000 psi.

5. Flexural Strength of Tile when tested by ASTM D 790-03 not to be less than 25,000 psi.

6. Chemical Stain Resistance of Tile when tested by ASTM D 543-95 (re approved 2001) to withstand without discoloration or staining - 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel fuel and motor oil.

7. Abrasive Wear of Tile when tested by BYK - Gardner Tester ASTM D 2486-00* (*ATX-G-U Standard) with reciprocating linear motion of 37± cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block is to be 3.2 lb. Average wear depth shall not exceed 0.06 after 1000 abrasion cycles measured on the top surface of the dome representing the average of six measurement locations per sample.

8. Resistance to wear of unglazed ceramic tile by Taber Abrasion per ASTM C501-84 (re approved 2002) shall not be less than 500.

9. Fire Resistance of Tile when tested to ASTM E 84-05 flame spread be less than 15.

10. Gardner Impact to Geometry "GE" of the standard when tested by ASTM D 5420-04 to have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. lbf/in. A failure is noted when a crack is visible on either surface or when any brittle splitting is observed on the bottom plaque in the specimen.

11. Accelerated Weathering of Tile when tested by ASTM G 155-05a for 3000 hours shall exhibit the following result – $\Delta E < 4.5$, as well as no deterioration, fading or chalking of surface of tile color No 33538.

12. Accelerated Aging and Freeze Thaw Test of Tile and Structural Embedment Flange System when tested to ASTM D 1037-99 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects.

13. Salt and Spray Performance of Tile and Structural Embedment Flange System when tested to ASTM B 117-03 not to show any deterioration or other defects after 200 hours of exposure.

5. DELIVERY, STORAGE AND HANDLING

A. Tiles shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings, and tile type shall be identified by part number.

B. Tiles shall be delivered to location at building site for storage prior to installation.

6. SITE CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum temperature of 40 degrees F in spaces to receive tactile tiles for at least 48 hours prior to installations, during installation, and for not less than 48 hours after installation. Store the detectable/tactile tiles material in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 40 degrees F in areas where work is completed.

B. The use of water for work, cleaning or dust control, etc. shall be in contained and controlled and shall not be allowed to come into contact with the passengers or public. Provide barricades or screens to protect passengers or public.

C. Disposal of any liquids or other materials of possible contamination shall be made in accordance with federal state and local laws and ordinances.

D. Cleaning materials shall have code acceptable low VOC solvent content and low flammability if used on the site.

E. Contractor shall coordinate phasing and flagging personnel operations as specified elsewhere.

7. EXTRA STOCK

A. Deliver extra stock to warehouse designated by engineer. Furnish new materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification. Furnish not less than two (2) % of the supplied materials for each type, color and pattern installed.

8. GUARANTEE

A. Cast-in-Place Detectable/Tactile Warning Tiles shall be guaranteed in writing for a period of (10) ten years from date of final completion. The guarantee includes defective work, breakage, deformation, fading and chalking of finishes, and loosening of panels.

Part 2 PRODUCTS

1. MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

B. The Vitrified Polymer Composite (VPC) Cast-in-Place Detectable/Tactile Warning Tiles specified is based on Armor-Tile manufactured by Engineered Plastics Inc. (800-682-2525). Existing engineered ADA and California Title 24 field tested

products in service for a minimum of 2 years which are subject to compliance with requirements, may be incorporated in the work and shall meet or exceed the specified test criteria and characteristics.

C. Color: Yellow conforming to Federal Color No. 33538. Color shall be homogeneous throughout the tile. Tiles are also available in Light Grey (Federal Color No. 26280), Dark Grey (Federal Color No. 36118), Onyx Black (Federal Color No. 17038), Pearl White (Federal Color No. 37875), Brick Red (Federal Color No. 22144), Ocean Blue (Federal Color No. 15187), Ochre Yellow (Federal Color No. 23594), and Colonial Red (Federal Color No. 20109).

D. Substitutions: Substitutions shall be made only under provisions of the contract and must meet all applicable standards for compliance with Americans with Disabilities Act (ADA). Any proposed substitution must meet standards specified in paragraph 1.4 D, 1.4 E and must be equivalent in appearance and function to the tile specified herein.

2. MATERIALS

A. Heavy duty elastomeric polyurethane sealant as manufactured by Boiardi, Mapei, Bostik or approved equal.

PART 3 EXECUTION

1. INSTALLATION

A. During Cast-In-Place Detectable/Tactile Warning Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

B. The specifications of the structural embedment flange system and concrete sealants and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers.

C. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 - 7 to permit solid placement of the Cast-In-Place Detectable/Tactile Warning Tile system. An overly wet mix will cause the tile to float, therefore under all conditions, suitable weights such as concrete blocks or sandbags (25 lb) shall be placed on each 2' x 2' tile module.

D. Prior to placement of the Cast In Place Detectable/Tactile Warning Tile system, the contract drawings shall be reviewed and a layout drawing prepared by the installation contractor to resolve the issues related to pattern repeat, tile cuts,

expansion joints, control joints, platform curves, platform end returns and platform surface interferences.

E. The concrete pouring and finishing operations require typical mason's tools, however, a mason's line, radius edge (1/8 x 3/16" return) tool, 4' long x 2" wide x 1/8" thick steel straight edge, 25 lb. weights, vibrator wand and small sledge hammer with 2" x 6" x 20" wood tamping plate are specific to the installation of the Cast-In-Place System.

F. The concrete shall be poured and finished level, true and smooth to the required dimensions prior to tile placement. Immediately after pouring concrete, a mason's line should be strung parallel to track to act as a reference line for placement of tile, and then the tile assembly shall be placed true to the platform edge and to each other on the concrete. The Cast-In-Place tiles shall be tamped or vibrated into the fresh concrete to ensure that the field level of tile is flush to the adjacent concrete or platform edge surface. The shop drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes. The tolerance for elevation differences between tile and adjacent surface is 1/16".

G. Immediately after tile placement, the tile elevation is to be checked to adjacent concrete or rubbing board heights with a steel straight edge. The tile elevation should be set consistent with shop drawings to permit water drainage to or away from track as the platform design dictates.

H. While concrete is workable steel edging trowel 1/8" radius x 3/16" return is to be used to edge the tile to adjacent concrete surfaces running parallel to track. While edging, ensure that a clean edge definition is created between tile and adjacent concrete and that tile to concrete elevations meet the shop drawing tolerances.

I. The placement of Cast-In-Place Tile assemblies to each other and to the mason's line or form edge shall be true and parallel to develop a true line consistent with the platform edge. A tight tile to tile placement can best be achieved by raking out the concrete at the butting edge to avoid trapping concrete or aggregate between tiles and/or form edge.

J. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external force placed on the tile to rock the tile, causing a void between the underside of tile and concrete.

K. Following tile placement, review installation tolerances to shop drawings and adjust tile before the concrete sets, suitable weights of 25 lb. shall be placed on each tile and additional weights at tile to tile assemblies as necessary to ensure solid contact of tile underside to concrete.

L. Following the curing of the concrete, the protective plastic wrap is to be removed from the tile face by cutting the plastic with a sharp knife tight to the concrete/tile

interface. If concrete bleeding occurs between tiles, a wire brush will clean the residue without damage to the tile surface.

M. An elastomeric polyurethane sealant can be applied (not typical) to the tile edges running parallel to the track or curb. Proper surface preparation requires that the tile and adjacent surfaces are mechanically etched with sandpaper or a carbide burr and wiped clean and dry with acetone. Applications of the polyurethane sealant shall be level to the adjacent surface and a straight line formed to the tile edge. A quality installation of the sealant may require that the tile face be masked off with duct tape to ensure a clean definition of sealant to the adjacent surfaces.

N. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.

2. CLEANING AND PROTECTING

A. Protect tiles against damage during construction period to comply with Cast-in-Place detectable/tactile warning tile manufacturer's specification.

B. Protect Cast-in-Place detectable/tactile warning tiles against damage from rolling loads following installation by covering with plywood.

C. Clean Cast-in-Place detectable/tactile warning tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Cast-in-Place detectable/tactile tiles by method specified by tile manufacturer.

--- End of Section ---

SECTION 09 5110 –SUSPENDED ACOUSTICAL CEILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Suspended Acoustical Ceiling system and perimeter trim
   2. Acoustical panels

1.2 REFERENCES

A. ASTM C635 -Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings
B. ASTM E580 -Practice for Application of Ceiling Suspension Systems for Acoustical Tile ad Lay-in Panels in Area Requiring Seismic Restraints.
C. ASTM E1264 -Classification of Acoustical Ceiling Products
D. Ceiling and Interior Systems Contractors Association (CISCA) Acoustical Ceilings: Use and Practice.

1.3 SYSTEM DESCRIPTION

A. Suspension system to rigidly secure acoustic ceiling system including 9ntergral mechanical and electrical components with maximum deflection of 1/360
B. Scheduling:
   1. Sequence Work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested and approved
   2. Install acoustical units after interior wet work is dry.
   3. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit a list of proposed products and materials to be provided for a complete system, along with their manufacturer’s product data, specifications, and other data as necessary to demonstrate compliance with the specified requirements for each item listed.
   2. Samples:
      a. Submit two samples 6x6 inches in size illustrating material and finish of acoustic units.
      b. Submit two samples each, 6 inches long, of suspension system main runner, cross runner, edge trim, etc.
      c. Manufacturer's Installation instructions: Indicate special procedures, perimeter conditions required special attention.

3. Warranty Documentation: Submit final warranties signed by the manufacturer's field representative with complete terms clearly indicated for all warranties covering items furnished or installed under this Section.

B. Maintenance Material Submittals: Deliver extra stock materials to the Owner before Final Completion.
   1. Furnish paints from the same manufacturer and matching those installed, in an amount equal to 5 percent of the gross surface area for each type, color, finish, and variety installed, but not less than one gallon, container, or bucket, as applicable.
   2. Properly package and identify extra stock materials for future maintenance, repair, or replacement.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Must be a legal business entity with at least 3 consecutive years' experience manufacturing paints for use on projects similar in material, design, complexity, and extent to this Project, and whose products have resulted in applications with a record of successful in-service performance.
   2. Manufacturer's Field Representative: Must be an employee of the manufacturer, and have at least 3 consecutive years' technical field experience performing manufacturer's services on projects similar in material, design, complexity, and extent to this Project. Sales representatives do not qualify as experienced technical representatives.
   3. Applicator: Must be a company and individuals with at least 5 consecutive years' experience in the application of identical paints on comparable projects similar in material, design, complexity, and extent to this Project that have resulted in applications with a documented record of successful in-service performance.

1.6 HANDLING

A. Packaging Requirements: Each delivery must include with it a copy of manufacturer-prepared instructions for the proper storage, handling, mixing, application and protection of each product delivered.

B. Delivery and Acceptance Requirements:
   1. Delivery:
      a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery; in original unopened containers clearly marked with intact and legible identification labels indicating
         1) manufacturer's name and trademark;
         2) product type, size, grade, use, lot or batch number, and quantity; and
      b. During transport and delivery, protect items from (1) exposure to weather; (2) becoming wet; and (3) other sources of deterioration or damage.
   2. Acceptance at the Site:
      a. Inspect for damage all items delivered to the Project site.
      b. Reject the delivery of items that show damage or have damaged containers.

c. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:

1. Storage:
   a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage.
   b. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.
   c. Store materials and place equipment in a manner to avoid permanent deflection of floor or roof decks.
2. Handling:
   a. Protect items from excessive moisture during handling.
   b. Avoid contamination and damage to containers.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

1.7 WARRANTY

A. Manufacturer's Warranty: Acoustical ceiling tile must be covered by a written warranty that protects the Owner for at least 5 years after application against

1. defective products, materials, accessories, and systems;
2. patent or latent defects; and

B. Remedy: If acoustical ceiling tile products or applications fail within the specified warranty period, then the manufacturer shall replace defective items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - SUSPENSION SYSTEM

A. DONN 's Fine Line product for grid and suspension system
B. Substitution: Or equal manufacturer.

2.2 SUSPENSION SYSTEM MATERIALS

C. DONN 's Fine Line Series:
D. Grid Finish: White color in low gloss finish
E. Grid material: Commercial quality cold - rolled steel with galvanized coating.
F. Accessories: Stabilizer bars, clips, splices, edge molding, hold down clips, etc. required for complete suspension grid system

G. Support Channels and Hangers: Galvanized steel: siz and type to suite application, seismic requirements, and ceiling system flatness requirements specified.
H. Edge Finish:
White color for suspended ceiling system
Brown color for "Panel fiberboard" system in vaulted cathedral ceilings in Recreational and Childcare buildings.

2.3 MANUFACTURERS -ACOUSTICAL UNITS

A. Armstrong World Industires , Inc.

B. Substitutions: Or equal manufacturer

2.4 ACOUSTICAL UNIT MATERIAL

A. Acoustical Lay-in Panels for flat ceilings: ASTM E1264
- 24x48 inches in size lay-in tile "Cortega" .

B. Acoustical Fiberboard panels for cathedral ceiling in Recreational and childcare center:
1 x 6 inch acoustical fiberboard , wood finish , " Wood Haven" by Armstrong or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify all existing conditions prior to installation of work.
B. Verification layout of hangers will not interfer with other work.

3.2 PREPARATION

A. Protection of In-Place Conditions:
1. Work Area Protection: Protect work areas from excessive dust and other airborne contaminants during surface preparation, paint application, and while paint is drying.
2. Coordinate all mechanical and electrical work with installation.

3.3 INSTALLATION- GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C363, ASTM E580, manufacturer's instructions and as supplemented in this Section.
B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
C. Locate system on room axis according to Reflected Ceiling Plan, or as directed by Architect.
D. Coordination the location of hangers with other Work.
E. Provide hanger clips during installation of panels.
F. Hang suspension system independent of walls ,columns, ducts, pipes, and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members
G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hanger and related carrying channels to span the extra distance.
H. Do not support components on main runner or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner , or support component independently.
I. Do not eccentrically load system, or produce rotation of runners.
J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths.

Miter corners. Provide edge molding at junctions without interruptions.

K. Install edge molding between exposed beams in cathedral ceiling in Recreational and Childcare rooms. Fasten directly to beams.

L. Form expansion joints as required. Form to accommodate plus or minus 1 inch movement. maintain visual closure.

3.4 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical unit in accordance with manufacturer's instructions.
B. Fit acoustical unit in place , free from damaged edges or other defects detrimental to appearance.
C. Lay directional patterned units as indicated on the Reflected Ceiling plan or as directed by the Architect. Fit border trim neatly against abutting surfaces.
D. Install units after above ceiling Work is complete.
E. Install acoustical units level, in uniform plane and free from twist, warp and dents.
F. Install acoustic fiberboard T7G panels between exposed beams on edge molding. All above Work to be completed including batt insulation with vapor barrier.
G. Cut panels to fit irregular grid and perimeter edge trim. Field rabbet panels edges to fit.

3.5 CLEANING

A. Waste Management: After completing the work of this Section, leave work areas around the project site free from debris, materials, equipment, and related items.

3.6 ERECTION TOLERANCES

A. Maximum variation from flat and level surfaces: 1/8 inch in 10 feet.
B. Level perimeter edge angle with laser devise.
C. maximum variation from plumb of grid members caused by eccentric loads: 2 degrees.

END OF SECTION

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SECTION 09 51 13 – ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Mineral fiber acoustical ceiling panels.
2. Ceiling suspension systems.
3. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. AHJ: Authority (Authorities) Having Jurisdiction.
2. CAC: Ceiling Attenuation Class.
3. CBC: California Building Code.
4. CISCA: Ceiling s and Interior Systems Construction Association.
5. LR: Light Reflectance.
6. NRC: Noise Reduction Coefficient.
7. SWG: Steel Wire Gauge.

B. Definitions:
1. Manufacturer: Means the ceiling assembly manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate ceiling assembly layout and installation with adjacent construction elements that penetrates ceilings, or is supported by them, including
1. light fixtures;
2. HVAC equipment;
3. fire-suppression system components;
4. partition assemblies; and
5. perimeter conditions.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: Submit the manufacturer's product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
2. Shop Drawings: Submit medium-scale dimensioned drawings showing ceiling assembly layout, materials, joints, profiles, edge conditions, attachments to other work, and finishes.

a. Include plan drawings of each ceiling layout. All such drawings must show
   1) plan locations of all components, accessories and trim, including joint locations, openings, penetrations, and items installed in each surface;
   2) ceiling grid, overhead supports, and bracing locations; and
   3) extent of each different ceiling type.
b. Include project-specific large-scale dimensioned detail drawings showing profiles, joints, seams, and dimensions, including terminations, penetrations, interior and exterior corner conditions either not detailed in the product data, or indicated on the product data, but not in a manner specific to the Project. Furnish edge details where specified items abut adjacent items.
c. Indicate method of anchoring assemblies to supporting construction.
   1) Show fasteners brackets, clips, and similar attachments to other work.
   2) Label each attachment type by manufacturer's product name;
   3) Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.

3. Samples:
   a. Submit at least 12-inch square samples showing (1) typical panel construction with facing; and (2) edges finished as specified.
   b. Submit at least 12-inch long samples of each suspension system component, including suspension system members, moldings, and trim.

B. Informational Submittals:
1. Coordination Drawings: Submit minimum 1/4-inch scale dimensioned reflected ceiling drawings showing the following items coordinated with each other, based on input from installers of the items involved.
   a. Ceiling suspension system members.
   b. Method of attaching hangers to building structure. Furnish layouts for cast-in- place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
   c. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
2. Test and Evaluation Reports: Submit test reports evidencing compliance with the requirements of the AHJ. Submit current report from the International Code Council Evaluation Services (ICC-ES), or other qualified national testing organization acceptable to the AHJ evidencing ceiling assemblies and components units required for the Project conform to the requirements of the AHJ.
3. Installation Instructions:
   a. Before starting work, submit manufacturer-prepared, published instructions for proper acoustical panel ceiling installation.
   b. If manufacturer-published instructions are either unavailable or do not apply to Project-specific conditions, then consult with the manufacturer's technical representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing, and promptly distribute copies to the Architect before proceeding with the work.

C. Closeout Submittals:
1. Operation and Maintenance Data: Submit to the Owner a copy of the manufacturer's recommendations for maintenance, including

a. recommendations for care, repair, restoration, adjusting, cleaning, protection, maintenance, and troubleshooting;
b. recommendations for periodic inspections and identification of common causes of damage;
c. recommendations for cleaning and refinishing ceiling assemblies, and warnings against using materials and methods that may be detrimental to ceiling assembly quality, durability, appearance, and performance; and
d. instructions for both permanent repair and for temporary repair and patching until permanent repair can be made.

D. Maintenance Material Submittals: Deliver extra stock materials to the Owner before Final Completion.
1. Furnish full size ceiling panels suspension system components from the same manufacturer lot, or from consecutive lots, matching those installed, in an amount not less than 2 percent of the quantity of each size, type, color, pattern, composition, finish, and variety installed, but not less than one box or package.
2. Properly package and identify extra stock materials for use for future maintenance, repair, or replacement.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain ceiling systems and accessories through one source from a single manufacturer.

B. Regulatory Requirements:
1. Surface-Burning Characteristics: Provide ceiling panels having the following surface- burning characteristics, when tested in compliance with ASTM E 1264 for Class A materials, as determined by testing identical items in compliance with ASTM E 84:
a. Maximum Flame Spread Index Value: 25 or less.
b. Maximum Smoke Developed Index Value: Less than 450.

C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions per requirements of authorities having jurisdiction, and the following:
1. ASCE/SEI 7.

2. IR 25-5, “Metal Suspension Systems for Lay-In Panel Ceilings” and CBC Sections 803.9.1.1, 1614 and 2506.2.1.

1.6 HANDLING

A. Packaging Requirements: Each delivery must include with it a copy of manufacturer- published or -prepared instructions for the proper storage, handling, installation, and protection of each product delivered.

B. Delivery and Acceptance Requirements:
1. Delivery:
a. Deliver items to the Project site in conformance with the manufacturer’s requirements, recommendations, or instructions for transport and delivery, and in original unopened

containers.

b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.

c. During transport and delivery, protect items from sources of deterioration or damage.

2. Acceptance at the Site:

a. Inspect for damage all items delivered to the Project site.

b. Reject the delivery of items that show damage or have damaged containers.

c. With a minimum of handling, unload and store only undamaged items and items that have undamaged containers.

C. Storage and Handling Requirements:

1. Storage:

a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage. Provide adequate dunnage and bracing during storage.

a. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.

1) Store items so as to prevent bending, warping, twisting, or other damage.

2) Provide spacers to separate stored items and allow air to circulate around all surfaces.

3) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.

4) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture, or to ultraviolet radiation in excess of the manufacturer's recommended exposure limits.

5) Store materials in a manner to avoid permanent deflection of floor or roof decks.

2. Handling: Handle ceiling panels in a manner that prevents bending, warping, twisting or other damage, and avoids chipping edges or damaging units.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.

2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

1.7 PROJECT CONDITIONS

A. Temperature and Relative Humidity:

1. Install ceiling assemblies only if the temperature and relative humidity have been maintained within a range required, recommended, approved, or accepted by the manufacturer for at least 96 hours before installation.

2. Acclimate ceiling panels to the specified temperature and relative humidity conditions

for at least 72 hours before installation.

3. After ceiling assemblies have been installed, maintain a constant temperature of at least 60 deg. F until Final Completion.

B. Measurements:

1. Field-verify measurements before ordering ceiling assembly components, and indicate those field measurements on shop drawings.
2. Establish layouts that conform to the ceiling layouts shown on the reflected ceiling plans. Balance border widths at opposite edges of each ceiling. Avoid using less- than-half-width panels at borders.
3. Provide enough additional material during fabrication to allow for proper trimming and fitting at the Project site.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS AND SUSPENSION SYSTEMS

A. Products: AS SELECTED BY THE ARCHITECT.

2.2 CEILING TRIM SYSTEMS

A. Trim and Transition Molding: AS SELECTED BY THE ARCHITECT.

B. Wall Molding: The following, with exposed flanges prefinished to match suspension system

1. Perimeter Molding: 7/8-inch by 7/8-inch, and 7/8-inch by 2-inch perimeter angle moldings.
2. Reveal Molding: 3/8-inch by 3/8-inch reveal molding.
3. Shadow Molding: 7/8-inch flange by 2-inch high by 3/4-inch reveal hemmed-edge shadow molding

2.3 ACCESSORIES

A. Attachment Devices: Sized for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.

B. Wire: Soft temper, zinc-coated, pre-stretched, galvanized carbon steel wire complying with ASTM A 641 Class 3 or A coating, and having a minimum yield-stress load of 3 times the design load.

1. Hanger Wire: Minimum 0.162-inch diameter (SWG 8).
2. Diagonal Bracing Wire: Minimum 0.106-inch diameter (SWG 12).

C. Seismic Clips:

1. Description: 2-inch beam end retaining clip that joins main beam or cross tee to wall molding and web of grid with no visible pop rivets.
2. Products: “ACM7” clips by USG Interiors, Inc., or equal by Armstrong World Industries.

D. Seismic Separation Joints: Provide ceiling system manufacturer's standard at seismic separation joints at ceiling locations where the contiguous area of non-broken ceiling is 2,500 square feet or greater.

E. Compression Struts:

1. Cold or hot rolled angles, loadbearing or non-loadbearing studs, EMT or rigid conduit, or black iron.
2. Cold-rolled steel section with maximum L/R ratio of 200.

F. Engineered Compression Struts: As an alternate to compressions struts indicated above, manufactured compression struts may be provided when installed in compliance with its manufacturer's instructions.

1. Description: Pre-engineered telescoping seismic compression posts manufactured from heavy-wall galvanized tubing.
2. Products: Design is based on "Donn Brand Compression Post VAS" by USG Interiors, Inc., or equal by Armstrong World Industries.

G. Other Accessories: Install or apply other accessories and similar secondary items as supplied, required, recommended, approved, or accepted by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.

1. Examine substrates supporting ceiling assemblies, and other conditions under which such items are installed.
2. Verify that work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements, and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance.

B. Evaluation and Assessment:

1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.
2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 INSTALLATION

A. General:

1. Comply with the manufacturer's instructions for installing ceiling assemblies.
2. Use materials and methods required, recommended, approved, or accepted by the manufacturer,

along with manufacturer-recommended accessories and techniques.

3. Set items level, and square, without panel warp or rack, with flush well-fitted joints, and in alignment with adjacent construction

B. Special Techniques:

1. Suspend ceiling hangers from building's structural members and as follows:
   a. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   b. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   c. Where width of ducts and other construction within ceiling plenums produce hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   d. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   e. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

f. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
g. Do not attach hangers to steel deck tabs.
h. Do not attach hangers to steel roof deck. Attach hangers to structural members.
i. Space hangers not more than 48 inches on center along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
j. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

2. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.
3. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   a. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   b. Screw attach moldings to substrate at intervals not more than 16 inches O.C. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
   c. Do not use exposed fasteners, including pop rivets, on moldings and trim.
4. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
5. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   a. Arrange directionally patterned acoustical panels as follows:
      1) As indicated on reflected ceiling plans.
      2) Install panels with pattern running in one direction parallel to short axis of space.
   b. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
   c. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
   d. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

C. Installation Tolerances: Installed assemblies must be within the following tolerances.
   1. From true position: 1/4-inch.
   2. From plumb, alignment and level: 1/8-inch.

D. Attachment: Securely attach ceiling items and accessories in place to supporting construction.

3.3 CORRECTION AND REPAIR

A. Correction:
   1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer's field representative and the Architect.
      a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
      b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
         1) descriptions and locations of defective work;
         2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
         3) similar documentation and visual depictions of Contractor-proposed corrections.
      c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
      d. Corrected work must also be inspected by the Owner's testing agency and re- tested, as applicable.
      e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
         1) corrections being performed skillfully,
         2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
         3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
         4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
   2. Arrange and pay costs for either removing and reinstalling or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:
   1. Repair or refinish items that
      a. are damaged, loose, chipped, broken, stained, or corroded;
      b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
      c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
   2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Tests and Inspections: Testing and inspecting of completed installations of acoustical panel ceiling hangers and anchors and fasteners takes place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Extent of Each Test Area: When installation of ceiling Suspension Assemblies on each floor has reached 20 percent completion but no panels have been installed.
2. Testing Methods:
   a. Within each test area, testing agency selects one out of every 10 power-actuated fasteners and post installed anchors used to attach hangers to concrete and tests them for 200 lbf of tension; testing agency also selects one of every 2 post installed anchors used to attach bracing wires to concrete and tests them for 440 lbf of tension.
3. Results: When testing discovers fasteners and anchors that do not comply with the specified requirements, testing agency tests those anchors not previously tested until 20 pass consecutively, and then resumes the initial testing frequency.

C. Remove and replace acoustical panel ceiling hangers and anchors and fasteners that do not pass tests and inspections and retest as specified above.

3.5 CLEANING

A. Cleaning Installed Work:

1. Remove manufacturer's protective materials after installation.
2. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.
3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
   a. Protect other work from staining or damage caused by cleaning operations.
   b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
4. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas around the project site free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Remove protection when it's no longer needed and before Substantial Completion.

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SECTION 09 65 00 –RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient tile flooring
   2. Vinyl Composition floor tile
   3. Resilient base
   4. Trim units.

B. Related Requirements:
   1. Section 930 00 for preparation of tile flooring to receive sheet vinyl flooring.
   2. Section 09 05 16 for preparation of concrete slabs for tile flooring.

1.1 REFERENCES

A. ASTM-EE84 Surface Burning Characteristics of Building Material
B. ASTM F1066 Vinyl Composition Floor Tile
C. FS L-F-475 Floor Covering, Vinyl Surface (Tile and Roll), with Backing.
D. FS SS-W-40 Wall Base: Rubber and Vinyl Plastic.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify the chemical and adhesive compatibility of the selected waterproofing/crack isolation membrane with any applied curing compounds.
   2. Obtain either testing results or an affidavit from the waterproofing/crack isolation membrane manufacturer and the curing compound or MVECS manufacturer, evidencing that the selected waterproofing/crack isolation membrane is chemically and adhesively compatible with the curing compound or MVECS to which it will be applied, based on current product formulations.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer's product data, specifications, sizes, patterns and color samples, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
   2. Samples:
      a. Submit two samples of actual size, illustrating color and pattern for each floor tile of each color specified. Min 24-inch square samples of sheet vinyl flooring type and composition, for each specified color and finish.
      b. Submit two 4 inch long samples of base material for each color specified.
      c. Submit full-size units of each type of trim and accessory for each specified color and

finish.

d. Submit 6-inch long samples of each threshold material.

B. Informational Submittals:

1. Installation Instructions:

a. Before starting work, submit manufacturer-published instructions for the proper storage, handling, mixing, installation, and protection of each tile and installation material type.

b. If the manufacturer's instructions are either unavailable or do not reflect Project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared application requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect before proceeding with the work.

2. Qualification Statements: Before starting work, submit written descriptions of experience, including a list of projects successfully completed by the manufacturer and Installer within the past 5 years that were similar in material, design, complexity, and extent to this Project.

C. Closeout Submittals:

1. Operation and Maintenance Data: Submit to the Owner a copy of the manufacturer's recommendations for maintenance, including

a. Recommendations for care, repair, restoration, cleaning, protection, maintenance, and troubleshooting;

b. Recommendations for periodic inspections and identification of common causes of damage;

D. Maintenance Material Submittals: Deliver extra stock materials to the Owner before Final Completion.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Properly package and identify extra stock materials for use for future maintenance, repair, or replacement.

1.4 QUALITY ASSURANCE

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

B. Regulatory Requirements:

1. Allowable VOC Content: Provide adhesives, sealers, and waterproofing membrane materials that conform to SCAQMD's Rule 1113 requirements for maximum VOC material content.

2. Minimum Static Coefficient of Friction Value: Not more than 0.6 for level floor or deck surfaces, nor 0.8 for sloped floor or deck surfaces, when tested in conformance with ASTM C 1028. (CBC section 1124B.1/ADA Standard 4.5.1)

C. Qualifications:

1. Manufacturers: Must be legal business entities with at least 10 consecutive years' experience manufacturing tile, installation materials, thresholds, and related items similar

in material, design, complexity, and extent to this Project, and whose products have resulted in installations with a record of successful in-service performance.

2. Installer: Must be a company and individuals with at least 5 consecutive years' experience in the installation on projects similar in material, design, complexity, and extent to this Project that have resulted in installations with a documented record of successful in-service performance.

1.5 HANDLING

A. Packaging Requirements:
   1. Tile packages must be labeled in conformance with the requirements of ANSI A137.1.
   2. Each delivery must include with it
      a. master grade certificates for each type and composition of tile, signed by the manufacturer, indicating the tile type and grade, and that the delivered tile conforms to ANSI A137.1; and
      b. a copy of manufacturer-published or -prepared instructions for the proper storage, handling, mixing, installation, and protection of each item delivered.
      c. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery, and in original unopened containers.
      d. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.
      e. During transport and delivery, protect items from sources of deterioration and damage.
   3. Acceptance at the Site:
      a. Inspect for damage all items delivered to the Project site.
      b. Reject delivery of items that show damage or have damaged containers.
      c. With a minimum of handling, unload and store only undamaged items and items that have undamaged containers.

B. Storage and Handling Requirements:
   1. Storage:
      a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage. Provide adequate dunnage and bracing during storage.
      b. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Unvented polyethylene tarpaulins may not be used.
   2. Handling: Handle tile in a manner that prevents breakage or other damage.

C. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become damaged.
   1. Remove and dispose of damaged items at a disposal location away from the Project site.
   2. Replace removed items with undamaged new items.

PART 2 - PRODUCTS

2.1 MATERIALS - TILE FLOORING

A. Vinyl Composition Tile : ASTM F1066:
Size: 12x12 inches, Thickness: 1/8 inch
Design: See drawings finish schedule for products as selected by Architect from manufacturer's standard selections (verify with Architect)
Manufacturers:
a. Armstrong
b. Azrock
c. Substitution: As equal manufacturer

B. Sheet Vinyl Flooring:
Size: standard manufactures rolls. Thickness: 1/8 inch
Welded seams
Integral cove base 6" ht in all toilet rooms, kitchen, and janitor rooms.
Design: See drawing Finish Schedule for products as selected by Architect from manufacturer's standard selections (verify with Architect)
Manufacturers:
a. Patcraft
b. Armstrong
c. Substitution: As equal manufacturer

C. Resilient Base
Base: ASTM F-1861 Type TS and Type TP Group 1 (solid) Standard specifications for Rubber, top set, pre-molded external corners.
Height: 4 inches, thickness: 0 .125 inch
Color: See drawing Finish Schedule for products as selected by Architect from manufacturer's standard selections.
Manufacturers:
a. Burke Flooring Products
b. Substitutions: As equal manufacturer

Base accessories: Pre-molded end stops and external corners f same material, size and color as base.

2.2 INSTALLATION MATERIALS

A. Waterproofing / Crack Isolation Membrane:

1. Description: 2-coat, trowel-applied, fungus and micro-organism resistant, flexible waterproofing and crack isolation membrane system conforming to ANSI A118.10 requirements for both interior and exterior applications.
2. Products: Design is based on “Mapelastic HPG” with “Bio-Block” antimicrobial protection.” manufactured by Mapei Corp. Other acceptable sources of comparable products include the following, contingent on demonstrated conformance to the specified requirements, including the item description above..
   a. “Laticrete 9235 Waterproofing Membrane” with “Microban” antimicrobial product protection by Laticrete International, Inc.
   b. “TEC Triple Flex” by Specialty Construction Brands.
   c. Or equal.

3. Accessories:
   a. Moisture Reduction Barrier
      1) Application: Apply only to those areas (a) where test results indicate slab relative humidity or MVER exceed the selected waterproofing/crack isolation membrane manufacturer's recommended limits; and (b) that do not already have a MVECS installed.
      2) Description: 2-component solvent-free epoxy coating specially formulated to reduce concrete's moisture vapor transmission rates of up to 15 pounds per 1,000 square feet per 24 hours to a rate of below 3 pounds per 1,000 square feet per 24 hours.
      3) Product: Design is based on "Planiseal MRB" by Mapei Corp., or equal.

   b. Products: Design is based on "Ultraflex 3" manufactured by Mapei Corp. Other acceptable sources of comparable products include the following.
      1) Ardex.
      2) Custom Building Products.
      3) Laticrete International, Inc.
      4) Or equal.
   c. Color: White.

2.3 ACCESSORIES

A. Finishing and Edge-Protection Profile for Outside Corners: Provide "Schluter-QUADEC Item No. Q 80 EB" manufactured by Schluter Systems, or equal.
   1. Height: 5/16-inch.
   2. Material and Finish: Brushed stainless steel.

B. Floor Transition Profiles: Provide "Schluter-RENO-U" manufactured by Schluter Systems, or equal.
   1. Heights:
      a. 1/8-inch: AEU 35.
      b. 5/16-inch: AEU 80.
      c. 3/8-inch: AEU 100.
      d. 1/2-inch: AEU 125.
   2. Material and Finish: Satin anodized aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine substrates supporting tile, and other conditions under which such items are installed.
   2. Verify that work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance.

B. Evaluation and Assessment:

1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.
2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 PREPARATION

A. Protection of In-Place Conditions:

1. Work Area Protection: Protect work areas from excessive dust and other airborne contaminants during surface preparation, flooring installation from other work being performed at job site.

B. Surface Preparation:

1. Remove substrate coatings and other substances that are incompatible with installation materials or that may negatively affect the quality of the installation, durability, appearance, or performance of either the flooring or base installation materials concrete ridges and bumps. Fill low spots, cracks, joint, holes and other defects with filler to achieve smooth, flat hard surface.
2. Prohibit traffic until filler is cured.
3. Vacuum clean substrate
4. Apply primer to surfaces.

3.3 INSTALLATION

A. General:

1. Install in accordance with manufacturer's instructions. Comply with the manufacturer's installation instructions for installing tile.
   a. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   b. Set items plumb, level, and square, with flush well-fitted joints, and in alignment with adjacent construction
2. Mix tile from container to ensure shade variations are consistent when tile is placed
3. Spread only enough adhesive to permit installation of material before initial set.
4. Set flooring in place, press with heavy roller to attain full adhesion.
5. Lay flooring with joints parallel to building lines to produce symmetrical tile pattern.
6. Install tile with direction of tile pattern in same direction. Install flooring roll material with pattern in same direction.
7. Terminate flooring at centerline of door openings wher adjacent floor finish is dissimilar.
8. Install metal edge strips at unprotected or exposed edges, and where floor terminates. Secure metal strip with stainless steel screws.
9. Scribe flooring to walls, columns, cabinets, flooring outlets and other appurtenances to

produce tight joints.

10. Sheet vinyl : All seams, joints to have welded seams in accordance with manufacturers standard installation procedures.

3.4 CLEANI
NG

A. Cleaning Installed Work:
   1. Remove protective materials after installation.
   2. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
      a. Protect other work from staining or damage caused by cleaning operations.
      b. Only use cleaners recommended by manufacturer, and only after determining that cleaners are safe to use by testing samples of tile and other surfaces.
      c. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
      d. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
   3. Clean, seal and wax flooring and base surfaces in accordance with manufacturer's instructions.
   4. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.5 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.
   1. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
   2. Prohibit traffic on tile flooring for at least 48 hours after grouting is completed.

A. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

SECTION 09 65 13 – RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Rubber wall base.
2. Resilient transitional moldings.
3. Installation materials, including adhesives.
4. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
1. Section 09 05 16 for preparation of concrete slabs.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. MVECS: Moisture Vapor Emission Control System.
2. MVER: Moisture Vapor Emissions Rate.
3. SCAQMD: South Coast Air Quality Management District.

B. Definitions:
1. Resilient Product: Means the wall base, transitional molding, or stair accessory, as applicable.
2. Manufacturer: Means the resilient base, transitional molding, or stair accessory manufacturer, as applicable, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Verify the chemical and adhesive compatibility of the selected resilient stair accessories and resilient stair accessories adhesive with any applied curing compounds specified in Section 03 35 00 or MVECS specified in Section 09 05 16.
2. Obtain either testing results or an affidavit from the resilient stair accessories and resilient stair accessories adhesive manufacturer, and the curing compound or MVECS manufacturer, evidencing that the selected resilient stair accessories and resilient stair accessories adhesive is chemically and adhesively compatible with the curing compound or MVECS to which it will be applied, based on current product formulations.

B. Sequencing:

1. Install resilient products only after flooring installation is complete.
2. Install resilient products only after other finishing operations, including painting, are complete.
3. Do not install resilient stair accessories over concrete until the concrete has cured; the concrete is sufficiently dry to bond with adhesive; and the concrete has pH (alkalinity), MVER, and relative humidity within ranges required, recommended, approved, or accepted by the manufacturer, as determined by testing in conformance with Section 09 05 16.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: Submit manufacturer's product data, specifications, typical instruction details, and other data necessary to demonstrate conformance to the specified requirements.
2. Samples: Submit full-height, and at least 6-inch long samples, of each resilient product in each color required.

B. Informational Submittals:

1. Installation Instructions:
   a. Before starting work, submit manufacturer-prepared, published instructions for the proper installation of each resilient product.
   b. If manufacturer-published instructions are either unavailable or do not apply to Project-specific conditions, then consult with the manufacturer's technical representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing, and promptly distribute copies to the Architect before proceeding with the work.

C. Closeout Submittals:

1. Operation and Maintenance Data: Submit to the Owner a copy of the manufacturer's recommendations for maintenance, including
   a. recommendations for care, repair, restoration, adjusting, cleaning, protection, maintenance, and troubleshooting;
   b. recommendations for periodic inspections and identification of common causes of damage;
   c. recommendations for cleaning the resilient products, and warnings against using materials and methods that may be detrimental to quality, durability, appearance, and performance; and
   d. instructions for both permanent repair and for temporary repair until permanent repair can be made.

D. Maintenance Material Submittals: Deliver extra stock materials to the Owner before Final Completion.

1. Furnish full-length, size, and width resilient products from the same manufacturer lot, or from consecutive lots, matching those installed, in an amount not less than 10

linear feet for every 500 linear feet, or fraction thereof in roll form, if applicable, of each size, type, color, pattern, composition, grade, finish, and variety installed.

2. Properly package and identify extra stock materials for future maintenance, repair, or replacement.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of rubber base and transitional molding through one source from a single manufacturer.

B. Regulatory Requirements: Provide adhesives that conform to SCAQMD's Rule 1113 requirements for maximum VOC material content.

1.6 HANDLING

A. Packaging Requirements: Each delivery must include with it a copy of manufacturer- prepared instructions for the proper storage, handling, installation, and protection of each product delivered.

B. Delivery and Acceptance Requirements:
   1. Delivery:
      a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery; in original unopened containers clearly marked with intact and legible identification labels indicating
         1) manufacturer's name and trademark; and
         2) product type, size, grade, use, lot or batch number, and quantity.
      b. During transport and delivery, protect items from (1) prolonged exposure to UV radiation in excess of the manufacturer's recommended limits; (2) exposure to weather; (3) becoming wet; and (4) other sources of deterioration or damage.
   2. Acceptance at the Site:
      a. Inspect for damage all items delivered to the Project site.
      b. Reject the delivery of items that show damage or have damaged containers.
      c. With a minimum of handling, unload and store only undamaged items.

C. Storage Requirements:
   1. Storage:
      a. Store items as shipped, in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage.
      b. Store rubber base and transitional moldings with labels up, and ensure that color, roll and batch numbers can be easily read.
      c. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Unvented polyethylene tarpaulins may not be used.
         1) Incline stored items to provide maximum drainage of accumulated moisture.

2) Provide spacers to separate stored items and allow air to circulate around all surfaces.
3) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other damage.

d. Do not overload decks with localized concentration of resilient accessories and materials.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.
1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

F. PROJECT CONDITIONS

G. Temperature and Relative Humidity:
1. Install rubber base and transitional moldings only if the temperature and relative humidity have been maintained within a range required, recommended, approved, or accepted by the manufacturer for at least 48 hours before installation.
2. Acclimate rubber base and transitional moldings to the specified temperature and relative humidity conditions for at least 48 hours before installation.
3. After rubber base and transitional moldings installation, maintain temperature and relative humidity within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

PART 2 - PRODUCTS

2.1 RUBBER WALL BASE

A. Description: Solid thermoset vulcanized SBR rubber base complying with ASTM F 1861 requirements for Type TS (vulcanized thermoset), Group I (homogenous) bases.

B. Items must conform to the following:
1. Products: AS SELECTED BY THE ARCHITECT.
2. Height: AS SELECTED BY THE ARCHITECT.
3. Colors: AS SELECTED BY THE ARCHITECT.
4. Profile: AS SELECTED BY THE ARCHITECT.

C. Performance Requirements:
1. Fire Class: Provide Class A materials and products having a maximum flame spread index value of 25 or less and smoke developed index of less than 450 when, tested as an assembly at the intended thickness in compliance with ASTM E 84.

2. Radiant Flux Classification: Average Class 1 critical radiant flux value of at least 0.45 watts per square centimeter within exits and access to exits, when tested in compliance with ASTM E 648.

2.2 TRANSITIONAL MOLDINGS

A. Products: AS SELECTED BY THE ARCHITECT.

B. Profiles: AS SELECTED BY THE ARCHITECT.

C. Colors: AS SELECTED BY THE ARCHITECT.

2.3 ACCESSORIES

A. Trowelable Leveling and Patching Compounds: As specified in Section 03 35 00, or as otherwise supplied, required, recommended, or approved by the manufacturer for the applications indicated.

B. Adhesives: Water-resistant type furnished, required, recommended, or approved by the manufacturer for the applications indicated.

C. Other Accessories: Provide other accessories and similar secondary items as supplied, required, recommended, approved, or accepted by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine substrates and other conditions under which the rubber base and transitional moldings are installed.
   2. Verify that
      a. work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance;
      b. substrates are dry and free of curing compounds, sealers, and hardeners; and
      c. substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of rubber base and transitional moldings.

B. Evaluation and Assessment:
   1. Reject work that does not conform to the manufacturer's installation requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

2. Proceeding with installation stipulates the Installer's acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's installation requirements.

3.2 PREPARATION

A. Protection of In-Place Conditions:
   1. Work Area Protection: Protect work areas from excessive dust and other airborne contaminants during surface preparation, and rubber base and transitional moldings installation.
   2. Adjacent Material Protection: Protect adjacent surfaces not indicated as receiving rubber base and transitional moldings from staining and damage. Provide drop cloths, shields, masking, barricades and other protection necessary to provide adequate protection against adjacent surfaces becoming damaged

B. Surface Preparation:
   1. Test substrates for alkalinity (pH), MVER, and relative humidity as specified in Section 09 05 16.
   2. Prepare substrates in conformance with the requirements of Section 09 05 16 and the manufacturer's installation instructions. In the event of conflict between the manufacturer's instructions and the requirements of Section 09 05 16, the manufacturer's instructions govern.
   3. Remove substrate coatings and other substances that are incompatible with adhesives or that may negatively affect the quality of the installation, durability, appearance, or performance of either the furnished rubber base and transitional moldings or adhesives.

3.3 INSTALLATION

A. General:
   1. Comply with the manufacturer's installation instructions for installing rubber base and transitional moldings. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

B. Special Techniques:
   1. Rubber Base Installation:
      a. Apply rubber base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
      b. Install rubber base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
      c. Tightly adhere rubber base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
      d. Do not stretch rubber base during installation.

e. On masonry surfaces or other similar irregular substrates, fill voids along top edge of rubber base with manufacturer's recommended adhesive filler material.
f. Use straight pieces of maximum lengths possible to form corners; form without producing discoloration (whitening) at bends.

2. Transitional Moldings Installation: Butt resilient transitional moldings to adjacent materials, and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of flooring that would otherwise be exposed.

3.4 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.
   a. Correction of defective work is only permitted when visual appearance is not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
      3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
      4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
2. Arrange and pay costs for either removing and reinstalling or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer’s field representative and the Architect.

B. Repair:

1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, or stained, or
   b. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.

2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.5 CLEANING

A. Cleaning Installed Work:
   1. Remove manufacturer's protective materials after installation.
   2. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
      a. Protect other work from staining or damage caused by cleaning operations.
      b. Remove adhesive and other blemishes from base and accessory surfaces.
      c. Damp-mop surfaces to remove marks and soil.
      d. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
   3. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
   4. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to, on, or against installed items unless they are adequately protected from damage and staining, as determined by the Architect.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 09 91 00 –PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Exterior and interior acrylic latex paint.
   2. Surface preparation for painting.
   3. Supplementary accessories and detail work necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. DFT: Dry Film Thickness.
   2. SCAQMD: South Coast Air Quality Management District.
   3. VOC: Volatile Organic Compound.

B. Definitions:
   1. Manufacturer: Means the paint manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Paint all interior and exterior exposed surfaces throughout the Project, except as excluded below.
      a. Paint all exposed surfaces whether or not colors are designated, except where the natural finish of the material is obviously intended or specifically noted as a surface not to be painted.
      b. Where items or surfaces are not specifically mentioned, paint them to match adjacent similar materials or areas.
      c. Unless specifically indicated, do not paint the following surfaces:
         1) Concrete.
         2) Steel decking.
         3) Roofing.
         4) Insulation and its facing.
         5) Finish hardware, except those items specified with a USP finish.
         6) Refinished metal surfaces such as anodized aluminum, stainless steel, chromium plating, copper, bronze, brass and similar finished materials.
         7) Walls or ceilings in concealed and inaccessible areas, such as furred areas, chases, and shafts.
         8) Moving, mechanical or electrical parts of operating units, such as valve and damper

operator linkages, sensing devices, motor and fan shafts or similar parts.

9) Nameplates, code-required labels such as UL and FM, or other equipment identification, performance rating, name, or nomenclature plates.

2. Specified surface preparation, priming and coats of paint are in addition to shop priming and surface preparation specified in other Sections.
3. Provide paints of the same generic chemistry as the specified paint system components and that also meet or exceed the performance requirements of the specified products. Proposed substitutions that change the generic chemistry of specified paints will not be considered.
4. For primed surfaces indicated as painted, review for compatibility the specification sections that specify the primers, along with the primer manufacturer's product data.
   a. Provide finish coats compatible with the prime coats used; provide barrier coats over incompatible primers; or remove primer completely and re-prime.
   b. Verify compatibility of all other components within the total paint system.
5. Specified paint thicknesses and coverage rates are minimums; where manufacturer's paint recommendations differ from specified thickness and coverage rate, consult with manufacturer's technical representative, obtain manufacturer-prepared requirements, recommendations or instructions in writing, and promptly distribute copies to Architect prior to starting work.

B. Scheduling:
1. In some instances, primers not finish coated for 30 days may require abrading to create a profile for finish coat to properly bond. Verify with primer manufacturer.
2. Otherwise, schedule paint application to limit exterior exposure of primed steel surfaces to a maximum of not more than 60 calendar days.
3. Re-prime steel surfaces that have been exposed to the exterior for any period of time exceeding 60 calendar days; comply with the paint manufacturer's instructions for re-priming.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: Submit a list of proposed products and materials to be provided for a complete system, along with their manufacturer's product data, specifications, and other data as necessary to demonstrate compliance with the specified requirements for each item listed.
   a. Identify materials by manufacturer's name and product label or stock number.
   b. Prepare a repetitive list of the specified paint finishes, with the addition of specific products intended for each coat.
2. Samples:
   a. Submit 8-1/2-inch by 11-inch drawdown cards of each painted finish color and sheen. Label each sample for Project location and indicate either interior or exterior application.
   b. Submit stepped samples with each coat, including prime coats, separately identified.
   c. Submit a list of materials to which each coat of each sample will be applied.
   d. Use representative colors when preparing samples.

B. Closeout Submittals:
1. Operation and Maintenance Data: Submit to the Owner a copy of the manufacturer's recommendations for maintenance, including
   a. recommendations for care, protection, maintenance, and troubleshooting;

b. recommendations for periodic inspections and identification of common causes of damage;
c. recommendations for cleaning, and refinishing paints, including warnings against using materials and methods that may be detrimental to paint quality, durability, appearance, and performance; and
d. instructions for both permanent repair, and temporary repair until permanent repair can be made.

2. Warranty Documentation: Submit final warranties signed by the manufacturer's field representative with complete terms clearly indicated for all warranties covering items furnished or installed under this Section.

C. Maintenance Material Submittals: Deliver extra stock materials to the Owner before Final Completion.
1. Furnish paints from the same manufacturer and matching those installed, in an amount equal to 5 percent of the gross surface area for each type, color, finish, and variety installed, but not less than one gallon, container, or bucket, as applicable.
2. Properly package and identify extra stock materials for future maintenance, repair, or replacement.

1.5 QUALITY ASSURANCE

A. Source Limitations:
1. Obtain each paint type and accessory through one source from a single manufacturer.
2. Products may only be obtained from a manufacturer that sends a qualified field representative to the Project site before the start of work to verify existing conditions; and also during execution of the work to perform manufacturer's services.

B. Regulatory Requirements: Provide products that conform to SCAQMD's Rule 1113 requirements for maximum VOC material content.

C. Qualifications:
1. Manufacturer: Must be a legal business entity with at least 10 consecutive years' experience manufacturing paints for use on projects similar in material, design, complexity, and extent to this Project, and whose products have resulted in applications with a record of successful in-service performance.
2. Manufacturer's Field Representative: Must be an employee of the manufacturer, and have at least 5 consecutive years' technical field experience performing manufacturer's services on projects similar in material, design, complexity, and extent to this Project. Sales representatives do not qualify as experienced technical representatives.
3. Applicator: Must be a company and individuals with at least 5 consecutive years' experience in the application of identical paints on comparable projects similar in material, design, complexity, and extent to this Project that have resulted in applications with a documented record of successful in-service performance.

D. Field Samples (post-submittal, *in situ* visual mockups): Include field samples as part of the work of this Section.
1. Before starting work, including bulk purchase and delivery of products, prepare a field sample in a manner approved by the Architect to demonstrate the expected final visual effect of the

planned installation.

2. At a minimum, comply with the following:
   a. Size: At least a 4 foot square d=sample of each color.
   b. Illumination: Illuminate field samples with at least the same type and level of illumination maintained in the room or space after the building is occupied.
3. The Architect reviews field samples to determine if the work falls within an acceptable range for
   a. visual appearance;
   b. mottling, sheen, color, and texture variation;
   c. evenness of finish;
   d. integration of the work of different trades;
   e. installation tolerances;
   f. overall quality;
   g. fabrication and installation (workmanship); and
   h. conformance to specified requirements.
4. The Architect either rejects or approves field samples as the acceptable standard by which subsequent work is evaluated for conformance to the requirements of the Contract Documents.
   a. If a field sample is rejected, make corrections requested by the Architect or remove and replace it when the Architect refuses to accept corrective work.
      1) Repeat field samples until the Architect approves them.
      2) Approval of field samples does not constitute approval of deviations from the Contract Documents, unless those deviations are approved by Owner in writing.
   b. Upon written authorization from the Architect, field samples may remain part of the Work after being properly identified for future reference.

1.6 HANDLING

A. Packaging Requirements: Each delivery must include with it a copy of manufacturer- prepared instructions for the proper storage, handling, mixing, application and protection of each product delivered.

B. Delivery and Acceptance Requirements:
   1. Delivery:
      a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery; in original unopened containers clearly marked with intact and legible identification labels indicating
         1) manufacturer's name and trademark;
         2) product type, size, grade, use, lot or batch number, and quantity; and
         3) shelf life and expiration date.
      b. During transport and delivery, protect items from (1) exposure to weather; (2) becoming wet; and (3) other sources of deterioration or damage.
   2. Acceptance at the Site:
      a. Inspect for damage all items delivered to the Project site.
      b. Reject the delivery of items that show damage or have damaged containers.
      c. With a minimum of handling, unload and store only undamaged items.

C. Storage and Handling Requirements:
   1. Storage:
      a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage.
      b. Store flammable or combustible items in a cool, dry area away from sources of sparks and open flames.
      c. Store containers in a tightly closed condition and away from direct sunlight, other flammable or combustible items, or sources of heat.
      d. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Un-vented polyethylene tarpaulins may not be used.
      e. Store materials and place equipment in a manner to avoid permanent deflection of floor or roof decks.
   2. Handling:
      a. Protect items from excessive moisture during handling.
      b. Avoid contamination and damage to containers.
      c. Rotate inventory; do not use items the shelf life of which has expired.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.
   1. Remove and dispose of damaged items at a disposal location away from the Project site.
   2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions:
   1. Weather: Do not apply paints in adverse weather conditions, or when substrate or ambient temperature, relative humidity, or other environmental requirements are outside the limits recommended by the manufacturer.
      a. Proceed with surface preparation and application only when there is no threat of impending precipitation, and both current and forecasted weather conditions are favorable to proper surface preparation and application being performed in conformance with the manufacturer's requirements, recommendations, or instructions, and in a manner that does not void any warranty.
      b. Do not apply paints
         1) during snow or rain, on in fog or mist;
         2) when rain or snow is predicted within 24 hours; and
         3) until after surfaces that have become wet have had at least 7 consecutive and uninterrupted days of drying time within temperature and humidity ranges required, recommended, approved, or accepted by the manufacturer .
   2. Temperature and Relative Humidity:
      a. Apply paints only if the temperature and relative humidity have been maintained within a

range required, recommended, approved, or accepted by the manufacturer for at least 24 hours before application. Do not apply paints when

1) ambient temperature is below 45 deg. F or more than 90 deg. F during application, and for at least 8 hours after;
2) surface temperatures are less than 40 deg. F or greater than 120 deg. F; and
3) surface temperatures are 5 deg. F or less above the dew point.

B. Existing Conditions:

1. Surface Conditions: Surfaces indicated as receiving paints must be dry. If surface moisture is observed or detected, then either dry or allow those surfaces to dry sufficiently to permit application, as determined by the manufacturer's field representative.
2. Other Existing Conditions: Do not apply paints
   a. in areas where dust is being generated or where liquids are being sprayed;
   b. when windy conditions exist that may cause paints to be blown onto vegetation or onto surfaces not indicated as being coated; and
3. Ventilation: Comply with the manufacturer's recommendations for providing adequate ventilation during and after application and curing, setting, or drying. Where natural ventilation is inadequate, provide forced-air circulation or other mechanical ventilation.
4. Illumination: Illuminate work areas during application with at least the same level of illumination maintained in the room or space after the building is occupied, and as

   otherwise required, recommended, approved, or accepted by the manufacturer to properly perform the Work.

1.8 WARRANTY

A. Manufacturer's Warranty: All paints must be covered by a written warranty that protects the Owner for at least 5 years after application against

1. defective products, materials, accessories, and systems;
2. patent or latent defects; and
3. incipient or catastrophic failure.

B. Terms:

1. Defects include:
   a. Adhesive or cohesive failure.
   b. Discernible color changes from a control sample of the original application, beyond manufacturer's published information.
   c. Blisters, running, peeling, scaling, chalking, streaks, or stains.
   d. Deteriorating effects caused by washing painted surfaces with alkali-free soap to remove surface dirt from painted surfaces.

C. Remedy: If a paint products or applications fail within the specified warranty period, then the manufacturer shall replace defective items.

PART 2 - PRODUCTS

2.1 PAINT

A. Description: 100 percent premium grade (best grade) low- and no-VOC acrylic paints.

B. Manufacturers: Design is based on products manufactured by Frazee/Comex Group.
Other acceptable sources of comparable products include the following.
1. Vista Paint
2. Benjamin Moore.
3. Color Wheel Or equal.

C. Products: As scheduled at the end of this Section.

D. Colors:
1. Interior Spaces
Walls: Community Center, Recreation Center, Offices
Frazee 023 Encore Interior Acrylic Velvet
Sheen Finish: Eggshell

Walls: Kitchen, kitchen storage, Toilet rooms, Janitor Closet
Frazee Encore Interior Acrylic Enamel Paint
Finish: Satin , Semi-gloss

Walls: Storage, Closets
Frazee 103 Interior Flat Paint
Finish: Flat finish

2. Exterior Walls
Walls CMU or Stucco
Color Wheel 1200 Everlastic Elastromeric (Smooth) Paint
Finish: Satin

4. Ceilings
Frazee 003 Ceiling Paint Interior Latex
Acoustic Flat Paint
Finish: Flat

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2.2 MIXING

A. Either box paint at the job site, or factory-batch to ensure color uniformity and consistency.
This requirement includes specified maintenance materials.

B. Factory-mix paints to match approved samples and colors, and to provide a consistency permitting prompt application.

C. Only open paint containers as required for use, and mix paints in designated areas. Thoroughly stir and agitate paints to a uniform, smooth consistency suitable for proper application.

D. Do not reduce, alter or introduce foreign materials into paints, except in conformance with the manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine substrates indicated as receiving paints, and other conditions under which paints are applied.
   2. Verify that
      a. work performed as part of the work of other Sections conforms to the manufacturer's application tolerance requirements, and satisfies all other conditions relating to the quality of paint application, durability, appearance, and performance;
      b. surfaces indicated as receiving paints are free from dirt, dust, oil, grease, waxy films, curing compounds, release agents, and other deleterious materials that would adversely affect the quality of application, and material appearance and performance; and
      c. ambient project conditions are within the specified ranges, and existing construction conforms to allowable tolerances.

B. Evaluation and Assessment:
   1. Reject work that does not conform to the manufacturer's application requirements. The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer's application requirements.
   2. Proceeding with application stipulates the Applicator's acceptance of existing conditions. After starting work, the Applicator shall perform remedial work necessary to correct deficient conditions and to conform to the manufacturer's application requirements.

3.2 PREPARATION

A. Protection of In-Place Conditions:
   1. Work Area Protection: Protect work areas from excessive dust and other airborne contaminants during surface preparation, paint application, and while paint is drying.

2. Adjacent Material Protection: Protect adjacent surfaces not indicated as receiving paint from overspray. Provide drop cloths, shields, masking, barricades and other protection necessary to provide adequate protection against adjacent surfaces becoming damaged

B. Surface Preparation:

1. Prepare substrates in conformance with the manufacturer's installation instructions to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
2. Prime newly-installed gypsum board.
3. Check painted surfaces for pigment bleeding and treat areas susceptible to pigment bleeding. Sand gloss, semi-gloss, and eggshell finishes with fine sandpaper.
4. Remove substrate coatings and other substances that are incompatible with or that may negatively affect the quality of the installation, durability, appearance, or performance of the furnished paint.

3.3 APPLICATION

A. General:

1. Comply with the manufacturer's application instructions.
2. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques that do not lead to or result in warranties becoming void.
3. Start paint application with the manufacturer's technical representative present.
   a. The number of coats specified is the minimum required for complete coverage and uniformity of color and sheen.
   b. Apply additional coats when undercoats, stains, or other conditions show through the final finish until the finish is of uniform color and appearance.
   c. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
4. Only apply paints under conditions that will ensure finishes that are free from blemishes and defects. Leave corners with no undue amount of paints buildup.
5. Provide opaque, smooth surfaces of uniform finish, color, appearance, and coverage. Coated surfaces with cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other imperfections are not permitted and are rejected as non- conforming work.
6. Do not exceed the application rate recommended by the manufacturer.
7. Primer and intermediate coats must be unscarred and completely integral when succeeding coats are applied.
8. Sand and dust between each coat to remove defects visible from a distance of 5 feet. Primer and intermediate coats must be unscarred and completely integral when succeeding coats are applied.
9. Coat interior surfaces that are a continuation of exterior surfaces, or are subject to exterior exposure (i.e. an out-swinging door), with the applicable exterior paint system.
10. Completed work must match approved field samples, as determined by the Architect.

B. Special Techniques:

1. Use applicators and techniques suited for paint and substrate indicated.
2. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow drying.
3. Apply paints to substrates and adjoining surfaces indicated.
   a. Apply paints in conformance with the manufacturer's application instructions, using applicators and techniques suited for paint and substrate indicated.
   b. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
   c. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   d. Apply paint systems to produce uniformly textured, colored, and patterned finished-surface films without substrates, undercoats, marks, or stains showing through. Produce sharp, even glass lines and color breaks.
4. Verify wet film thickness of paint during application by numerous measurements taken with a wet film gage.

C. Conformance: Completed work must match the approved field samples, as determined by the Architect.

3.4 CORRECTION AND REPAIR

A. Correction:
1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.
   a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected, and fire-resistive ratings are not compromised.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. Corrected work must also be inspected by the Owner's testing agency and re-tested, as applicable.

   e. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
      3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
      4) no visible evidence of correction nor any other apparent distinction or seam

between original and corrected work.

2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer's field representative and the Architect.

B. Repair:

1. Repair or refinish items that
   a. are damaged, loose, chipped, broken, stained, or corroded;
   b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
   c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.5 FIELD QUALITY CONTROL

A. Manufacturer Services: The work of this Section is subject to examination by the manufacturer's field representative.

1. As the work progresses, manufacturer's field representative periodically examines the application for defective materials, defective fabrication and installation (workmanship), and conformance to the manufacturer's application instructions and other requirements. At a minimum, the manufacturer's field representative
   a. verifies areas have not been missed; and
   b. notes defects and identifies conditions and items that do not conform to the manufacturer's application instructions and other requirements.
2. During each field representative visit, itemize into a punch list all defects, improperly performing items, and nonconforming conditions and items.
3. For each item listed, record the field representative's recommendations for correcting each defect and improperly performing item, or for brining each nonconforming condition or item into conformance to the manufacturer's application instructions and other requirements.
4. Before final inspection or acceptance of applied paint, schedule a meeting at the project site with the manufacturer's field representative to review final surface preparation and paint application Notify invitees at least 10 days before the scheduled meeting.

B. Nonconforming Work:

1. Promptly correct or repair to the satisfaction of the manufacturer's field representative and the Architect any unsatisfactory conditions identified during the manufacturer's field representative's examination, and then arrange to have unsatisfactory areas re-examined by the field representative before work starts or resumes in the affected areas.
2. Do not start or resume the work of this Section in affected areas until all items on the punch list have been corrected.
3. The manufacturer's field representative withholds issuing the specified warranty until all items on the punch list have been satisfactorily completed.

3.6 CLEANING

A. Waste Management: After completing the work of this Section, leave work areas around the project site free from debris, materials, equipment, and related items.

3.7 PROTECTION

A. Post “wet paint” signs promptly after painting.

B. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

C. Do not store anything adjacent to, on, or against installed painted surfaces unless they are adequately protected from damage and staining, as determined by the Architect.

D. Do not use painted surfaces as work surfaces.

E. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

SECTION 10 14 13 – REGULATORY SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Regulatory signage posted at the following permanent locations.
      a. Restroom doors.
      b. Egress stairway doors.
      c. Permanent rooms.
      d. Accessible entrances and routes.
      e. Evacuation signs.
   2. Supplementary components and accessories necessary for a complete installation whether or not such items are indicated on the Drawings or included within the Specifications.

1.2 2REFERENCES

A. Abbreviations and Acronyms:
   1. ABA: Architectural Barriers Act.
   2. ADA: Americans with Disabilities Act.
   3. CBC: California Building Code.

1.3 ADMINISTRATIVE REQUIREMENTS:

A. Coordination: Coordinate regulatory signs with Owner's signage and graphic design package.

B. Sequencing: Complete all finishing operations, including painting, before beginning installation of signage assemblies.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product indicated.
   2. Shop Drawings: Sign Contractor shall provide complete structural drawings with supporting calculations and shop drawings, to scale, and full size drawings of all details affecting visible appearance. Sign Contractor shall submit shop drawings for review and approval prior to commencement of fabrication to the Owner.
      a. For non-standard signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
      b. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
   3. Samples:
      a. Copy Patterns: All sign copy or graphics (lettering and numbers) are included in the

documents for information only. Sign contractor must produce film positives made by photo-type position or computer generated method. Large copy must be enlarged in stages using optical, photographic or computer graphics equipment as required to achieve precise reproduction of all elements. Submit 2 sets of representational copy, with sign panel outline shown and using solid copy to Architect for approval for all sign types.

b. Sign Material Samples: Submit two 8-inch square samples for approval of the surface sheen and treatment of all exposed materials such as metals, plastics, vinyls and glass.

c. Hardware Samples: Submit one sample of all exposed hardware such as glides, hinges, locks, brackets, exposed supports and fasteners.

d. Paint Color Samples: Provide 2 samples of each color on an 8-inch by 8-inch square of the actual material that paint or ink is being applied to, to accurately depict the final finish coat to submit to Architect for approval.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each size type color pattern and variety of regulatory sign used for the Project through one source from the same manufacturer.

B. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

C. Regulatory Requirements:

1. Warning Signs: Provide Proposition 65 signage as directed by the Owner.
2. Character Type: Characters on signs must be raised at least 1/32-inch and must be sans serif uppercase characters accompanied by Grade 2 Braille.
3. Character Size: Raised characters must be at least 5/8-inch and not more than 2 inches high.
4. Finish and Contrast: Contrast between character, symbols and their background must be minimum 70 percent and shall have a non-glare finish, complying with Section 1117B.5.2, Part 2, Title 24 of CCR Accessibility Regulations.
5. Proportions: Character width-to-height ratio between 3:5 and 1:1; character stroke width-to-height ratio between 1:5 and 1:10, complying with Section 1117B.5.3, Part 2, Title 24 of CCR Accessibility Regulations.
6. Braille: California (Contracted) Grade 2, complying with Section 1117B.5.6, Part 2, Title 24 of CCR Accessibility Regulations wherever Braille is required.
7. Dots must be 1/10-inch O.C. in each cell with 2/10-inch space between cells, measured from second column of dots in first cell to second column of dots in second cell.
8. Dots must be raised minimum 1/40-inch above background.

D. Quality Standard Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines, CBC Chapter 11B, Section 1117B.5.

E. Mockups: Mockups must be approved by Architect prior to fabrication.

1. Submit prototypes of any details that may affect design intent/exterior appearance, such as panel edge treatment.

2. Submit one sample of each sign type.
3. Submit prototypes for approval prior to proceeding with production of the specific sign type.
4. Samples will be used on project if approved by Owner.

PART 2 - PRODUCTS

2.1 SIGN BACKING AND BASE MATERIALS

A. Metal Materials:

1. Stainless Steel Sheet and Plate: ASTM A 666 (annealed and tempered), Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 2 (half-hard) temper (hardness not less than Rockwell B-70 not more than Rockwell B- 85; can be bent 90 degrees across the direction of rolling around a radius equal to its thickness), passivated in conformance with ASTM A 967; tension-level sheet to a flatness of not more than 5 I-units.
   a. Minimum Thickness: At least 0.0625-inch thick (USSG 16), unless otherwise indicated.
   b. Finish: Provide No. 6 brush finish.
2. Aluminum Sheet and Plate: ASTM B 209. Provide flat plate stock or extruded material (not rolled stock).
   a. Alloy and Temper: 5005-H32 for anodic finishing; 3003-H14 for painted or unfinished sheet.
   b. Minimum Thickness:
      1) Heavy Duty Applications: At least 0.080-inch (USSG 12), unless otherwise indicated.
      2) Medium Duty Applications: At least 0.063-inch (USSG 14), unless otherwise indicated.
      3) Light Duty Applications: At least 0.040-inch (USSG 18), unless otherwise indicated.
   c. Finish: Provide non-glare finish.

B. Plastic Materials:

1. Clear Acrylic Sheet:
   a. Description: PMMA conforming to ASTM D 4802, Category A-2 (continuous cast), Finish 1 (smooth or polished), Type UVT (UV transmitting).
   b. Products: Design is based on “Acrylite FF” manufactured by Evonik Cyro LLC. Other acceptable sources of comparable products include the following, contingent on conformance to the specified requirements, including the item description above.
      1) “Plexiglas” by Degussa AG.
      2) “Lucite” by Lucite international.
      3) Or equal.
   c. Items must conform to the following:
      1) Minimum Thickness: At least 3mm (nominal 1/8-inch) thick, unless otherwise indicated.
      2) Color: Colorless non-glare finish.

3) Optics Type: Transparent.

2. Color Acrylic Sheet:
   a. Description: PMMA conforming to ASTM D 4802, Category A-1 (cell-cast), Finish 1 (smooth or polished), Type UVT (UV transmitting).
   b. Products: Design is based on "Acrylite GP" manufactured by Evonik Cyro LLC. Other acceptable sources of comparable products include the following, contingent on conformance to the specified requirements, including the item description above.
      1) "Plexiglas" by Degussa AG.
      2) "Lucite" by Lucite international.
      3) Or equal.
   c. Items must conform to the following:
      1) Minimum Thickness: At least 0.118 (nominal 1/8-inch) thick, unless otherwise indicated.
      2) Color: Match Evonik color 5H31, "Blue"; provide non-glare finish.
      3) Optics Type: Translucent.

2.2 WALL-MOUNTED PHOTOPOLYMER (ONE-PIECE) PANEL SIGNS

A. Description: Single-piece construction, permanent identification signs consisting of moisture resistant, non-glare photopolymer bonded to sign base material.

B. Products: Design is based on interior grade photopolymer panels by Jet USA.

C. Comply with the Following:
   1. Photopolymer Layer: 0.040-inch acrylic photopolymer.
   2. Base Material:
      a. Interior Locations: "Jet 388" 0.120-inch phenolic base.
      b. Interior Locations: "Jet 388 EX" exterior grade photopolymer applied to a 0.120- inch phenolic base.
   3. Colors: AS SELECTED BY THE ARCHITECT. Provide non-glare finish.
   4. Copy: Copy must follow the dimensions and spacing indicated on the Design Drawings and/or approved copy patterns.
      a. Letter spacing must conform to standards shown and kerned optically to the acceptance of the Owner.
      b. Lines of copy must be straight and parallel to the sign format, unless otherwise specified.
      c. Edges of letters, numbers, and symbols must be smooth and continuous, with straight and curved portions reproducing the original forms exactly, with corners sharp and true.
      d. All form shall be free of ticks, line waiver, discontinuous curves and other imperfections.
   5. Font: AS SELECTED BY THE ARCHITECT.
   6. Overall Thickness: Between 1/8-inch minimum and 1/4-inch maximum.
   7. Edge Condition: Square cut.
   8. Corner Condition: Square.
   9. Mounting: As indicated on the Drawings.

10. Wall mounted with mechanical fasteners or adhesive.

2.3 ACCESSORIES

A. Fasteners: Non-removable mechanical fasteners and anchors suitable for secure attachment to substrate and placed through predrilled holes as recommended in writing by the sign manufacturer.
   1. Exposed Fasteners: Exposed fasteners are permitted only where specifically stated in the drawings, and must be stainless steel painted or finished to match adjacent surfaces, unless otherwise indicated.
   2. Concealed Fasteners: Fabricate from metals that are not corrosive to the sign material and mounting surface.

B. Plastic Cement for Fabrication of Plastic Parts: Type #4 as manufactured by Industrial Polychemical, Dow Joint Bond, General Electric, 3M or equal.

C. Adhesive for Installing Signs: Silicone: clear, high bond adhesive as manufactured by Dow Corning 732, General Electric, 3M or equal.

D. Tape for Installing Signs:
   1. Foam tape: Black tape, .0125” used in conjunction with silicone adhesive for installation of wall mounted signs as manufactured by 3M, Arlon or equal.
   2. VHB tape: Very high bond tape for laminating panels together as manufactured by 3M, Arlon or equal.

E. Other Accessories: Provide other accessories and similar secondary items, including and cleaning agents selected by the Contractor, as furnished, required, recommended, approved or accepted by the sign manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

C. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 INSTALLATION

A. General:
   1. Comply with manufacturer’s written instructions for the installation of panels.
   2. Shop-fabricate items to the greatest degree possible.
   3. Utilize fasteners, adhesives, and bonding agents recommended by manufacturer for type of installation indicated. Material that is cracked, chipped, warped, hazed or discolored as a result of installation or fabrication methods will not be accepted.

4. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

B. Special Techniques:

1. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer-prepared instructions.
2. Install signage systems level and plumb at the height indicated on the drawings.
3. Install signs on walls adjacent to latch side of door where applicable.
   a. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls.
   b. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door

3.3 CLEANING AND PROTECTION

A. Protect surfaces from damage until date of substantial completion.

B. Repair work or replace damaged work which cannot be repaired to Architect's satisfaction.

END OF SECTION

SECTION 10 21 13 – TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Toilet partitions.
2. Wall-hung privacy and urinal screens.
3. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. CBC: California Building Code.
2. MSG: Manufacturer’s Standard Gage.

B. Definitions:
1. Manufacturer: Means the toilet partition or urinal screen manufacturer, as applicable, unless otherwise indicated.
2. Manufacturers' Standard Gage for Sheet Steel: Means the thickness steel sheet based on a weight of 41.82 pounds per square foot per inch of thickness.

1.3 SUBMITTALS

A. Action Submittals:
1. Product Data: Submit the manufacturer’s product data, specifications, typical installation details, and other data necessary to demonstrate conformance to the specified requirements.
2. Shop Drawings: Submit medium-scale dimensioned drawings showing toilet partition layout, materials, joints, profiles, edge conditions, attachments to other work, and finishes.
   a. Include elevation drawings of each toilet compartments. All such drawings must show
      1) horizontal and vertical location and sizes of all components, accessories, and trim, including openings and items installed in each surface; and
      2) locations of wall mounted items hardware and cutouts for compartment- mounted toilet accessories.
   b. Indicate method of anchoring partitions to supporting construction.
      1) Show fasteners brackets, clips, and similar attachments to other work.
      2) Label each attachment type by manufacturer's product name;
      3) Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
3. Samples:
   a. Submit at least 12-inch square samples showing (1) typical panel construction with facing; and (2) edges finished as specified.
   b. Submit one full-size sample of each hardware component; samples are returned to the contractor.

B. Informational Submittals:

1. Installation Instructions:
   a. Before starting work, submit manufacturer-prepared instructions for the proper storage, handling, installation and protection of each partition, screen, or compartment type.
   b. If the manufacturer's instructions are either unavailable or do not reflect Project conditions, then consult the manufacturer's field representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing and promptly distribute copies to the Architect for feedback before proceeding with the work.

C. Closeout Submittals:

1. Operation and Maintenance Data: Submit to the Owner a copy of the manufacturer's recommendations for maintenance, including
   a. recommendations for care, repair, restoration, adjusting, cleaning, protection, maintenance, and troubleshooting;
   b. recommendations for periodic inspections and identification of common causes of damage;
   c. recommendations for cleaning and refinishing compartments, including warnings against using materials and methods that may be detrimental to toilet compartment quality, durability, appearance, and performance; and
   d. instructions for both permanent repair and for temporary repair and patching until permanent repair can be made.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain toilet compartments and accessories through one source from a single manufacturer.

B. Regulatory requirements:

1. Toilet Stalls: Must have a slide bolt door latch; U-shaped or wire pulls on both sides of the door; and self-closing hinges.
2. Door Hardware: Must be mounted between 30 and 44 inches above finished floor.
3. Minimum Door Clear Width:
   a. Front-Entry Stalls: At least 32 inches when the door is open 90 degrees. (CBC section 1115B.3.1.4.4)
   b. Side-Entry Stalls: At least 34 inches at when the door is open 90 degrees. (CBC section 1115B.3.1.4.4)

1.5 HANDLING

A. Packaging Requirements:

1. Each delivery must include with it a copy of manufacturer-prepared instructions for the proper storage, handling, installation, and protection of each product delivered.
2. To prevent damage during fabrication, delivery, storage, handling, and installation, provide either strippable film or the manufacturer's other standard form of temporary protection for metal surfaces.

B. Delivery and Acceptance Requirements:

1. Delivery:
   a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery, and in original unopened

containers.

b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.

c. During transport and delivery, protect items from sources of deterioration or damage.

2. Acceptance at the Site:

a. Inspect for damage all items delivered to the Project site.

b. Reject the delivery of items that show damage or have damaged containers.

c. With a minimum of handling, unload and store only undamaged items and items that have undamaged containers.

C. Storage and Handling Requirements:

1. Storage:

a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage. Provide adequate dunnage and bracing during storage.

b. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Unvented polyethylene tarpaulins may not be used.

1) Store items so as to prevent bending, warping, twisting, or other damage.

2) Incline stored items to provide maximum drainage of accumulated moisture.

3) Provide spacers to separate stored items and allow air to circulate around all surfaces.

4) Protect stored items to prevent contact with the ground, to prevent staining, and to prevent cracking, distortion, warping, and other physical damage.

5) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture, or to ultraviolet radiation in excess of the manufacturer's recommended exposure limits.

6) Store materials and place equipment in a manner to avoid permanent deflection of floor or roof decks.

2. Handling: Handle toilet compartments in a manner that prevents bending, warping, twisting or other damage.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become deteriorated, contaminated, or otherwise damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.

2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

1.6 WARRANTY

A. Manufacturer's Warranty: Toilet partition or urinal screen must be covered by a written warranty that protects the Owner for at least 5 years after Substantial Completion against

1. defective products, materials, components, and accessories; and

2. patent or latent defects.

B. Terms: Warranties exclude damage, deterioration, or failure caused by improper installation or usage; or failure caused by vandalism.

C. Remedy: If a product fails within specified warranty period, then the manufacturer shall replace at no additional cost to the Owner those items showing defects during the warranty period.

PART 2 - PRODUCTS

2.1 TOILET COMPARTMENTS

A. Manufacturer: Acceptable sources of comparable products include the following, subject to conformance with the specified requirements, including the item description above.
   1. Bradley Corp.
   2. Global Steel Products Corp.
   3. Sanymetal.
   4. Or equal.

B. Items must conform to the following:
   1. Model: Bradley Corporation Series 400 Sentinel or equal
      Colors: 6128 Blonde - Womens
      2125 Azure (Drizzle) - Mens
   2. Mounting Configuration: Wall- Screens, Floor mounted with overhead brace - wall partitions
   3. Minimum Section Thicknesses:
      a. Doors, Screens and Panels: One inch.
      b. Pilasters: 1-1/4 inches.
   4. Door, Panel and Pilaster Face Thickness:
      a. Doors: At least 0.0312-inch thickness (MSG 22).
      b. Partitions and Screens: At least 0.0312-inch thickness (MSG 22).
      c. Stiles or Pilasters: At least 0.0375-inch thickness (MSG 20).
      d. Door and Partition Edge Locking Strips: At least 0.0375-inch thickness (MSG 20).
   5. Edges: All edges must be welded together and interlocked, under tension, with a rolled form oval crown locking bar, mitered, welded and ground smooth at the corners.
   6. Panel Reinforcement: Provide concealed internal reinforcement at locations required for anchoring accessories to units and for tapping where machine screws are used for attaching items to units.
      a. For Anchoring: At least 0.1046-inch base metal thickness (MSG 12) reinforcement.
      b. For Tapping: At least 0.0747-inch base metal thickness (MSG 14) reinforcement.
      c. Head-rail: Etched and anodized alum head-rail is extruded with anti-grip profile. H clamps over the pilasters and is secured at the wall with stainless steel brackets.

C. Materials:
   1. Core Construction: Manufacturer’s standard moisture-resistant, sound-deadening Kraft paper honeycomb, fiberboard or corrugated paperboard core door, panel and pilaster cores.
   2. Templates: Provide grab bar reinforcements and cutouts as required.

D. Accessories:
   1. Brackets: Provide stainless steel continuous brackets.
   2. Pilaster Shoes: Provide 4-inch high stainless steel shoes secured by concealed fasteners. Type 304 stainless steel with #4 satin brushed finish and are secured by concealed retainer

clips.

3. Door Hardware: Provide stainless steel Type 304 No. 4 finish hardware. Do not provide chrome-plated brass, chrome-plated zinc alloy or aluminum hardware.
   a. Hinges: Provide stainless steel wraparound self-lubricating nylon sleeve gravity hinges, through-bolted to pilasters, and that allow for fully-adjustable door closing position.
   b. Latches: Provide concealed, standard zinc #4 brushed finish die casting with face mortised flush with edge strip of door. Slide latches are not permitted, except for accessible stalls, or elsewhere required by code.
   c. Door Pull: Provide stainless steel pulls at out-swinging doors mounted in compliance with the accessibility requirements of the authorities having jurisdiction. Provide pulls at both sides of compartment doors indicated to be accessible.
   d. Coat Hook/Bumper: Provide manufacturer's standard combination hook and rubber-tipped bumper, mounted on the water closet side of each compartment door, and sized to prevent door from hitting compartment-mounted accessories.
4. Other Accessories: Provide other accessories and similar secondary items supplied, required, recommended, approved, or accepted by the manufacturer.

E. Accessories: Furnish other accessories and similar secondary items as furnished, required, recommended, approved, or accepted by the key box manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine site conditions and field-verify measurements affecting the work of this Section.
   1. Examine substrates supporting partitions, screens, and compartments, and other conditions under which such items are installed.
   2. Verify that work performed as part of the work of other Sections conforms to the manufacturer’s installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of installation, durability, appearance, and performance.

B. Evaluation and Assessment:
   1. Reject work that does not conform to the manufacturer’s installation requirements.
      The Contractor shall either perform or arrange and pay all costs for remedial work necessary to correct deficient conditions and to conform to the manufacturer’s installation requirements.
   2. Proceeding with installation stipulates the Installer’s acceptance of existing conditions. After starting work, the Installer shall perform remedial work necessary to correct or improve deficient conditions and to conform to the manufacturer’s installation requirements.

3.2 INSTALLATION

A. General:
   1. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   2. Set items plumb, level, and square, without panel warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
   3. Securely attach compartments and accessories in place to supporting construction.

B. Special Techniques:

1. Set pilasters with anchorages having not less than 2-inch penetration into structural floor, unless otherwise recommended by partition manufacturer.
   a. Level, plumb, and tighten installation with devices furnished.
   b. Hang doors and adjust so that tops of doors are level with tops of pilasters when doors are in closed position.
2. Secure panels to walls with continuous brackets.
   a. Locate wall brackets at the same height, so that holes for wall anchorages occur in tile joints.
   b. Anchor panels to studs or backing plates; fastening components to walls with toggle bolts is not permitted.
3. Install hardware as recommended by manufacturer. Conceal evidence of drilling in finished work.

C. Installation Tolerances: Installed compartments and screens shall be within the following tolerances.

1. From true position: 1/4-inch.
2. From plumb, alignment and level: 1/8-inch.

3.3 CORRECTION AND REPAIR

A. Correction:

1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the manufacturer’s field representative and the Architect.
   a. Correction of defective work is only permitted when both performance and visual appearance are not affected.
   b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
      1) descriptions and locations of defective work;
      2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
      3) similar documentation and visual depictions of Contractor-proposed corrections.
   c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
   d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
      1) corrections being performed skillfully,
      2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces;
      3) colors and textures matching adjoining and adjacent surfaces, without differentiation; and
      4) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
2. Arrange and pay costs for either removing and re-installing or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the manufacturer’s field

representative and the Architect.

B. Repair:
   1. Repair or refinish items that
      a. are damaged, loose, chipped, broken, stained, or corroded;
      b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
      c. do not match the appearance of adjacent surfaces, materials, or finishes, as determined by the Architect.
   2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that both matches adjacent undamaged areas and shows no evidence of repair or refinishing, as determined by the Architect.

3.4 ADJUSTING

A. Lubricate and adjust operating parts and hardware as necessary to function properly and provide a smooth, quiet operation, free from warp, twist, or distortion.

B. Test and adjust doors and hardware. Verify safe, easy, and reliable operation.
   1. Adjust brackets and hardware to provide uniform clearances not exceeding the following dimensions:
      a. Pilasters and walls: One inch.
      b. Panels and walls: One inch.
      c. Pilasters and panels: 1/2-inch.
      d. Pilasters and doors: 3/16-inch.
   2. Adjust hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30-degree from closed position when unlatched, except set hinges on out-swinging doors to return to fully closed position.

C. Remove and replace damaged, defective, malfunctioning, or unsafe materials, units, components, accessories, and parts.

3.5 CLEANING

A. Cleaning Installed Work:
   1. Remove protective materials after installation.
   2. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.
   3. Clean surfaces exposed to view using cleaning agents, equipment, tools, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
      a. Protect other work from staining or damage caused by cleaning operations.
      b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
   4. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
   5. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.

B. Do not store anything adjacent to or against installed compartments unless they are adequately protected from damage and staining, as determined by the Architect.

C. Do not use compartment surfaces as work surfaces.

D. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 10 28 13 – COMMERCIAL TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Commercial toilet accessories associated with public toilet rooms.
   2. Supplementary components and accessories necessary for a complete installation whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. NAAMM: National Association of Architectural Metal Manufacturers.
   2. NOMMA: National Ornamental & Miscellaneous Metals Association.

B. Definitions:
   1. Manufacturer: Means the commercial toilet accessory manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit the manufacturer's product data, specifications, typical installation details, and other information necessary to demonstrate conformance to the specified requirements.
   2. Shop Drawings: Submit medium-scale dimensioned drawings showing toilet accessory layout, materials, joints, profiles, attachments to other work, and finishes.
      a. Include elevation drawings of toilet accessories. All such drawings must show horizontal and vertical locations of wall mounted items, hardware, and cutouts for compartment-mounted toilet accessories.
      b. Indicate method of anchoring accessories to partitions and to supporting construction.
         1) Show fasteners, brackets, clips, and similar anchors.
         2) Label each attachment type by manufacturer's product name.
         3) Indicate substrate material and finish, fastener material and finish, and material and finish of items being fastened or attached.
   3. Samples: When requested, submit one full-size sample of each toilet accessory; samples are returned to the Contractor.

B. Informational Submittals:

1. Installation Instructions:
   a. Before starting work, submit manufacturer-prepared, published instructions for the proper installation of each toilet accessory type.
   b. If manufacturer-published instructions are either unavailable or do not apply to Project-specific conditions, then consult with the manufacturer's technical representative and obtain manufacturer-prepared installation requirements, recommendations, or instructions in writing, and promptly distribute copies to the Architect before proceeding with the work.

C. Closeout Submittals:
   1. Operation and Maintenance Data: Submit to the Owner a copy of the manufacturer's recommendations for maintenance, including
      a. recommendations for care, repair, restoration, adjusting, cleaning, protection, maintenance, and troubleshooting;
      b. recommendations for periodic inspections and identification of common causes of damage;
      c. recommendations for cleaning and refinishing accessories, including warnings against using materials and methods that may be detrimental to the quality, durability, appearance, and performance; and
      d. instructions for both permanent repair and for temporary repair until permanent repair can be made.
   2. Keying: Deliver to the Owner before Final Completion at least 6 keys for each toilet accessory with a lock. Properly label keys with individual tags indicating lock locations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain toilet accessories through one source from a single manufacturer, unless otherwise indicated.

B. Regulatory Requirements: Compliance with ADA requirements for accessories and their attachments is the Contractor's responsibility.
   1. Mount toilet accessories required to be accessible in compliance with Section 1118B, Part 2, Title 24 of CCR Accessibility Regulations, and CBC Section 1115B.8.
   2. Toilet accessories required to be accessible shall be mounted at heights according to CBC Section 1115B.8 and DSA Checklist Figure 15-A.
   3. The grab bar cannot project more than 3 inches into the required clear floor space. (CBC Section 1115B.4.1, Item 3 and Figure 11B-1E)
   4. Toilet paper and feminine napkin dispensers located on the grab bar side of an accessible toilet room or stall shall not be located closer than 1-1/2 inches clear of the tangent point of the grab bar. Accessories surface-mounted above grab bar will restrict usability.

1.5 HANDLING

A. Packaging Requirements:

   1. Each delivery must include with it a copy of manufacturer-published or -prepared

instructions for the proper storage, handling, installation and protection of each product delivered.

2. To prevent damage during delivery, storage, handling, and installation, provide either strippable film or the manufacturer's other standard form of temporary protection for metal surfaces.

B. Delivery and Acceptance Requirements:

1. Delivery:
   a. Deliver items to the Project site in conformance with the manufacturer's requirements, recommendations, or instructions for transport and delivery, and in original unopened containers clearly marked with intact and legible identification labels indicating
      1) manufacturer's name, brand name, or trademark; and
      2) product type, size, use, and quantity.
   b. Provide adequate dunnage and bracing during transport and delivery. Support items on non-staining, shock-absorbing material.
   c. During transport and delivery, protect items from (1) exposure to weather; (2) becoming wet; and (3) other sources of damage.
2. Acceptance at the Site:
   a. Inspect for damage all items delivered to the Project site.
   b. Reject the delivery of items that show damage or have damaged containers.
   c. With a minimum of handling, unload and store only undamaged items and items that have undamaged containers.

C. Storage and Handling Requirements:

1. Storage:
   a. Store items as shipped, upright in their original shipping containers, and in conformance with the manufacturer's requirements, recommendations, or instructions for storage. Provide adequate dunnage and bracing during storage.
   b. Store items off the floor or ground on pallets, and protect against weather, precipitation, and other forms of moisture with breathable covers. Unvented polyethylene tarpaulins may not be used.
      1) Store items so as to prevent bending, warping, twisting, or other damage.
      2) Provide spacers to separate stored items and allow air to circulate around all surfaces.
      3) Protect stored items to prevent contact with the ground, to prevent corrosion, and to prevent cracking, distortion, warping, and other damage.
      4) Do not leave items uncovered where they may be exposed to rain, mist, high relative humidity, condensation, frost, or other sources of moisture.
      5) Store items in a manner to avoid permanent deflection of floor or roof decks.
2. Handling: Handle items in a manner that prevents bending, warping, twisting, or other damage.

D. Damaged Item Replacement Requirements: Promptly remove, dispose of, and replace, or arrange and pay costs for the removal, disposal, and replacement of items that become damaged.

1. Remove and dispose of damaged items at a disposal location away from the Project site.
2. Replace removed items with undamaged new items.

E. Packaging Waste Management: Remove and dispose of construction waste at a disposal location away from the Project site.

PART 2 - PRODUCTS

2.1 COMMERCIAL TOILET ACCESSORIES

A. Manufacturer: Brobrick Inc. or approved equal

B. Products:

1. Grab Bars: B-5806 x 42L- side walls, B-5806 x 36L- back wall.
1 1/4" Dia tubing, 18 GA. Type 304 Satin Finish Stainless Steel
Concealed mounting flange 1/8" thick, Type 304 Stainless Steel
Leads 65-70% recycled Stainless steel.

2. Toilet Towel Seat Dispenser: B-221 Surface mounted seat dispenser
Satin Finish Stainless Steel
Mounting Height- ADA compliant

3. Mirror: B165-1836, Mirrored Glass: ASTM C 1503, Q-1 Mirror Select Quality
Type 430 Stainless Steel Brush Alum Frame.
Surface mounted channel frame
1/4" glass mirror, galv. steel back
Warranty against Silver Spoilage -15 years
Mounting Height- ADA Compliant

4. Waste Disposal Containers: B279 Wall Surface Mounted Container
Satin Finish Stainless Steel

5. Soap Dispenser: B5050 Matrix Series
Push button dispenser
Surface Mounted Dispenser
Capacity: 50 FL OZ.

6. Toilet Tissue Dispenser: B-288 Surface Mounted Dispenser
Multi-roll toilet tissue dispenser
Finish: Satin Stainless Steel
Theft Resistant Heavy duty spindles

7. Sanitary Napkin/ Tampon Vendor: B-47069C Cuntura Series
Surface Mounted
Operation: Less than 5 LBS of force.
Single coin slot (Quarters)

8. Sanitary Napkin Disposal: B-270 Series, Surface Mounted Disposal unit.

Capacity : 1.0 Gals.

9. Warm hand Dryer: B-7120 115V Surface Mounted Dryer
Automatic Sensor
115V, 15 AMP, 11725 Watts
50/60 HZ, Single Phase
Type 304, Satin Finish Stainless Steel on exposed surfaces.

10. Sanitary Napkin/ Tampon Vendor: B-47069C , Cuntura Series
Surface Mounted
Operation: Less than 5 LBS of force.
Single coin slot (Quarters)
Type 304 Satin Finish, Stainless Steel on exposed surfaces.

11. Warm Hand Dryer: B-7120 Surface Mounted
Automatic Sensor
115V, 15 AMP, 1725 Watts, 50/60 HZ Single Phase
Type 304 Satin Finish Stainless Steel on exposed surfaces

12. Toilet Tissue Dispenser: B-288 Surface Mounted Dispenser
Multi-roll toilet tissue dispenser
Finish: Satin Stainless Steel
Theft Resistant Heavy duty spindles

2.2 ACCESSORIES

A. Fasteners: Provide screws, bolts, and other devices as supplied, required, recommended, approved, or accepted by the manufacturer.

B. Other Accessories: Provide other accessories and similar secondary items as supplied, required, recommended, approved, or accepted by the manufacturer.

2.3 FINISHES

A. General: Comply with NAAMM/NOMMA publication “Metal Finishes Manual for Architectural and Metal Products” recommendations for applying and designating finishes. Protect mechanical finishes by applying a strippable, temporary protective covering before shipping.

B. Stainless Steel Finishes: Provide No. 4 finish for stainless steel sheet products, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine and field-verify site conditions affecting the work of this Section.
   1. Examine substrates supporting toilet accessories and other conditions under which such items are installed.
   2. Verify that work performed as part of the work of other Sections conforms to the manufacturer's installation tolerance requirements; provides true, flat, and level surfaces; and satisfies all other conditions relating to the quality of the toilet accessories' installation, durability, appearance, and performance.

B. Evaluation and Assessment:
   1. Reject work that does not conform to the specified requirements or to the manufacturer's requirements. The Contractor shall either perform or arrange and pay costs for all remedial work necessary to correct deficient conditions to conform to the manufacturer's installation requirements.
   2. Proceeding with installation stipulates the installer's acceptance of existing conditions. After starting work, the installer shall perform remedial work necessary to correct conditions to conform to the manufacturer's installation requirements.

3.2 INSTALLATION

A. General:
   1. Use materials and methods required, recommended, approved, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   2. Set items plumb, level, and square, without panel warp or rack, with flush well-fitted joints, and in alignment with adjacent construction.
   3. Shim as required, using concealed shims.

B. Special Techniques:
   1. When installed in ceramic tile surfaces, coordinate accessory location with the tile work so that the top and one side (closest to the door) of the accessory will align with a tile joint.
   2. Install grab bars to withstand a downward load of at least 250 pounds per foot when tested in compliance with ASTM F 446.

C. Interface With Other Work:
   1. Attachment: Securely attach toilet accessory items and accessories in place to supporting construction.
      a. Drill holes to correct size and location. Install accessories plumb, level and equally spaced (when applicable).
         1) Where accessories are attached to toilet compartments, do not "thru-bolt" but drill and tap partition reinforcement.
         2) Provide templates of accessories for drilling and tapping required in Section 10 21 13.
      b. Attach accessories securely with screws or bolts to steel studs or backing plates.

Do not use Molly or toggle bolts in gypsum board.

3.3 CORRECTION AND REPAIR

A. Correction:
   1. Correct deficiencies that do not conform to the Drawings or specified requirements, as determined by the Architect.
      a. Correction of defective work is only permitted when both structural performance and visual appearance are not affected.
      b. Document both defective work and proposed corrections to the defective work, and then submit such documentation to the Architect for review. Defective work submittals must include
         1) descriptions and locations of defective work;
         2) supporting sketches, diagrams, photographs, and other visual depictions of defective work; and
         3) similar documentation and visual depictions of Contractor-proposed corrections.
      c. Do not begin correction of defective work until after the Architect's review of the defective work submittal is complete.
      d. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon
         1) corrections being performed skillfully;
         2) corrective work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces; and
         3) no visible evidence of correction nor any other apparent distinction or seam between original and corrected work.
   2. Arrange and pay costs for either removing and reinstalling or replacing items that are damaged or that cannot be satisfactorily corrected, as determined by the Architect.

B. Repair:
   1. Repair or refinish items that
      a. are damaged, loose, chipped, broken, stained, or corroded;
      b. have damaged, loose, chipped, broken, stained, or corroded parts, components, accessories, and similar items; or
      c. do not match the appearance of like items, as determined by the Architect.
   2. Arrange and pay costs for replacing items that cannot be satisfactorily repaired or refinished in a manner that shows no evidence of repair or refinishing, as determined by the Architect.

3.4 ADJUSTING

A. Lubricate and adjust operating parts and hardware as necessary to function properly and provide a smooth, quiet operation, free from warp, twist, or distortion.

B. Test and adjust operating parts and hardware. Verify safe, easy, and reliable operation.

C. Remove and replace damaged, defective, malfunctioning, or unsafe materials, units,

components, accessories, and parts.

3.5 CLEANING

A. Cleaning Installed Work:
   1. Remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.
   2. Clean surfaces exposed to view using cleaning agents, equipment, and procedures supplied, required, recommended, approved, or accepted by the manufacturer.
      a. Protect other work from staining or damage caused by cleaning operations.
      b. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
   3. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.
   4. Replace items that cannot be satisfactorily cleaned, as determined by the Architect.

B. Waste Management: After completing the work of this Section, leave work areas free from debris, materials, equipment, and related items.

3.6 PROTECTION

A. Protect installed items in place from sources of moisture, corrosion, deterioration, staining, or other damage until Substantial Completion.
   1. Provide protection items supplied, required, recommended, approved, or accepted by the manufacturer.
   2. Use protection methods that do not void manufacturer's warranties.

B. Do not store anything adjacent to, on, or against installed toilet accessories unless they are adequately protected from damage, as determined by the Architect.

C. Do not use toilet accessory surfaces as work surfaces.

D. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 11 31 00 RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Kitchen appliances.
   2. Supplementary components and accessories necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's product data, specifications, typical installation details and other data as necessary to demonstrate compliance with the specified requirements for each item specified.
   2. Submit sample copies of warranties to be furnished under this Section with terms, conditions, and time periods for the warranty clearly defined.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each color, grade, finish, type, and variety of residential appliance used for the Project from the same manufacturer.

B. Performance Requirements: All appliances must be ENERGY STAR qualified.

PART 2 - PRODUCTS

2.1 RESIDENTIAL KITCHEN APPLIANCES

A. Products:
   Manufacturers: GE Appliances, Kenmore, Kitchen Aid, Maytag or equal

1. Refrigerator
   GE Energy Star 18.0 cu ft. or equal
   Frost Free, Top Freezer,
   Finish: Stainless Steel
   ADA Compliant, energy efficiency rating
   Power: 120V, 60 HZ, 15 Amp

2. Stove/Oven
   GE Series 32" Electric Induction stove /oven or equal
   Model # JS 750 S. FSS.

Controls: LCD Digital, Location: Front
Cooktop Burner: Type 5 Induction
6"/9" 3600 W power
6" 1200 W power
Hot surface indicator light
Finish: Stainless Steel

Oven: Convection Bake
Self cleaning oven, big view oven window
bake wattage: 2650 W
Convection wattage: 2500 W
Broiler wattage: 3600 W
Breaker: 40 Amp- 208V, 40 Amp- 240V
KW Rating: 208V-95.KW, 240V-12.6 KW
ADA Compliant, energy efficiency rating

3. Cooktop Stove
GE Series 30" Electric Induction Cooktop or equal
Model # PHP 960 SM SS
Controls: LCD Digital display. Location: front center
Finish: Stainless steel
Breaker: 50 Amp-208V, 50 Amp-240V
KW rating: 208V-8.7KW, 240-11.6KW

4. Microwave/ Convection oven
GE Series 30" Built-in double microwave/ convection oven
Controls: LCD Digital display. Location: front
Finish: Stainless steel
Self cleaning oven
21 3/4" W x 43 1/2" H x 23 1/2" D
Breaker: 30Amp- 208V, 30 Amp- 240V
KW rating: 208V-8.7KW, 240V-5.1KW
Mounting height; ADA compliant

5. Exhaust Hood
GE Series 30: vent hood
Model # JS 936DSS or equal
7" round duct. Stainless steel duct kit for exposed ducts
Cooktop lighting
CFM: 590/ 7.5 high speed
160/ 0.4 working speed
Finish: Stainless steel
Power: 3.9 Amps rating at 120V

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install appliances in compliance with their manufacturer's instructions and recommendations plumb, level and secured to their supports.

B. Connect, test, and adjust each appliance to ensure that they function properly, as intended.

END OF SECTION

SECTION 22 00 00 - PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Labor, materials, tools, and equipment to install plumbing systems as indicated.

B. Related Sections:

1. Section 15410: Basic Plumbing Materials and Methods.
2. Section 15420: Plumbing Identification.
3. Section 15430: Plumbing Insulation.
4. Section 15440: Plumbing Common Work.

1.2 SUBMITTALS

A. Provide in accordance Section 15440: Plumbing Common Work.

B. Provide necessary documentation to Owner for processing rebates for water efficient fixtures.

1.3 QUALITY ASSURANCE

A. Unless otherwise noted, the California Plumbing Code is hereby made part of this section.

B. Conform to provisions of Section 15440: Plumbing Common Work..

1.4 PRODUCT HANDLING

A. Conform to provisions of Section 15410: Basic Plumbing Materials and Methods.

PART 2 - PRODUCTS

2.1 PIPING SYSTEMS

A. Materials: Refer to Section 15410: Basic Plumbing Materials and Methods.

B. Insulation for Piping: Refer to Section 15430: Plumbing Insulation.

2.2 FIXTURES AND DRAINS

A. General: Fixtures specified shall be furnished complete with trim and fittings. Cast iron plumbing fixtures shall be acid resistant enamel, and identified by casting letters "AR" or words "acid-resistant" into metal. Fixtures shall be white unless otherwise specified. Cast iron fixtures shall be white enamel inside and on back, rim and apron, with exposed unfinished surfaces painted white. Fixtures of same general classifications shall be of same make.

B. Finished Brass:

1. Unless otherwise specified, finished brass of a similar type shall be of same manufacturer and model throughout buildings.
2. Finished and exposed brass equipment, except floor, shower and urinal drains shall be chromium-plated and polished. Floor, shower and urinal drains, unless otherwise specified, shall be nickel-bronze metal.

C. Traps, Trap Arms and Tailpieces:

1. Fixture traps shall be all cast brass, chromium-plated and polished. (No tubular traps). Exceptions as follows:
   a. Traps that are an integral part of a fixture.
   b. Traps concealed in floors, walls and furring.
   c. Traps standard for service sinks and Industrial Shop equipment. "Basic

Plumbing Materials and Methods"

2. Concealed traps and 17 gage tailpieces may be rough brass finish, except as otherwise specified. Laboratory traps and tailpieces shall be as specified in Section 15410: Basic Plumbing Materials and Methods. Furnish chromium-plated and polished cast brass wall flanges with setscrews and chromium-plated and polished brass casing on discharge side of each trap.
3. Tailpieces shall be not lighter than 17 gage, brass, chromium-plated, and polished. Furnish and install chromium brass plated wall flanges with set screws and chromium-plated 20 gage brass casing on discharge side of each chrome-plated all cast trap.

D. Faucet and Shower Valve Handles: Faucet and shower valve handles shall be solid brass, chromium-plated and polished, and fastened to their stems by Allen type hollow head stainless steel set screws through the side of the handle extending into the stem. Handles with sharp edges or projections shall not be furnished.

E. Fixture Supplies:

1. Supplies for water heaters shall be unplated rigid copper water tube with threaded adaptors for connections to valves and other threaded connections. All other supplies shall be chromium-plated brass with hospital threads or shall be furnished with fittings and valves, which completely cover threads.
2. Exposed supplies for showers shall be chromium-plated brass pipe up to header with hospital threads or shall be furnished with fittings and valves, which completely cover threads.
3. Supplies to water closet tanks and lavatories shall be furnished with chromium- plated and polished screwed type angle compression stops with square shank stems and lock shields extending beyond stem. Instead of solid supply piping, polished chrome-plated risers of 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished. The installation of braided stainless or easy hooker's supplies is not permitted. Exception: Supplies that rise vertically from floor shall be furnished with straight type instead of angle type stops.
4. Each supply or pipe that penetrates a finished surface and plumbing pipes passing through a countertop or part of a cabinet shall be furnished with a chromium-

plated brass flange except flanges furnished by manufacturer of flush valves as an assembly.

5. Water supplies of plumbing fixtures shall be protected against back-siphonage in event of a vacuum in piping system.
6. Discharge outlets of supply faucets for lavatories and sinks shall clear top of overflow rim by at least one inch.
7. Toilet and urinal flush valves shall be furnished with recognized atmospheric vacuum breakers, installed a minimum of 6 inches above fixture.

2.3 ACCESS PLATES (To cleanouts, valves, water hammer arrestors and hose faucets)

A. Schedule Numbers:

AP-1: Square, unless otherwise noted, steel, prime coated; frame, 18 gage minimum. Door shall be 16 gage minimum with concealed hinge or be removable, with vandal- proof lock operated by Allen wrench.

(Specify for painted and stucco walls.)

SMITH	ZURN	ELMDOR	MILKOR	WATTS	MIFAB
Fig 4760 AK	Z-1462-VP	DW-AKL	MOR DW AK1	CO-300-S-6	UA-A OR EQUAL

AP-2: Round type, stainless steel, vandal-proof, 5/16 inch No. 18 or 1/4 inch No. 20 flat-head machine screw into cleanout plug. Plate shall be prime coated minimum 18 gage steel or polished chrome-plated brass, 18-8 No. 302 stainless steel, or polished nickel bronze.
(To be specified for painted walls, screwed into cleanout plug.)

SMITH	ZURN	JOSAM	WADE	WATTS	MIFAB	OR EQUAL
4710U	Z-1469-VP	58600	8480R	CO-480-RD-6	C1400-RD-6	

2.4 CLEANOUT ASSEMBLIES

A. Cleanout plug shall be line size.

B. Schedule Numbers:

CO-1: Iron body cleanout tee full line size up to 4 inches and round access plate, plugs shall be brass, countersunk with tapped boss for 5/16 inch No. 18 or ¼ inch No. 20 screws. (Specify for finished walls at base of waste stack, above urinal and service sink.) AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal.

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
4532-U	Z-1446-BP	CO-460-RD-34B	C1460-RD-6	

CO-2: Iron body with approved UPC plug, top and adjustable sleeve, cut-off ferrule, polished scoriated brass nickel bronze secured cover. AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal (To be specified for finished floors inside buildings, in covered areas, and in concrete paving.)

Square:

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
4053L-U-NB	ZN-1400-T	CO-200-S	C1220-S-1-6l	

Round:

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
4033-L-U-NB	ZN-1400	CO-200-R	C1220-1-6	

CO-3: Secured cover, extra heavy-duty, adjustable sleeve, cut-off ferule, UPC. Brass approved type plug, scoriated tractor type cover.

(To be specified for areas outside building on concrete paving.)

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
4233-U	ZN-1400-HD	CO-200-RX-4	C1220-4-6	

2.5 FLOOR DRAINS

A. Schedule Numbers:

FD-1: Cast iron body, no hub with seepage pan and flat, round nickel bronze strainers not less than 5-inch diameter for 2-inch outlet bodies, 7-inch for 3-inch outlet bodies and 8-inch for 4-inch outlet bodies, with maximum of ½ inch square holes or slots not larger than ¼ inch by 1 ¼-inch.

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
2005Y-A	ZN-415-B	FD-100-A	F1100-C-1	

FD-2: Area type, with 8-inch diameter minimum cast iron top grates (no hub). Drain shall be vandal-proofed by securing grate to body with stainless steel Allen flat-head screws.

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
2110-Y-U	Z-550-VP	FD-320-Y-6	F1320-4-6	

FD-3: Pavilion type with cast iron hinged top, with removable sediment bucket. Drain shall be vandal-proofed by securing grate to body with stainless steel Allen flat head screws. No hub; 4-inch drain in lunch area in lieu of clarifier.

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
2230-Y-H-U	Z-610-H-NH-UP Z-541-NH-VP-H	FD-340-Y-SET-9-6	F1340-TFB-4-6	

FD-4: Drain parking garage floor (emergency drain) with cast iron body, flashing collar and cast iron tractor grate NO hub, vandal-proof top.

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
2120Y-U	ZN-508-9-INCH VP	FD-320-Y-6	F1320-4-6	

FD-5: Area drain, cast iron body, round pedestrian grate set in square frame.

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
1470Y-U-NB	ZN-158-VP	RD-200-CP-L-1	F1100-C-S8-1-6	

FD-6: Planter drain, cast iron body, secured bronze dome with stainless steel mesh screen.

SMITH	ZURN	WATTS	MIFAB	OR EQUAL
2646Y	ZRB-352 with Z-1040 adaptor	FD-860	F1810-6	

FD-7: Trash Drain Wash down Area Drain: Waste water diversion valve drain acts as an area drain for sanitary and rain drainage. When the hose Bibb is activated, the drain automatically diverts run offs to sanitary drain. Unit shall be approved by West Hollywood Testing Laboratory.

FOX Waste Water Diversion Valve System:	OR EQUAL
DD 400	

2.6 FLEXIBLE HOSES

A. Schedule Numbers:

FLH-1: Braided stainless steel metal hose (for gas use). US Flex, Metraflex, Nelson Dunn or equal.

FLH-2: Braided bronze metal hose (for non pressure condensate connection use). US Flex, Metraflex, Nelson Dunn or equal.

2.7 FLOOR SINKS – Refer to Plumbing Fixture Schedule

2.8 HOSE BIBBS - Refer to Plumbing Fixture Schedule

2.9 LAVATORIES - Refer to Plumbing Fixture Schedule

A. Access compliant faucets for Lavatories: Force to activate controls shall be no greater than 5 pounds. Self closing metering, when specified, to remain open 10 seconds minimum when activated.

B. Cast Iron Lavatories shall be acid resistant enamel, and shall conform to Commercial Standards CS 77.63. Unites furnished in conjunction with strainer installation or faucet installation shall be brass. Exposed brass nuts shall be chrome plated.

C. Exposed trim shall be free from sharp edges or points. Fixture shall be furnished with other listed manufacturer specified trim. Instead of solid supply pipe, polished chrome-plated risers, 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished.

D. Insulate cold water, hot water and drain lines under all access compliant lavatories with approved type insulation.

PLUMBEREX	LAV-GUARD	OR EQUAL

2.10 PIPE HANGERS

A. Refer to Section 15410: Basic Plumbing Materials and Methods.

B. Schedule Numbers:

1. PH-1: Complete with clamps, inserts, etcetera.

SUPERSTRUT	UNISTRUT	TOLCO	B-LINE	OR EQUA

2.11 P-TRAPS

A. Schedule Numbers:

PT-1: Cast brass complete, chrome-plated.

ZURN	AB&A	KOHLER	OR EQUAL
Z-8712-LC	107	K-9018	

2.12 PRESSURE REGULATING VALVE ASSEMBLIES - Refer to Plumbing Fixture Schedule

2.13 ROOF DRAINS - Refer to Plumbing Fixture Schedule

2.14 SERVICE SINKS and TRIM - Refer to Plumbing Fixture Schedule

2.15 SEWAGE EJECTORS

A. Schedule Numbers:

SE-1: Duplex, (unless otherwise indicated) screen-less sewage ejector with two pumps and motors mounted on cover-plate and cover-plate shall be gas tight; furnished with automatic alternator, high water alarm, micro switch liquid level controller starters, fused disconnect switches and factory wired. Sump pit concrete is as specified in a related section.

WEIL PUMP CO.	PACIFIC PUMP CO.	Mc COOK PUMP CO.	HYDROMATIC PUMP	OR EQUAL

1. Motors: Drip-proof with electrical characteristics as scheduled on Drawings.

2. Controls: Weil Model 8230, or equal, mercury float switches, UL listed, two switches for high water alarms with cover mounting brackets. Control panels shall be NEMA 1, UL listed, and each contain following:

a. Two cross-the-line magnetic starters.

b. Two fusible disconnect switches.

c. Two HOA switches.

d. Two running lights.

e. One 480/220 volt control circuit transformer.

f. One high water alarm relay.

g. One alternator.

h. One NEMA 1, 4-inch diameter alarm bell for mounting on control panel.

3. Basin Covers: Heavy steel covers, sizes as scheduled on drawings. Covers shall be duplex type with openings for pumps, manholes, and vent openings. Parts shall be gas-tight.

2.16 SERVICE STOP GAS VALVES

A. Schedule Numbers:

SGV-1: Bronze/Brass gas cock valve with double stake packing nut, ½ inch to 2-inch, with IPS, inclusive, with flat or square head. CSA approved.

(To be specified for oven ranges, convection ovens, skillets.)

AMERICAN	Mc DONALD	NIBCO	OR EQUAL
85 CBK or 86C	10596, flat 10604, square	GB2A	

SGV-2: Bronze/Brass, ¾-inches to 2-inch IPS (WOG) water, oil, or gas – full port ball valve. CSA approved.

(To be specified for larger water heaters, small boilers, pool heaters, and A/C units on roofs.)

WATTS	NIBCO	WILKINS	OR EQUAL
G4000-FDA	F-510-CS-R-66-FS	Model 850	

SGV-3: Lubricated plug gas valve, 3/4-inch to 2-inch IPS valve.

To be specified for use after gas meter headers, gas regulators, and isolation valves for building isolation, individual floor level isolation, and boiler rooms.)

NORDSTROM	WALWORTH	RESUN	OR EQUAL
142	1786	1430	

SGV-4: Lubricated plug gas valve flanged type 2 ½-inch and larger valve.

(To be specified for use after gas meter headers, gas regulators, isolation valves for buildings isolation, individual floor level isolation and boiler rooms.)

NORDSTROM	WALWORTH	RESUN	OR EQUAL
142	1786-F	1431	

2.17 SUMP PUMP

A. Schedule Numbers:

SP-1: Duplex, centrifugal open type impeller and motor mounted cover plated, furnished complete with high water alarm, automatic alternator, float switch, enamel control panel, with starters, disconnect switches, pilot lights, factory wired, sump pit shall be concrete (or fiberglass) as specified in a related section.

WEIL PUMP	PACIFIC	Mc COOK	HYDROMATIC	OR EQUAL

CO.	PUMPING CO	PUMP CO.	PUMP	
1600 Series				

2.18 STOP VALVES

A. Stops shall be loose key type, ½-inches IPS inlet and outlet chrome-plated brass casting, except as noted.

B. Schedule Numbers:

STV-1: Angle:

CHICAGO,	CRANE	NIBCO	OR EQUAL
442-LK	8.5113.	77	

STV-2: Partition:

CHICAGO	T& S BRASS	OR EQUAL
1771	B-1028	

STV-3: Straight Type, with Loose Key:

CHICAGO	CRANE	T&S BRASS	OR EQUAL
45-LK (1/2 inch)	8-5111	B-O418	

2.19 TRAP PRIMERS

A. Schedule Numbers:

ATP-1: Automatic, trap primer, cast bronze with access panel. Manufactured by PPP, Smith, Josam, or equal. (Installed in accessible location.)

SMITH	PPP	ZURN	WATTS	OR EQUAL
2699	P2-500	Z-1022	A-200	

ATP-2: Automatic, Multi-trap primer, cast bronze with access panel. Manufactured by:

PPP	J.R. SMITH	Or Equal
P2-500 with DU4	SERIES 260	

2.20 URINALS - Refer to Plumbing Fixture Schedule

2.21 WATER CLOSETS - Refer to Plumbing Fixture Schedule

2.22 WATER HEATERS / Domestic / Boilers

A. Gas fired water heaters shall meet the Flammable Vapors Ignition Resistance requirements (FVIR).

B. Gas and electric water heaters must meet NAECA energy efficiency requirements. Exceptions: Table top and point of use models (electric) less than 20 gallons. In capacity and gas models over 75,000 BTUH.

C. Water heaters from 75,000 BTU/hr to Boilers 2,000,000 BTU/hr shall comply with rule 1146.2 “Emission of Nitrogen from large water heaters and small boilers”. Natural gas fired water heaters with heat input rates less than 75,000 Btu/hr shall comply with rule 1121.

D. Instantaneous/Tank-less water heaters of any kind are prohibited. A minimum 6 gallon water heater is to be used.

E. Schedule Numbers: Refer to Plumbing Fixture Schedule.

2.23 WATER HAMMER ARRESTORS

WHA-1: Headers for Lavatories, Wash Sinks, Wash Fountains, Kitchen Sinks, Service Sinks, Urinals and Water Closets. For sizing purposes size according to manufacturer's recommendations.

SIOUX CHIEF	PPP	JR SMITH	WATTS	OR EQUAL
655 and 656 SERIES	SC SERIES	5005 TO 5050 SERIES	Series 05 and 150	

2.24 YARD BOXES

A. Schedule Numbers:

YB-1 Yard Boxes: 14 ¾-inch by 20-inch by 12-inch, cast concrete, with cast iron traffic cover marked "GAS"

(For use over gas stops).

BROOKS 36-H MB with No. 36-T Cast iron Cover	EISEL 363.5	OR EQUAL

YB-2: Same as YB-1, marked "WATER" (For use over water valves).

BROOKS 36- H MB with No. 36-T Cast iron Cover	EISEL 363.5	OR EQUAL

YB-3: Same as YB-1, marked "SEWER"

BROOKS 36- H MB with No. 36-T Cast iron Cover	EISEL 363.5	OR EQUAL

2.25 FIXTURE CONNECTIONS

A. Branches to individual fixtures shall be of the following sizes unless larger sizes are indicated on Drawings:

	Copper,	Copper,	Trap and	Soil/	
Fixture	Cold	Hot	Connections	Waste	Vent
WC Flush Valve	1 inch	-----	4-inch	4-inch	2-inch
Lavatories	½ inch	½ inch	1 ½-inch by 1 ¼-inch	2-inch	1 ½-inch
Sinks:					
Service	½ inch	½ inch	2-inch	2-inch	1 ½-inch
Kitchen	½ inch	½ inch	1 ½-inch by 1 ½ inch	2-inch	1 ½-inch
Wash	¾ inch	½ inch	1 ½-inch by 1 ½ -inch	2-inch	1 ½-inch
Multiple	3/8 inch	-----	1 ½-inch by 1 ½-inch	2-inch	1 ½-inch

Fixture	Water Supply	Soil/ Horizontal	Vent
Urinals, Wall-Hung Flush Valve			
Standard	¾ inch	2-inch	1 ½-inch
Access Compliant Use	1 inch	2-inch	1 ½-inch
Sill cocks	¾ inch minimum	-----	-----

2.26 HEIGHT OF FIXTURES

A. Heights for standard fixtures.

Fixture	Adult
Water Closets	15-inch
Lavatories	32-inch
Wash	30-inch
Urinals, lip height	24-inch

B. Heights for access compliant fixtures.

Fixture	Adult
Toilets, center line from wall	18-inch
Toilets, height to top of seat	17 to 19 - inches
Lavatories, sink top height	34-inch maximum
Lavatories, sink knee clearance	27-inch minimum
Urinals, lip height	17-inch maximum
Urinals, flush handle height	N/A
Wash Sink	Per Drawings

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Unless otherwise specified, plumbing fixtures, equipment and appliances that require connections to plumbing line shall be connected. This shall include fixtures specified or indicated as furnished by others, furnished by Owner, or specified in other related sections. Install supplies, stops, valves, traps, wall flanges, or pipe casing for connection of this equipment.

2. Install equipment as indicated on reviewed and accepted Shop Drawings.

3. Avoid interference with Work of other trades. Do not deviate from Drawings without review of the Architect.

B. Examination: Check each piece of equipment in system for defects verifying that parts are properly furnished and installed.

C. For piping Work, refer to Section 15410: Basic Plumbing Materials and Methods.

D. Plumbing Fixture and Equipment Installation:

1. Unless otherwise indicated, fixtures shall be installed with 5/16 inch brass bolts or screws of sufficient length to securely fasten fixture to backing, wall, or closet ring.

2. Fixtures installed against concrete or masonry walls shall have their hangers fastened with 5/16 inch brass bolts, Philip Shield type anchors, or 2 unit cinch anchors. Wood or plastic plugs are not permitted.

3. Fixtures installed against wood or metal stud walls shall have their hangers fastened to metal backing plates with 5/16 inch brass bolts screwed into plate. Fixture hangers for urinals shall be fastened centered vertically on metal backing plate with three 5/16 brass bolts each for small individual hangers and six, for larger one piece hangers. Lavatories shall be hung with not less than four 5/16 inch brass bolts or not less than five 1/4 inch brass bolts. Each sink hanger shall be hung with not less than four 5/16 inch brass bolt or not less than five 1/4 inch brass bolts.

4. Backing for hanging of plumbing fixtures and equipment shall be installed in supporting wall at time rough piping is installed. Backing for stud walls shall be steel plate 1/4 inch thick, not less than 4 inches wide. Backing for urinals shall be ¼-inches thick by 6-inch wide steel plate. Steel plate shall be attached to stud at each end of plate and to each stud it crosses. Plate shall be attached to metal studs by bolting with two ¼ inch U-bolts per stud with bolts through plate and around stud flange or by welding with a 1/8 inch fillet weld full width of stud flange, top and bottom of plate. At wood studs, plate shall be carefully recessed flush with face of stud and attached to each stud with 2 No. 14 flat-head wood screws, 2 inches in length into pre-drilled 1/8 inch holes. Backing for stud walls supporting wall-hung closets shall be as detailed.

5. Rough-in for fixtures, equipment and appliances shall be as indicated on Drawings and as specified, including those items indicated as furnished by others, furnished by Owner, or future capacity. When connections to equipment from capped or plugged lines are required, caps or plugs shall be removed at time equipment is set and stops or valves installed and connections provided as specified.

6. Piping materials for trap arms shall be Brass, Cast Iron or DWV copper

7. Piping shall be stubbed out to exact location of fixtures and stubs shall be installed symmetrical with fixtures. Hot and cold water supplies for center set faucets on lavatories shall be installed on 8-inch centers, unless otherwise specified or required.
8. Kitchen equipment requiring backflow protection with hot and cold water connections shall be installed with approved backflow prevention assemblies; BPV- 3 and drain into floor sink with air gap.

E. Cleanouts in Drain, Waste, Vent and Sewer Lines:

1. Cleanouts shall be installed at locations stated in the California Plumbing Code and accessible at following locations:
   a. Above service sink with brass plug.
   b. At each urinal and locate above urinal with brass plug.
   c. In vertical line at base of each downspout connected to an underground storm drain system extend cleanout to exterior of building.
   d. At upper end of a horizontal vent line when any part of horizontal line is below overflow level of fixture it serves.
   e. Not to exceed 100-foot intervals in sewer and waste lines exterior of building.
   f. At property line connection.
   g. Where indicated on Drawings.
2. Cleanouts shall be extended to grade as follows:
   a. Not to exceed 100-foot intervals in straight runs of pipe outside buildings.
   b. At horizontal changes of direction in aggregate greater than 135 degrees (underground).
   c. At property lines.
   d. Where cleanouts occur under concrete.
   e. Where marked for future connections.
3. Cleanouts in building shall be extended to floor level or above floor level or above floor level in walls or furring when cleanouts are not accessible or where clearance is less than 18 inches.
4. Cleanouts in finished areas in building shall be concealed except that cleanouts above service sinks in janitor's rooms or closet, and cleanouts above service sinks or in exposed piping in boiler or heater equipment rooms, may be exposed. Cleanouts for urinals shall be installed above urinal and shall terminate behind an access plate.
5. Cleanouts in floors of covered areas and those extended to grade in concrete areas shall be floor level type with extensions body brass plugs and detachable nickel- bronze or aluminum alloy scoriated.
6. Concealed cleanouts in vertical lines shall be service weight soil cleanout tees with brass plugs and round cover plates unless otherwise specified or indicated. A snug

fitting sleeve of galvanized sheet metal shall be placed around hub of tee and shall extend to flush with finished soil, or cleanout shall be extended to finished wall.

7. Cleanouts extended from below floor to a wall or furring or on horizontal lines above floor that terminate at a wall or furring shall be iron body type with brass plugs and round cover plates.

8. Cover plates over cleanouts in painted walls shall be steel, bonderized and prime coated. Cover plates cover cleanouts in tile walls shall be chromium-plated brass or nickel bronze. Plates shall be attached to cleanout plugs with 5/16 inch No. 18 or 1/4 inch No. 20 stainless steel vandal-proof type screws. Plates shall be one inch larger in diameter than fitting opening.

9. Cleanouts at bases of downspouts shall be tapped soil tees with brass plugs as hereinafter specified, full size of line.

10. Cleanouts extended to grade in exterior sewer lines other than floors or concrete areas shall be a cleanout assembly with secured top, extra heavy-duty, adjustable sleeve, cut-off ferrule, countersunk threaded brass plug and scoriated tractor type cover.

11. Other cleanouts shall be iron body type.

12. Cleanout extensions shall be no-hub cast iron soil pipe. Exterior cleanouts, those in concrete excepted, shall terminate in a 14-inch by 6-inch thick concrete block with cleanout assembly and top of block flush with finish grade.

13. Fittings in lines utilized as cleanouts shall be approved soil fittings including no- hub pipe. Tees and crosses in vent headers excepted.

14. Pipe joint compound shall not be installed on cleanout plug. After lines are tested and approved, each cleanout plug shall be removed, greased, and replaced.

3.3 WATER HAMMER ARRESTORS

A. Install water hammer arrestors indicated on Drawings and in following locations (only non-ferrous arrestors may be installed in copper water system):

1. Water lines to lavatory headers, water closet and urinal headers, service sinks, kitchen sinks, wash fountains, laboratories with medical type faucets and on wash sinks having three or more stations and all other quick closing fixture such as clothes washers, as close to fixture as possible.

2. Between last two fixtures when three or more fixtures, other than those listed in Number 1 above, are served by a common header.

B. When possible, arrestor shall be installed in wall or furring. When arrestor is installed in wall or furring, furnish an access plate large enough to permit removal of arrestor. Access plate shall be a minimum of 2 inches larger in each direction than the arrestor.

C. Fixture water lines shall be provided with mechanical water arrestor hammer dampening devices. Air chambers are not approved.

3.4 CONDENSATE DRAINS - FROM AIR CONDITIONING UNITS

A. Connect drain piping from drain pan of air conditioning unit to condensate disposal location indicated. When coil or unit housing is shock or vibration isolated, connection shall be furnished through a flexible connector not less than 10 inches long. Drain line shall pitch to flow out at not less than one inch in 8 feet. Drain line size shall be per UPC (3/4 inch up to 3 ton only). Drain line shall not be reduced smaller than unit outlet connection.

B. Condensate drain piping installed within building whether in air conditioned space or not shall be insulated. Refer to Section 15430: Plumbing Insulation, for type of material required.

C. Condensate Trap:

1. A condensate trap shall be installed for each air conditioning coil. Trap shall be assembled from 2 brass unions: one between A/C unit and inlet of trap, and one at outlet of trap that connects to main drain.

2. Trap configuration shall be per manufacturer's recommendations based on total unit casting static pressure (simulated plugged filter condition), but not less than 3 inch water seal.

3. Running trap design is not permitted.

4. Secondary drain shall not be trapped.

D. Condensate trap shall be checked at equipment operational tests for proper water drainage flow from air conditioning unit. Cooling condensate pan shall be filled with water, filters covered with plastic (plugged filter simulated), unit panels replaced, and unit motor running at design condition. Pan shall drain without hesitation to bottom of inlet connection. Tests are made prior to installation of ceiling.

E. Secondary Overflow Drain:

1. Drain pan installed underneath air conditioning units in concealed ceiling space or units that incorporate dam fitting shall be furnished with secondary drain piped to outside planter area with outflow location clearly visible.

2 If outside building location is not available or feasible, secondary drains shall be piped to a sink, if sink is not available pipe to a room corner away from cabinets, computers, desks, door ways/entrances or stairs.

3 Secondary vertical pipe that penetrates through suspended ceiling shall be furnished with a coupling or threaded adapter so ceiling tile can be removed without damage.

3.5 CONDENSATE DRAINS - FROM WINDOW TYPE HEAT PUMP AND EXTERIOR WALL MOUNT HEAT PUMP UNITS

A. Whether indicated on Drawings or not, window units and wall mount units without built in bottom drain pan for evaporator and condenser coils shall be provided with galvanized steel condensate pan at bottom of unit with drain line that drains into drywell. Install copper 1/2 inch diameter pipe for window type air conditioners and 3/4 inch diameter pipe for exterior wall-mounted heat pump units.

3.6 GAS SERVICE

A. Above Grade Service: Pipe shall be steel, hammered, free of dirt and scale, and blown out with oil-free air or nitrogen to a clean, dry condition. Piping shall not be installed in or through a ventilation duct or plenum.

B. Underground Service, Gas approved (yellow) Polyethylene Plastic Pipe: Refer to Section 15410: "Basic Plumbing Materials and Methods".

1. Pipes shall be joined with polyethylene fitting and joined together by thermal fusion in accordance with procedures recommended by Polyethylene plastic pipe and fitting manufacturer.

2. Plastic pipe shall be installed not less than 30 inches below grade..

3. Underground Warning Tape shall be installed 12 inches above buried gas piping. Warning tape shall be yellow with caution statement as follows: "CAUTION – BURIED GAS LINE BELOW".

4. Plastic pipe shall not be installed in or under a building or structure. Pipe shall be installed under bituminous surfacing or compacted soil area, free from large stones. Pipe may be installed under sidewalks or driveways, as long as no joint occurs. Pipe installed under paved covered areas wider than 40 feet shall be installed in ventilated conduits extending 2 feet past paving.

5. Pipe shall be installed on a 6 inches deep sand bed. After required pressure-leak test, pipe shall be covered with sand not less than 6 inches thick.

6. Piping shall not support weight of valves, metal fittings or other items. Pipe shall be installed strain free.

7. Plastic pipe fittings shall not be stored or left exposed to sunlight. Pipe in open trenches shall be shielded. A sand envelope of 6 inches minimum shall be placed around pipe, with exception of joints, until inspection by IOR is completed. Protection for pipe shall be provided when necessary to leave pipe exposed overnight.

8. Installer of piping is required to have training and to have attained a certification. Non-trained/Non-certified installer must contact the manufacturer or manufacturer's representative to provide on-site fusion training and certification, prior to work commencement

9. Polyethylene plastic pipe shall connect to a steel epoxy coated anodeless type riser to minimum of 6 inches above grade, when exiting the underground installation and transitioning to steel pipe connection.

10. Where a steel pipe riser passes into a structure or building, a double swing or double-offset joint shall be furnished. Pipe shall pass into structure 6-inches above grade and through a sleeve with a minimum one inch clearance. An isolation valve is required before pipe entering the building.

3.7 CLEANING - PLUMBING PIPING SYSTEMS AND FIXTURES

A. Plumbing lines and fixtures shall be flushed to remove dirt and foreign material until water runs clear and no foreign substance or odor is present. Strainers and screens on faucets shall be removed during this cleaning operation.

B. After satisfactory cleaning of strainer and screen replacements has been witnessed by the Project Inspector, post and maintain signs stating: "CAUTION - Water at this construction project has not yet been certified for human consumption." Signs shall be furnished with letters at least 1/2 inch in height, and shall be conspicuously posted at entrances to the Project site. Signs shall be paneled, black and yellow, in conformance with OSHA Section 1910.1455.

3.8 DISINFECTING DOMESTIC WATER PIPING SYSTEMS

A. Newly installed or replaced piping and/or fixtures dispensing potable water shall be disinfected and undergo an approved bacteriological analyses before water system is allowed for public use.

B. Work shall be performed by Technicians Certified by the American Water Works Association (AWWA) and/or the State of California Department Health Services, Grade II Water Treatment Operator Certification or higher issued by the Department of Health Services (DHS) for the State of California. Comply with Title 22, Code of Regulations Division 4, Chapter 13, and Article 2 Operator Certification Grades.

C. Method:

1. A Reduced Pressure Backflow assembly shall be in installed to protect from cross contamination of the local water purveyor's meter service supply when at any time there is any type of water connection with the piping to be disinfected (Chlorinated) and the water meter service supply.

2. System is to be flushed to remove any materials that may have entered the system.

3. Using a chemical feed metering pump and a chlorine tank, the chlorine solution is injected into the water system.

D. Disinfection and De-chlorination procedure (24 or 3 Hour Contact Time):

1. 24-hour Test Method:

a. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.

b. Piping system shall then be adequately flushed with water to remove any particles and eliminate air pockets.

c. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 50 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.

d. Chlorine residual test will be taken at all appropriate points and outlets to verify 50 PPM residual levels.

e. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 24 hours.

f. After 24 hours, chlorine residual levels will again be tested at various points throughout the system to insure a minimum of 25 PPM residual. If the system

has not met the minimum of a 25 PPM residual, the above disinfection process shall be repeated.

g. After satisfactory completion of the residual testing, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.

h. The Owner may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

2. 3 Hour Test Method:

a. If the water systems must be turned on for use as soon as possible, a 3 hours chlorine contact time to allow for disinfection is permitted with the Owner's approval.

b. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.

c. Piping system shall be then adequately flushed with water to remove any particles and eliminate air pockets. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 200 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.

d. Chlorine residual test will be taken at all appropriate points and outlets to verify 200 PPM levels. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 3 hours.

e. After satisfactory completion of a 3 hour disinfection period, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.

f. The Owner may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

E. Bacteriological Test:

1. After final flushing and satisfactory results from the residual free chlorine concentration test, Bacteriological test samples shall be collected. The intent of the following is to provide insurance for an accurate representation to a complete Bacteriological test of the water system. At least two samples shall be taken from each floor of each building.

2. Bacteriological test samples shall be delivered to a State of California Department of Health Services Certified Laboratory to perform qualitative and quantitative

bacterial analyses on the water samples for the presence of any Total Coliform bacteria and Plate Count. This count must be less than 500 cfu/mL.

3. The procedure shall be repeated if it shown by bacteriological examination made by an approved agency that the level of Disinfection does not meet these specifications.

4. After satisfactory results for the bacteriological test are provided to the Owner, warning sign or tags shall be removed.

3.9 VALVES ON PLUMBING SYSTEM

A. Furnish and install gates, ball, globes, angles, and check valves on plumbing Work at following locations whether indicated on drawings or not.

B. Hot and cold valves shall be:

1. Above the ground copper water system, 2-inch and larger, may utilize Victaulic butterfly valves and fittings for their connections. A 2-inch or larger Victaulic valve may be in a wall if an adequately sized access panel is provided for maintenance or removal.

C. Valves shall be accessible and installed within an access panel approximately 3 feet above floor and no more than 7 feet above floor, or in a marked yard box to prevent tampering.

1. Install a gate, ball valve or partition stop for stops adjacent to, and controlling water flow to each sill cock and hose bib.

2. Install gate or ball valve at each location where a water line is connected to a piece of equipment other than items mentioned above.

3. Install a check valve on each hot water return line where it connects to a hot water storage tank or a water heater.

3.10 VALVES - GAS SERVICE

A. A gas readily accessible shut-off stop shall be installed on each gas line entering a building immediately prior to the point it enters the building. Unless otherwise specified or indicated, shut-off valves for lines entering a permanent structure, buildings or portable buildings, shall be installed in a vertical riser above grade.

B. Gas Shut off valve within a building – A gas shut off valve with handles shall be accessible and serviceable within an access panel. Install valve minimum 3 feet above floor but less than 7 feet above floor.

C. In addition to locations specified, gas shut off valve shall be installed at following locations:

1. Install a lubricated plug gas shut off valve before entering any building or structure.

2. Install a gas valve on each outlet, in addition to any gas stop furnished with equipment.

3. Gas shut-off valves to be furnished with equipment.

4. Install gas shut-off valve at not more than 1,000 foot intervals on each gas main.

D. When a gas-shut off valve adjacent to gas-fired equipment is indicated in Contract Documents it shall be furnished and installed as part of Work of this section.

3.11 ELECTROLYSIS PREVENTION

A. Brass nipples, 6 inches, with recognized brass unions; flanges shall be furnished and installed at locations described herein. Flanges shall be installed with complete insulating component consisting of gasket bolt sleeves and bolt washers. Dielectric insulators shall be installed at following locations:

1. Where special applications indicated on Drawings require an insulation flange or brass union, with 6-inch brass nipple to be installed in a condensate line, or steam line, flange insulation shall be of a high temperature type, suitable for continuous operation at temperatures up to 220 degrees F. for condensate and 400 degrees F. for steam.

2. Where steel or cast iron in ground connects to copper or brass piping above ground, transition from steel or cast iron pipe to copper or brass pipe shall be provided in an accessible location.

3. Underground dielectric connections shall be furnished in accessible yard boxes.

4. Above ground dielectric connections shall be exposed; or if in finished rooms shall be located in accessible access boxes.

3.12 UNDERGROUND PIPE MARKERS

A. Pipe markers shall be furnished according to Section 15420: “Plumbing Identification”

B. Under ground Caution Tape shall be placed 12 to 18 inches above the utility line. The Caution Tape shall be a designated color and marked with the appropriate name for the specific type of utility pipe as follows:

1. Yellow – with the words: CAUTION GAS LINE BELOW

2. Blue – with the words: CAUTION WATER LINE BELOW

3.13 DEPTH OF SEWER LINES

A. Minimum depth of below grade sewer lines shall be 24 inches to centerline of pipe.
Sewer lines shall slope ¼ inch per foot minimum, unless otherwise indicated. Minimum depth at Owner property line shall be 6 feet, unless otherwise required.

3.14 BACKFLOW PREVENTION DEVICES

A. Backflow Devices: Installation of backflow devices shall be tested and certified by West Hollywood backflow device tester before Substantial Completion. Tests shall be performed in presence of Project Inspector. Test reports shall be turned over to Project Inspector for mailing to proper agency.

3.15 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose off Project site.

3.16 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 15440 - COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section provides the basic plumbing requirements that apply to the Work of Division 15.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 15: Plumbing
3. Division 23: HVAC
4. Division 26: Electrical.

1.2 REGULATORY REQUIREMENTS

A. Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less. Under California regulations pipes and pipe fittings are considered lead-free when they contain 0.25 percent lead or less as defined in California Assembly Bill 1953 (AB 1953). No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953.

1. Collect pipe, solder, and flux material samples as required by the Project Inspector. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.
   a. Test samples for lead content by the atomic absorption spectrophotometry method.
2. Materials found not conforming to SDWA and California AB 1953 regulations shall be deemed defective Work and shall be replaced with lead-free materials.
3. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the Project INSPECTOR.

A. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:

1. ANSI - American National Standards Institute.
2. ASME - American Society of Mechanical Engineers.
   a. ASME Boiler and Pressure Vessel Code.
   b. ASME B31 - Standards for Pressure Piping.

3. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.

4. ASTM - American Society for Testing and Materials.

a. ASTM A53 Specification for Welded and Seamless Pipe.

5. AWWA - American Water Works Association.

6. CSA - Canadian Standards Association.

7. FM Global - Factory Mutual Global

8. IAPMO - International Association of Plumbing and Mechanical Officials.

9. NFPA - National Fire Protection Association.

10. OSHA - Occupational Safety and Health Administration.

11. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.

12. UL - Underwriters Laboratories Inc.

13. Intertek (ETL Certification).

B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:

1. CBC, California Building Code, and CMC, California Plumbing Code.

a. Latest edition as adopted by the City of Los Angeles, the County of Los Angeles, and the State of California including amendments effective on the Effective Date of the Contract.

2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.

3OSHA - Occupational Safety and Health Administration.

4. CDPH - California Department of Public Health.

5. SCAQMD - South Coast Air Quality Management District.

C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

D. Permits and Fees: Refer to the General and Supplementary Conditions.

1.3 SUBMITTALS

A. The above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.

B. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project.

1. Complete system layout of equipment, components, plumbing fixtures, piping, indicating service clearances, and pipe sizes, fitting types and sizes and pipe

elevations, distances of pipes and equipment from building reference points and hanger support locations.

2. Schedule and description of equipment, piping and fittings.

1.4 PROJECT RECORD DOCUMENTS

A. Project Record Drawings:

1. Provide a complete set of plumbing and fire protection drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full size reproducible plots on vellum and 3 sets of prints.

2. Before Contract Completion, deliver corrected and completed prints to the Owner. Delivery of project record documents to the Owner does not relinquish responsibility of furnishing required information omitted from project record documents.

B. Operation and Maintenance Manuals:

1. Submit two copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return three copies of manuals. Submit an electronic copy of the entire manual in PDF file format.

2. Contents of Manual:

a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

b. Manufacturer's operating instructions including, but not limited to, the following:

1) Identification of components and controls.

2) Trouble shooting checklist and guidelines.

3) Recommendations for optimum performance.

4) Warnings and safety precautions on improper or hazardous operational procedures or conditions

c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished includes the following as a minimum:

1) Manufacturer’s model, identification and serial numbers.

2) Exploded view of assembly drawings identifying each component or part with the relevant part number.

3) Directory of manufacturer’s representatives, service contractors and part distributors.

4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

d. Project Record Drawings: Complete set of plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

e. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as required by SCAQMD to allow start-up and operation of equipment.

f. Los Angeles County industrial waste permits.

g. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

h. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.

B. Do not store plastic pipe or materials in direct sunlight.

1.06 PRELIMINARY OPERATION

A. Owner may require any portion of plumbing Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.

B. Notify the INSPECTOR at least 24 hours in advance of lighting or re-lighting pilots.

1.07 TRAINING OF OWNER PERSONNEL

A. Training of Owner’s personnel shall include:

1. A minimum of 4 hours of on-site overview of the overall Plumbing System.

2. Refer to Division 15 sections for specific training on each of the components of the Plumbing System.

B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.

C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

D. Upon completion of Owner training, a completion certificate indicating the nature

of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by Owner.

E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the Owner and kept as part of the project documents.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.

C. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. The additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

PART 3 – EXECUTION

3.1 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.

B. When service interruptions are mandatory, arrange in advance with the Owner as to time and date of such interruptions.

C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.2 CUTTING, NOTCHING, AND BACKING

A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.

B. Where pipes pass through, or are located within one inch of any construction element, install a resilient pad, ½ inch thick minimum, to prevent contact.

C. Furnish provisions for recesses, chases, and accesses and provide blocking and backing for proper reception and installation of plumbing Work.

3.3 LOCATION OF PIPING AND EQUIPMENT

A. Location of piping, apparatus and equipment indicated on the Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.

B. Trenches parallel to footings shall not be closer than 18 inches to the face of

footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.4 TESTS AND TESTING

A. Tests shall be as required under the applicable sections of Division 15, including this Section.

B. Additional tests may be required in the case of products, materials, and equipment if:

1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.

2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.

C. Piping Tests:

1. Perform tests required to demonstrate that operation of plumbing systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.

2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.

3. Pressure gauges furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.

6. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Inspector.

7. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

D. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:

Durham system, glass or plastic acid waste, vent and roof drain (except pipes running under a slab or underground)	Fill with water to top of highest vent; allow to stand two hours, or longer, as required by Inspector. Minimum head required for any joint shall be 10 feet in building.	Water
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10 feet of water, vertically	
Storm water disposal lines	Running water test	Water
Vacuum pump or condensate pump discharge and condensate return piping	150	Water
Domestic water piping	200	Water
Standpipes, wet or dry	300	Water

Fire sprinkler piping	200	Water
Gas piping(steel threaded or plastic)	60 (both tests)	Air
Gas piping (steel welded)	100 (both tests)	Air
Gas welding station	1-1/2 Working pressure 100 min.	Dry nitrogen

E. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.

2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.

3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of all equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified capacities.

4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

   a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.

5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.

6. Final adjustment to equipment or systems shall meet specified performance requirements.

7. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

3.05 NOISE AND VIBRATION REDUCTION

A. Correct noise or vibration caused by plumbing systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level

B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.6 PROTECTION, CARE AND CLEANING

A. Construction Facilities and Temporary Controls, the following shall be provided:

1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.

2. Protect installed Work.

3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.

4. Protect covering for bearings, open connections to tanks, pumps, compressors and similar equipment.

5. Interior of piping shall be maintained free of dirt, grit, dust, and other foreign materials.

6. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

7. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas.

END OF SECTION

SECTION 22 05 13 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section prescribes basic materials and methods generally common to the Work of Division 15.

B. Related Requirements:

1. Division 01: General Requirements.

2. Division 15: Plumbing.

3. Division 26: Electrical.

1.2 SUBMITTALS

A. Provide in accordance with Division 01, Section 15440. Types of

B. welding rods to be used.

1.3 QUALITY ASSURANCE

A. Standards: Comply with applicable national, state, and local codes and

Standards: ASTM, ASME, and ANSI. Federal Specifications, AWWA, SISPI, NFPA, FM, UL, CPC (California Plumbing Code), CMC (California Plumbing Code), CSA.

B. Qualifications of Manufacturer: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the Architect.

1.4 COORDINATION

A. Coordinate related Work in accordance with provisions of Section 01 3113: Project Coordination.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.

B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing

Codes and applicable standards as specified in Section 15440, manufacturer's instructions or as required.

1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.2 MANUFACTURERS AND MATERIALS

A. Ball Valves: Bronze, 2-inch and smaller:

BV-1: Class 150, 600 psi, CWP two piece construction with reinforced TFE seats, full port, adjustable packing gland, (no threaded stem designs allowed), threaded ends.

NIBCO T-685-80-LF, Hammond UP-8303A, Milwaukee UPBA-400 or equal.

NIBCO T585 S6R66 (Stainless Steel), Milwaukee BA-260 (Stainless Steel).

APPLICATION: BV-1A shall be used on hot domestic and cold water systems.

BV-2 Class 150, 600 psi CWP, 2-piece construction, bronze body, reinforced Teflon seats, adjustable packing gland, (no threaded stem designs allowed), threaded ends.

Hammond UP8301A, NIBCO T-585-70, Milwaukee BA-400, or equal.

BV-2 to be used only where water is NOT used for water consumption.

Ball Valves in Insulated Piping: Use extended operating handle of non-thermal conducive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied. NIBCO Nib-Seal Handle.

B. Butterfly Valves:

BFV-1 Centerline Series A, 200 psi CWP tight shut-off.

1. Body: Lug type ductile iron. Suitable for bi-directional dead-end service at rated pressure without use of downstream flange.

2. Disc: Bronze, or aluminum bronze.

3. Stem: One or two-piece, 400 series stainless steel.

4. Seat and O-Rings: EPDM.

5. Upper and Lower Stem Bearings: Copper alloy or non-metallic material.

6. Operators: Valves 6 inches and smaller, with lever handle. Valves 8 inches and larger, with manual gear operator and disc position indicator.

7. Manufacturers:

a) Valves 2.5 to 6-inch: NIBCO, Milwaukee ML-233E, Hammond 6411- 03, or equal.

b) Valves 8-inch and larger: Milwaukee ML 333E, Hammond 6411-03, NIBCO LD 2000, or equal.

C. Check Valves:

1. Bronze, 2-inch and smaller:

CHV-1: 200 psi, CWP horizontal swing, Y pattern, renewable seat and disc, threaded ends.

NIBCO T-413-Y-LF, Milwaukee UP-509, Hammond UP-904 or equal.

Application: Use on domestic hot and cold water systems.

CHV-2: Class 125 200 psi, swing check, bronze body, Teflon disc, soldered ends.

Stockham B-310TY, Crane 1340, NIBCO S-413-Y, Milwaukee 1509-T, Hammond IB-912 or equal.

APPLICATION: Provide on junior fire sprinkler systems less than 3 fire sprinkler heads.

CHV-3: 200 psi, CWP, bronze body, horizontal swing, Y pattern, renewable seat and disc, solder ends.

Nibco S-413-Y-LF, Milwaukee UP 1509-T, Hammond Up-946 or equal.

APPLICATION: Use on domestic hot and cold water systems.

2. Cast Iron 2 1/2-inch and larger:

CHV-4: Class 125, 200 psi, CWP, IBBM, renewable seat and disc, bolted cap, threaded ends:

Crane 372, Stockham G-927, NIBCO T-918-B, or equal.

D. Earthquake Valve:

EQV-1 Mechanically triggered by seismic movement, complying with state of California seismic response specifications, UL listed and certified by D.S.A. Size

and pressure as required or indicated on Drawings. (Minimum 1/4 psi, maximum 10 psi. Earthquake valve shall shut off gas automatically during an earthquake to prevent an explosion or fire. Valve shall be Koso California seismic valve, or equal.

1. Not sensitive to vibrations caused by passing trucks or accidental bumping.

2. Sensitive to wide amplitude G's only. Preset at factory for the correct G- rating.

3. Positive sealing from minus 10 degrees F. to 150 degrees F.

4. Visual open-close indicator.

5. Manual reset.

6. Plumb line for mounting.

7. Tripping mechanism has non-creeping rolling latch.

8. Install valve per manufacturer's recommendations only.

E. Gate Valves:

Gate valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03.

1. Bronze, 2-inch and smaller:

GV-1 Class 125, 200 psi CWP, bronze body and bonnet non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Hammond IB645, Crane 1701, Milwaukee 105, American 3F, NIBCO T-113, or equal.

APPLICATION: Shut-off and isolation of equipment and device for gas system.

GV-2 Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

APPLICATION: Use on domestic hot and cold water systems.

GV-3 Same as GV-1, except solder ends:

NIBCO S 113, Milwaukee 115, Hammond IB 647, or equal.

APPLICATION: Same as GV-1. Provide in yard box, to each group of fixtures behind access panels, where valves are located near ceiling and beams.

GV-4 Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

APPLICATION: Use on domestic hot and cold water systems.

GV-5A Class 250, 250 psi, CWP, O S and Y, IBBM, resilient seat gate valve, flanged ends.

Watts's 408-OSY-RW, Kennedy 7168 or equal.

The epoxy coated valves are recommended in the domestic cold water system where corrosives in the water line might cause damage to the inside of valve and where pressure rating in excess of 200 psi is required.

GV-9 Class 125 250 psi CWP iron body, flanged ends, bolted bonnet with wheel handle, resilient wedge, non-rising stem.

APPLICATION: For use in walls for cold water system pipe sizes 2 ½-inch and larger.

NIBCO F-619-RW or equal.

GV-10 Class 125, 250 psi CWP iron body, flanged ends, bolted bonnet with 2- inch operating nut, resilient wedge, non-rising stem, fusion bonded epoxy coated.

APPLICATION: For use below grade for cold water system pipe sizes 2 ½- inch and larger.

NIBCO F-619-RW-SON or equal.

F. Globe Valves:

1. Bronze, 2-inch and smaller:

GLV-1A Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Milwaukee UP 502, Hammond UP 440 or equal.

GGLV-2 Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, solder ends. Hammond

IB-418, Milwaukee 1502, NIBCO S-211-Y, or equal.

GLV-2A: Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, soldered ends. Milwaukee

UP 1502, Hammond UP 418 or equal.

G. Piping:

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.

2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in Section 15420: Plumbing Identification.

P-1 Cast iron: Hub less, service weight, ASTM A888, CISPI 301, conforming to CISPI 310 and installed in accordance to IAPMO 1S 06. American Foundry, Tyler, or AB & I or equal.

P-2 Galvanized steel, Schedule 40, ASTM A53., US Steel or equal.

P-3 Copper drainage tube, underground, type L hard, ASTM B 88, Mueller, Cerro Brass or equal.

P-4 Copper drainage tube, inside structure and above grade. Type DWV hard temper, ASTM B 306, Mueller, Anaconda, Cerro Brass, Cambridge- Lee, Halstead or equal.

P-5 Purple pipe, PVC, schedule 40 for reclaimed or recycled water (below ground only for non-potable irrigation systems), type 1, grade 1, PVC- 1120, Cell Class 12454 B.

P-6 Copper water tube, Type L hard, ASTM B88. Mueller, Cambridge-Lee, Halstead or equal. (when used above ground only)

P-7 Copper water tube, Type K hard, ASTM B88, by Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-8 Polyethylene plastic pipe, ASTM D 2513, standard dimension ratio. 11, rated at 80 psi working pressure at 73 degrees Fahrenheit (F). For 3- inch and smaller, SDR 11.5 rated at 76 psi at 73 degrees F. for 4-inch and above, butt or socket type fittings, joined by heat fusion, orange or yellow color.

CPCHEM (Chevron Phillips Chemical Company LP) PE 2406, or equal.

P-9 Red seamless brass 85-5-5-5, iron pipe size (IPS), threaded pipe, ASTM B43. Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-10 Black steel pipe, Schedule 40, ASTM A53, Type E, ERW by US Steel, or equal.

P-11 Seamless copper tubing, tempered drawn, Type M, ASTM B88 by Mueller, Cerro Brass or equal.

P-12 High Silicon Iron Casting, 1 ½-inch and 2-inch, threaded for science room vents when ferrous waste piping is provided, ANSI-A21.10, WWP- 356-36, ASTM D1784-699, by Duriron or equal.

P-13 PVDF (Polyvinylidene Fluoride) schedule 40 pipes, conforming to ASTM F1673, ASTM D3222 and complying with UL723 (ASTM E84). The joints may be no-hub or electro-fusion type. Installer shall be certified by manufacturer for joint installation. Orion, Fuseal or equal.

P-14 Polypropylene chemical waste, flame retardant pipe, conforming to ASTM F1412 and ASTM D4101. The joints may be no-hub or electro- fusion type. Installer shall be certified by the manufacturer for joint installation. Orion, Fuseal or equal.

P-15 PVC, thick wall, cast-iron OD sized, UL listed, AWWA listed, NSF listed, Class 200 with tracer wire, Blue Brute, or equal.

P-16 Type 316L Stainless steel chemical waste pipe, marked with manufacturer's identification and fittings. Mechanical press fit joints with EPDM seals Manufacturer's representative shall instruct installers and certify them for joint installation. Piping system shall be provided with a five-year manufacturer's material warranty.

Blucher-Josam or equal.

P-17 304 / 304L Stainless Steel, .049 wall, ASTM A312. Pipe must be certified for use with the Vic-Press 304TM piping system, by Trent Tube, Victaulic or equal.

P-18 CPVC (Chlorinated polyvinyl Chloride) schedule 40 pipe, conforming to ASTM D1784 and complying with UL723 (ASTM E84). The joints shall be of solvent cement type conforming to ASTM F493. Installer shall be certified by the manufacturer for this type of joint installation. Spears, Corzan, Charlotte or equal.

P-19 PVC, schedule 40, extruded from 100 percent virgin Polyvinyl Chloride (PVC) compound, meeting requirements of class 1254-13 of ASTM D1784.

H. Pipe Fittings:

PF-1 Cast iron, soil or waste no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. 2 bands for size 1 ½-inch thru 4-inch, IAPMO, ASTM C 564 and CISPI 310.

American Foundry, Mission, Tyler, or equal.

PF-2 Cast iron, soil or waste, Heavy-duty no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. 4 bands for size 5-inch thru 10-inch. IAPMO, ASTM C564 and CISPI 310.

American Foundry, Mission, Tyler, or equal.

PF-3 Malleable iron, Class 150, threaded, galvanized, beaded, ANSI B 16.3. P-2 Stockham,

Stanley Flagg, Grinnell Oreual.

PF-4 Cast brass drainage fittings ASA B 16.23, ASTM B 42. Provide with copper drainage tube.

Mueller Brass, Nibco, Stanley Flagg, Lee Brass Or equal.

PF-5 Wrought copper - solder type ANSI B 16.22

Mueller Brass, Nibco, Lee Brass or equal.

PF-6 Polyethylene plastic fittings, ASTM D 3261 and D 2683, standard dimension ratio 11, rated at 80 psi working pressure at 73 degrees F. for 3 inches and smaller, SDR 11.5 rated at 76 psi at 73 degrees F. for 4 inches and above, butt or socket type fittings, joined by heat fusion, color orange or yellow.

CPCHEM, (Chevron Phillips Chemical Company LP) or equal.

PF-7 Polyethylene transition risers, for Pff-6 above, Transition fitting must have a minimum vertical height of 36 inches from the horizontal connection which will allow for a 6-inch steel riser above ground. Polyethylene transition risers shall be anodeless.

Central Plastics Company or equal.

PF-8 Bronze and brass, 250 psi, threaded, ASA B16.17 and F S WW-P-460.

Mueller Brass, Lee Brass Or equal.

PF-9 Malleable iron, Class 125, ANSI B 16.3, threaded or welded Schedule 40 black steel for 2-inches and below and welded for 2 ½-inch and above, by Stockham or equal.

PF-10 Cast iron, threaded, Class 125, ANSI B 16.1.

Stockham or equal.

PF-11 Cast-iron OD sized, bell and spigot gasket joints. PF-12 Steel

butt weld type, ASTM A 234WPB.

PF-13a No-hub couplings for factory grooved PVDF or polypropylene, schedule 40 piping. The coupling shall be of the same material and gauge as the pipe. Each coupling shall have 300 series stainless steel outer band and 5/16 inch bolts, nuts and washers plated to meet a 100-hour salt spray test per ASTM B117. Installer shall be certified by the manufacturer for this type of joint installation. Orion, Fuseal or equal.

PF-13b The pipe and fitting shall be joined using the socket fusion system conforming to ASTM 2657. Installer shall be certified by the manufacturer for this kind of joint installation. Orion, Fuseal or equal.

PF-13c CPVC (Chlorinated Polyvinyl Chloride) schedule 40 pipe and fittings, conforming to ASTM D1784 and complying with UL723 (ASTM E84), shall be joined using solvent cement conforming to ASTM F493. Installer shall be certified by the manufacturer for this kind of joint installation. Spears, Corzan or equal.

PF-14a Drains, bottle traps and similar devices for CPVC, PVDF or polypropylene, schedule 40 piping, shall be of same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this kind of joint installation. Orion, Fuseal or equal.

PF-14b Type 316L Stainless steel joint for chemical waste piping systems including drain or bottle traps. Blucher-Josam or equal.

Victaulic Vic Press 304TM or equal.

PF-15 Precision cold drawn austenitic 304/304L stainless steel, with elastomer O-rings

PF-16 Grooved end type– ASTM A395 and A536 ductile iron; ASTM A234 WPB forged steel; fabricated from ASTM A53 carbon steel. Couplings shall be supplied with angle-pattern bolt pads for rigidity, except in locations where flexibility is desired. Gaskets shall be pre- lubricated. Galvanized or painted, by Victaulic or equal.

PF-17 Grooved end type– ASTM B75 or B152 and ANSI B16.22 wrought copper, bronze sand casting per ASTM B584-87 copper alloy CDA 836 per ANSIbB16.18. Couplings shall be CTS style 606 supplied with angle pattern bolt pads for rigidity, coated with copper coated alkyd enamel. Gaskets shall be pre-lubricated Flush seal type by Victaulic or equal.

PF-18 CPVC fittings must conform to ASTM D2846 specification for chlorinated polyvinylchloride (CPVC) plastic for hot and cold water distribution system.

PF-19 Plastic fittings, schedule 40 molded from PVC type I compound, conforming to the requirements of specification ASTM D2466.

I. Pipe Isolators:

PLA-1 Absorption pad shall be not less than ½ inch thick, unloaded. Pad shall completely encompass pipe.

Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator, or equal. Hydra-Zorb

Cushion Clamps, Acousto-Clamp, or equal.

J. Plug Valves:

PV-1 2 inches and smaller: Rockwell No.114, lubricated plug type, 200- pound., water operating gauge pressure iron body and plug, regular pattern, threaded, with indicating arc; by Walworth, Homestead, WKM, or equal.

PV-2. 2 ½-inch and larger: Rockwell No.115 and No.165 lubricated plug type, 200 pound water operating gauge. Iron body and plug, regular pattern, flanged, with indicating arc. Walworth, Homestead, WKM, or equal.

K. Vent Caps:

VC-1 Vandal-proof hood type, for plumbing vent lines.

Stoneman Engineering and Mfg., Semco 1550

L. Protective Coating for Underground Steel Piping Applied to Underground Automotive:

VV-1 Vacuum valves; for vacuum service, 125 psig

1. Black steel or galvanized steel piping indicated for below grade installation, shall be protected as specified prior to delivery to the Project site:

   a. Sandblast black steel pipe to a gray finish. Sandblast galvanized steel pipe lightly only.

b. Install one coat of cut back asphalt to galvanized pipe immediately after sandblasting. Pre-heat black pipe to 180 degrees F. immediately before coating.

c. Install one coat of high-temperature (melting point of 240 degrees F. minimum) Grade B asphalt enamel.

d. Install one wrapping of 20 mils thick glass, fiber mat, Owens- Corning Coromat or L.O.F. Blueflag with 1/4 inch overwrap. Glass fiber shall be dry at time of installation.

e. Install a second coat of asphalt enamel as specified above. Glass fiber mat shall be centered in the asphalt enamel.

f. Install an overwrap of Kraft ripple paper.

2. Total thickness of pipe wrapping shall be not less than 1/8 inch. Entire coating operation shall be accomplished by mechanical means in a continuous operation. Hand installation of protective coating is not permitted.

3. Each piece of wrapped pipe shall be legibly identified at no greater than 5 feet intervals by Fabrication Company. Each material submittal shall include the name of the fabrication company. Maintain one reviewed Sample on the Project Site.

4. Acceptable manufacturers of wrapping are: Hunt, Mobile, Conway or equal.

5. Fittings (including couplings), unprotected pipe adjacent to fittings, and damaged pipe protection shall be wrapped at Project site as follows:

a. Fittings and pipe to be wrapped shall be thoroughly cleaned of material foreign to pipe manufacturer.

b. Install one coat of Plicoflex No. 105 or Protecto Wrap No. 1170 adhesive primer to metal.

c. Wrap pipe and fittings with a minimum thickness of 3/32 inch of Plicoflex No. 310 pipe line butyl molding tape, or Protecto Wrap No. 200 molding tape. Install 3 layers, each layer overlapping next approximately 2/3 width of tape, without stretching. Tape and primer shall be of the same manufacturer.

d. Wrap vinyl tape, 10 mil thickness, over molding tape with 1 inch minimum overlap.

J.M. Trantex, 3M Scotchwrap or equal.

5. Pipe and fittings specified to be wrapped shall be tested with a holiday detector, after pipe has been installed in trench and before backfilling,

in presence of the Project Inspector. Furnish a Tinkler and Raser model E-P holiday detector, or similar equipment for this test. Work, which is deemed defective, shall be repaired or replaced. The Project Inspector may test for damaged pipe wrapping after backfilling.

6. Instead of wrapping underground steel pipe as specified above, pipe may be machine-wrapped before delivery to the Project site as follows:

   a. Pipe shall be cleaned of moisture, oil, grease, scale, and other foreign material by cleaning with non-oily solvent and wire brushing. Remove metal burrs and projections.

   b. Install one coat of Plicoflex No.105 adhesive primer to cleaned pipe. If thinning is required, furnish only non-oily thinners as recommended by tape manufacturer.

   c. Wrap coated pipe with Plicoflex No.340-25 tape (15 mil butyl and 10 mil vinyl laminate) Tape shall be installed by machine wrapping at approved plant only. Maintain tension (minimum of 5 pounds per inch of width) on tape over entire diameter of pipe. Tape shall be permanently identified and visible on vinyl side.

   d. Fittings, unprotected pipe, and damaged pipe protection shall be wrapped as indicated above.

U. Pipe and Fitting Requirements Schedule: Unless otherwise specified or indicated on Drawings, pipe and fittings shall be installed in accordance with the following table:

TABLE I
PIPE AND FITTING SCHEDULE

Use	Limits	Pipe	Fittings
Domestic hot and Cold water, underground	Up To 8 inches	P-6	PF-5
Copper, underground only		P-7	PF-5
Cold water, underground (Site piping)	4-inch and over	P-144	PF-11
Domestic hot and cold water, in building and above ground	All	P-6	PF-5
In building above ground	2 to 8-inch	P-6	PF-5
Compressed air	Underground or in concrete	P-9	PF-8
	Above ground	P-10	PF-3
Condensate drains and drains From HVAC Equip.		P-6	PF-5
Downspouts, interior above and below grade, up to 5 feet		P-1	PF-1 Or PF-2

from building.			
Acid Vent	All	P-12	PF-10
Fire Mains (Fire Hydrant)	Underground	P-15	PF-11
Gas Natural	Underground	P-8	PF-6
Gas Natural	Above ground	P-10	PF-9
Copper Drainage Tube (Underground)	Waste and Vent	P-3	PF-4
Copper Drainage Tube (Above Ground)	Waste and Vent	P-4	PF-4
Vents	New Building	P-1	PF-1 or PF-2 (IRE) if required by engineer
Vents	Existing Buildings and Exposed Downspouts	P-2	PF-3
Vents	For acid waste lines underground	P-13, 14, 16, 17, 18	PF- 13a, 13b, 13c, 14a, 14b or 15
Waste lines, Sanitary		P-1	PF-1 or PF-2 (IRE) if required by engineer
Waste lines, Acid	To nearest water dilution jet	P-13, 14, 16, 17, 18	PF- 13a, 13b, 13c,14a, 14b or 15

V. Flanges: Flanges shall be furnished and installed at each flanged connection of each type of equipment, tanks, and valves. Faces of flanges being connected shall be furnished alike. Connection of a raised face flange to a flat-faced flange is not permitted. Flanges shall conform to following schedules:

TYPE OF PIPE	FLANGE
Screwed black or galvanized grooved steel pipelines.	125 pound black cast iron screwed flange, flat faced or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Welded or grooved steel pipe, except high pressure steam lines.	150 pound black forged steel welding flanges, 1/16 inch raised face ASTM A 105, Grade II or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok F i g . 7401, or equal.
Copper and brass pipe or tubing.	150 pound cast bronze, flat-faced flange with solder end or grooved flange adapters, Victaulic Style 641, Tyco-Grinnell Fig. 61, Gruvlok Fig. 6084, or equal.

1. Gasket material for flanged connections shall be full faced or ring type to suit facing on flanges and shall be furnished in accordance with following schedule

SERVICE	TYPE
Cold water	1/16 inch thick neoprene

Grooved end flange adapters supplied with pressure responsive elastomeric Gaskets supplied with grooved flange adapters shall be pre- lubricated by the manufacturer. Grade of gasket to suit intended service.

W. Unions:

1. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished):

   a. At each threaded or soldered connection to equipment and tanks, except in Freon or fuel gas, piping systems, whether indicated or not.
   b. Immediately downstream of any threaded connection to each manually operated threaded valve or cock, and each threaded check valve, yard box or access box except those in Freon piping systems, whether indicated or not.
   c. At each threaded connection to threaded automatic valves (except those in Freon piping systems) such as reducing valves and temperature control valves, whether indicated or not.
   d. If grooved piping is used, couplings shall serve as unions. Additional unions are not required

2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this Section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.

B. Pipe Installation:

1. Install piping parallel to wall and provide an orderly grouping of proper materials and execution.

2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.

3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the Architect.

4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.

5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.

6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Continental Steel & Tube Co., ULINE, Independent Metal Strap, or equal.

7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the Architect, or indicated on Drawings.

8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping. Seismic loops required at all building separations.

9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.

10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of pipe being installed and except where their installation is specifically reviewed by the Architect.

11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 15440: Common Work Results for Plumbing.

12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top and to the side of sewer line.

13. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors.

2. Sleeves shall provide ½ inch clearance around pipes, except plastic pipe shall have 1 inch clearance. Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.

3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.

4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between two or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.

5. Where pipes pass through waterproofed walls, floors, or floors on grade, sealant with Link-Seal Modular Seals, or equal, between pipe and sleeve to provide a waterproof joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of sealed sleeves if reviewed by the Architect.

6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of sealant or compression joint to allow for expansion.

7. Provide polished, chrome-plated flanges when plumbing pipes pass through walls at plumbing fixtures, etcetera as specified in Section 15400 Plumbing. Provide polished steel, chromium-plated split floor and ceiling plates at locations where pipes pass through walls, floors, ceilings, and partitions in finished portion that neatly conceals pipe insert.

8. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.

D. Welding of Pipe and Qualifications of Welder:

1. Joints above grade or accessible conduit or tunnels in steel piping may be either welded or screwed unless specifically indicated otherwise on Drawings or specified. Joints in below grade steel piping, whether in insulation or not, shall not be welded, unless otherwise indicated.

2. Welded joints in pipe shall be continuous around pipe and shall comply with ASME B31: Code for Pressure Piping, unless otherwise specified.

3. Each pipe weld shall be stamped with welder's identification mark.
Welding shall be performed by welders possessing a valid certificate of qualification for welding carbon steel welding pipe in horizontal position (2G) and horizontal fixed position (5G) in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code, by an Owner-recognized, DSA approved testing laboratory.

4. Welding performed under these Specifications is subject to special tests and inspections including rigid Ultra Sonic Testing (UT) and radiographic inspection at random, in accordance with Technique for Radiographic Examination of Welded Joints by an Owner recognized, DSA approved testing laboratory.

E. Unacceptable Welds and Repairs to Welding:

1. Welds containing any of the following types of imperfections shall be deemed defective Work:

a. Cracks of any type.

b. Zones of incomplete (in excess of 1/32 inch) fusion or penetration.

c. Elongated slab inclusions longer than 1/4 inch.

d. Groups of slag inclusions in welds having an aggregate length greater than thickness of parent metal in a length 12 times the thickness of the parent metal.

e. Undercuts greater than 1/32 inch.

f. Overlaps, abrupt ridges or valleys.

2. When a defective weld is detected by examination as outlined above, two additional welds shall be radiographed at locations selected by the Project Inspector. If the two selected welds demonstrate compliant welding, then the two tested welds shall be deemed to be in compliance.

Welding revealed by radiographs to be defective Work shall be removed, repaired, and tested by radiograph.

3. If either of the two selected welds demonstrates welding deemed to be defective Work, all welding in that portion of the Work shall be deemed defective Work and either: all welds shall be cutout, prepare new ends for welding and weld to comply with this Specification, or radiograph all welds, removing and repairing only such welding deemed to be defective Work.

F. Welding Rods: Submit a written list of materials and proposed type of welding rods.

G. Backing Rings: Backing rings may be submitted for installation provided the Product Data is submitted with the material list.

H. Qualification Tests for Low-pressure Welding:

1. Tests shall be performed on 3-inch standard weight pipe ASTM A53, Grade A, and shall be welded by acetylene and electric arc. Each sample shall consist of 2 pieces, each 10 inches long, with 30-degree bevel at point weld.

2. Two 20-inch samples shall be performed in the 2G and two 20-inch samples in the 5G positions, with positions defined in Section IX, ASME Boiler and Pressure Vessel Code. Welds shall have the reinforcement ground or machined flush to the surface of the pipe before testing. Samples shall be tested as full section tensile.

3. Weld shall develop a load of 90 percent of 50,000 psi, i.e., 45,000 psi or shall develop a fracture in parent metal.

4. Each qualified welder shall carry an identification card listing welder's name, date of test, and type of welding tests passed; signed by the welder and the laboratory.

5. A valid certificate of qualification issued in compliance with requirements of the ASME Boiler Pressure Vessel Code Section IX shall qualify a welder for issuance of a certificate for low-pressure pipe welding.

I. Certificates of Qualification for Welding of Unfired Pressure Vessels:

1. Certificates of qualification shall be issued by a laboratory recognized by the Owner in compliance with the requirements of the ASME Boiler Pressure Vessel Code Section IX. Qualifications shall be for both acetylene and arc welding of Schedule 40 ASTM A53, Type B ,steel welded or seamless pipe in the Horizontal Position (2G) and the Horizontal Fixed Position (5G) as defined by said code.

2. Certificate described above is not valid unless it has been issued while welder was working for his current employer, and unless welder has performed type of work described by certificate in the preceding three months. Requirements for possession of a valid certificate shall not be waived for welders fabricating unfired pressure vessels when the Specifications require compliance with ASME code or when welding pipe carries working pressures greater than 75 psi and temperatures greater than 250 degrees F.

J. Pipe Joints and Connections:

1. Pipe and tubing shall be cut per IAPMO Installation Standards. Pipe shall have rough edges or burrs removed so that a smooth and unobstructed flow shall be provided.

2. Hot tapping of gas lines is strictly prohibited.

2. Threaded Pipe: Joints in piping shall be installed according to the following service schedule:

a. Soap Piping: Litharge and glycerine, or Expando, Gasoila, or equal.

b. Plastic Piping: Teflon pipe joint compound tape.

c. Oxygen Piping: Wash treads with S.P., rinse, blow-dry and apply litharge and glycerine.

d. Cleanout Plugs: No compound shall be used. After inspection and test, plugs shall be removed, cleaned, greased, and replaced.

b. Other services furnish sealant, suitable and as reviewed by the Architect.

3. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ANSI/ASME B2.1 for tapered pipe threads.

4. Joint compounds shall be smoothly placed on male thread and not in fittings. Threaded joints shall be installed tight with tongs or wrenches and sealant of any kind is not permitted. Failed joints shall be replaced with new materials. Installation of thread cement or sealant to repair a leaking joint is not permitted.

5. Sharp-toothed Stillson, or similar wrenches, is not permitted for the installation of brass pipe or other piping with similar finished surfaces.

K. Copper Tubing and Brass Pipe with Threadless Fittings:

1. Silver brazed joints shall be used for attaching fittings to non-ferrous metallic refrigerant piping.

2. Non-pressure gravity fed condensate lines may be soldered with 95/5 solder.

3 Silver brazing alloy, Class BCUP-5. Surfaces to be joined shall be free of oil, grease, and oxides. Socket of fitting and end of pipe shall be thoroughly cleaned with emery cloth and wiped to remove oxides. After cleaning and before assembly or heating, flux shall be installed to each joint surface and spread evenly. Heat shall be applied in accordance with instructions in the Copper Tube Handbook issued by Copper Development Associates. Joints constructed of rough bronze fittings shall be provided as recommended by manufacturer.

4. Do not overheat piping and fittings when installing silver brazing.

5. Joints in non-ferrous piping for services not covered above shall be installed with solder composed of 95/5 tin/antimony, ASTM B32, Grade 5A. Surfaces to be jointed shall be free of oil, grease, and oxides. Sockets of fitting and end of pipe shall be cleaned with emery cloth to remove oxides. Solder flux shall be sparingly installed and solder added until joint is completely filled. Do not overheat. Excess solder, while plastic, shall be removed with a small brush in order to provide an uninterrupted fillet completely around joint. Random inspection of joints shall be conducted by Project Inspector to ensure joints are lead- free.

6. Grooved end joints for copper piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

L. Ring-Type Pipe: Joints shall be installed in accordance with manufacturer's instructions with grooved couplings, fittings and rubber rings. Couplings and pipe shall be compatible and of the same manufacturer. Rings shall be accurately located and installed by grooves in coupling. Pipe shall be installed with zero deflection unless otherwise specified. Pressure pipe shall be furnished with thrust blocks at each offset point.

M. Welded Pipe Joints:

1. Joints in welded steel pipelines shall be installed by oxyacetylene or electric arc process. Welding shall be continuous around pipe and provided as specified.

2. Butt welds shall be of the single V-type, with ends of pipe and fittings beveled approximately 37 ½ degrees. Piping shall be aligned before welding is started with the alignment maintained during welding.

3. Welds for flanges and socket fittings shall be of the fillet type with a throat dimension not less than pipe wall thickness.

N. Grooved End Pipe Joints: Grooved end joints for carbon steel piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to grove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

O. Joints shall be Vic-Press 304TM, or equal, made with Victaulic Series 'PFT' tools and the appropriate sized jaw. Pipe shall be certified for use with Vic-Press 304TM system, and shall be square cut, properly deburred and cleaned, and marked at the required location to insure full insertion into the fittings and/or couplings.

P. Polyethylene (Plastic) Pipe:

1. Joints shall be installed by the heat fusion method, in accordance with manufacturer's recommendations and IAPMO installation standard IS 12, for natural gas.

2. Pipe Riser at Meter, Regulator and Building Wall: Prefabricated, anodeless type, utilizing a grade level transition between underground polyethylene pipe and gas supply steel pipe of riser outlet, R. W. Lyall Co., or equal. Below grade to above grade transition shall be installed in a welded, epoxy coated, steel casing.

3. Connections to Existing Pipe Line or Branch:

a. Steel-to-plastic (PE): Provide manufacturer's prefabricated standard transition fitting, transition from epoxy-coated steel pipe to plastic, R. W. Lyall Co., or equal.

b. Plastic-to-plastic, PVC to PE: Provide manufacturer's prefabricated standard transition fitting, transition from PVC to epoxy-coated steel pipe to PE; R.W. Lyall Co., or equal..

c. Plastic-to-plastic, PE to PE: Provide manufacturer's standard fused tapping tee assembly with shut-off feature.

4. Provide PE reinforcing sleeves where PE pipe is fused to multi-saddles, service punch tee, reducing tees, transition fittings and anodeless risers.

Q. Valves: Valves shall conform to the following:

1. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.

2. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.

3. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.

4. Valves for similar service shall be of one manufacturer.

5. Except where otherwise specified, valves shall be Belimo, Victaulic, Stockham, Crane, Jenkins, Milwaukee, Hammond, American, NIBCO, Hoffman, or equal.

6. Ball valves below grade in yard boxes shall have stainless steel handles.

R. Strainers: Strainers shall be installed on each water main (except for fire line) downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange or groove type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, Flow Control Industries, Inc., or equal.

S. Hangers and Supports:

1. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.

2. Piping shall not be supported by wire, rope, wood, plumbers' tape, or other non-recognized devices.

3. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of five, based on ultimate tensile strength of material installed.

4. Burning or welding of any structural member under load is not permitted. Field welding not specified on Drawings or reviewed Shop Drawings is not permitted without review by Architect and DSA.

5. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless

otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between covering and hanger. Installing hangers directly on pipe and butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.

6. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:

   a. Tolco I beam, Fig.62 for maximum 1000 pounds.

   b. Tolco I or WF beam, Fig. 329, for maximum of 1290 pounds.

7. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:

   a. Tolco Fig.310 for maximum of 600 pounds.

   b. Tolco Fig. 309 for maximum of 1140 pounds.

8. For fastening to wood ceilings, beams, or joists, furnish Grinnell Fig. 128R, Grinnell Fig. 153, Tolco 78, or equal pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2-inch by 2-inch by 1/4 inch angle clips 3 inches long, with 2, staggered 10d nails, clinched over joist.

9. Hanger rod sizes for copper, iron, or steel pipe: 3/8 inch for pipe sizes ½ inch through 2-inch, ½ inch for pipe sizes 3-inch, 4-inch and 5-inch, 5/8 inch for pipe size 6-inch, and ¾ inch for 8-inch and 10-inch pipe.

10. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.

11. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.

12. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8 inch thick rubber, neoprene, or soft resilient cloth.

13. Vertical Piping:

    a. Vertical pipe risers shall be securely supported with riser clamps of recognized type. Risers in reinforced concrete buildings shall be furnished with extension clamps fastened to pipe above each concrete floor slab with extended arms of clamp

to rest on slab. Clamps shall be provided with lead or Teflon liners when installed on copper tubing. Clamps shall be plastic- coated when installed on non-ferrous pipe or tubing.

b. Copper tubing in sizes 1 ½-inches and larger and steel pipelines passing up through building shall be supported at each floor of building or every 15 feet whichever is less.

c. Copper tubing sizes 1 ¼-inches and smaller shall be supported at not intervals not more than 6 feet on center. Special provisions shall be installed for vertical lines subject to expansion and contraction caused by operating temperature differences.

d. Vertical cast iron pipelines shall be supported from each floor and at its base. Malleable iron or steel pipe clamps with minimum thickness of 1/4 inch shall be furnished and fastened around pipe for support.

14. Horizontal Piping:

a. Pressure piping on roofs shall be supported from stands, trapezes, or structures so that the bottoms of pipes clear the roof surface by 10 inches.

b. Insulated steam and space heating hot water insulated condensate lines, insulated domestic hot water supply and return piping shall be supported with Tolco Figure 4, B-Line Figure B3140, Grinnell Figure 212, or equal, steel hangers with welded eye rods to permit hinge movement at point of attachment of hangers. Hinge movement at point of support shall be provided by welded eye linked rods Tolco Figure 101L, B-Line Figure B3211X, Grinnell Figure 278, or equal.

c. Domestic cold water piping, water supply and return piping, condenser water piping, insulated refrigerant piping gas piping, compressed air piping, cast iron soil piping, galvanized steel vents, waste and downspout piping and glass to be supported with Tolco Figure 1, B-Line Figure B3100, Grinnell Figure 260, or equal, hangers with rods, turnbuckles and inserts suitable for above hangers.

d. Maximum hanger and support spacing shall conform to CPC schedule for horizontal piping installed above grade.

15. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.

16. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are

not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

17. In systems where grooved piping is used, couplings shall be provided with angle pattern bolt pads to comply with support and hanging requirements of ANSI/ASME B31.1, ANSI/ASME B31.9, and NFPA Pamphlet 13.

T. Flashings:

1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.

2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through a roof shall be 4 pound soft sheet lead. Flashing and flanges for ducts and heater vents passing through exterior walls shall be 22 gage sheet metal. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct. No soldered joints on roof flashings will be allowed.

3. Lead flashing and flanges shall be constructed of 4 pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out onto roof a minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 7 inches.

4. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2 ½ inches. Flanges on gas- fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per NFPA Pamphlet 211.

5. Cast iron, steel, brass, and copper pipe, which terminates less than 18 inches above roof, shall be furnished with a combination counter- flashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter- flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.

6. Vent piping above roof shall be furnished with a combination counter- flashing sleeve and vandal-proof hood.

U. Equipment Installation: Install roof or floor mounted equipment on level platforms, housekeeping pads or curbs and provide sound, vibration and seismic control measures even if not indicated on Drawings.

END OF SECTION

SECTION 22 05 53 - PLUMBING IDENTIFICATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Marking and identification on mechanical piping systems, ducts, controls, valves, and apparatus.

B. Related Requirements:

1. Division 01: General Requirements
2. Section 15410: Basic Plumbing Materials and Methods.
3. Section 15400: Plumbing.

1.02 SUBMITTALS

A. Submit in accordance with Division 01 and Section 15440: Common Work Results for Plumbing.

B. Submit product data and installation instructions for each item specified.

C. Submit Samples of materials.

1.03 QUALITY ASSURANCE

A. Comply with provisions of:

1. Section 15440: Common Work Results for Plumbing.
2. ANSI/ASME A13.1: Scheme for the Identification of Piping Systems.
3. APWA: Uniform Color Code.
4. IAPMO: Uniform Plumbing Code (UPC)

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, shall be permanently identified.

2.2 VALVES

A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or model number of each valve in the system, its location, and function.

B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the Project Inspector.

C. Bind copies of each chart in operating instructions manual.

2.3 EQUIPMENT

A. Identify each major piece of equipment with engraved bakelite nameplates permanently affixed to the equipment, indicating the room numbers it services, Equipment identification designation shall be the same to its designation indicated on the "As-Built Drawings". Room numbers in the nameplates shall correspond to the final room numbers.

2.4 ABOVE GRADE PIPE IDENTIFICATION

A. Identify pipes by means of colored labels with directional flow arrows and identification of the pipe content, in conformance to ANSI/ASME A13.1 or the UPC.

B. Materials: Precoiled acrylic plastic with clear polyester coating, all-temperature, self- adhering, as manufactured by Brady, Brimar Industries, Seton, Stranco, Inc., or equal.

C. Size:

Outside Diameter of Pipe or Insulation (in inches)	Length of Color Field (in inches)	Size of Letter (in inches)
¾ to 1 ¼	8	½
1 ½ to 2	8	¾
2 ½ to 6	12	1 ¼
8 to 10	24	2 ½
over 10	32	3 ½

D. Locations:

1. On accessible piping, whether insulated or not (including mechanical rooms, attic and ceiling spaces); except that labels shall be omitted from piping where contained material is obvious due to its connection to fixtures (such as faucets, water closets, etcetera.).

2. Near each valve and branch connection in such accessible piping.

3. At each pipe passage through wall or floor.

4. At not more than 20 feet spacing on straight pipe run between bands required in 2 and 3 above.

5. At each change in direction.

E. Application: Install on clean surfaces free of dust, grease, oil, or any material that will prevent proper adhesion. Replace non-adhering or curling labels with new labels.

F. Color Schedule:

Content of Pipe	Legend	Background Color	Lettering Color
Domestic cold water	Domestic. C.W.	Green	White
Non-potable cold water	Caution: Non-potable Water Do Not Drink (1)(2)	Purple	Black
Domestic hot-water 140ºF	Domestic H.W. 140ºF	Blue	Black
Sanitary waste	San waste	Green	White
Sanitary vent	San vent	Green	White
Storm drain or downspout	Storm drain	Green	White
Indirect drain	Ind drain	Green	White
Sump pump discharge	Pump discharge	Green	White
Fire sprinkler supply	Fire Sprinkler supply	Red	White
Fire sprinkler drain	Sprinkler drain	Red	White
Gas	Gas	Yellow	White
Reclaimed Water	Caution: Reclaimed Water Do Not Drink (1)(3)	Purple	Black

G. Notes on Schedule:

1. Note (1) indicates 2 ¼ inch by 1 inch yellow label with ½ inch letters reading UNSAFE WATER at one end of primary label.

   Note (2) words should read “CAUTION: NONPOTABLE WATER DO NOT DRINK.” with international *do not drink* symbol.

   Note (3) words should read “CAUTION: RECLAIMED WATER DO NOT DRINK.” with international *do not drink* symbol.

2.6 UNDERGROUND PIPE

A. Detectable Marking Tape:

1. Provide and install detectable marking tape along buried piping. Tape shall be specifically manufactured for marking and locating underground utilities with electronic equipment. Tape shall be acid and alkali resistant, and manufactured with integral wires or foil backing, encased with protective cladding. Tape shall be a minimum of two inches in width.

2. Manufacturer: Reef Industries, Inc., Advantage Brands, Inc., Northtown Company, Mutual Industries, Inc., or equal.

3. Detectable marking tape shall be color-coded per APWA Color Code:

a. Yellow: Oil and gas.

b. Blue: Water, irrigation and slurry lines.

c. Green: Sewer and drain lines.

B. Tracer Wire:

1. Solid copper wire type THWN, 12 AWG gauge, with heat and moisture resistant insulation.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Correct detrimental conditions prior to commencing the Work of this Section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.

B. Place tracer wire on top of non-metal utility lines allowing some slack. Do not wrap tracer wire around pipe. Fasten tracer wire in place at approximately 10 feet on centers with non-metal ties.

C. Install underground detectable pipe marking tape continuously buried 8 to 10 inches above the buried utility pipe. Wrap tape on pipe risers up to a height of 12 inches above grade.

3.2 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation for plumbing piping.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 15440: Common Work Results for Plumbing.
3. Section 15410: Basic Plumbing Materials and Methods.
4. Section 15420: Plumbing Identification.
5. Section 15400: Plumbing.

1.02 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.
2. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
3. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
4. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
5. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
6. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Underwriters Laboratories, Inc.

1. UL 723 - Test for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:

1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. California Code of Regulation Title 24.

1. California Green Building Standards Code.

1.3 SUBMITTALS

A. Submit in accordance with Division 01 and Section 15440: Common Work Results for Plumbing.

1. Complete material list of items to be furnished and installed under this Section.
2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.
3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.
4. Display sample cutaway sections.
5. Manufacturer's recommended method of installation procedures, which will become part of this Section.

1.04 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Installer, Materials, Fabrication, Execution, and

Standard of Quality: Comply with provisions stated under Section 15440: Common Work Results for Plumbing and Section 15410: Basic Plumbing Materials and Methods.

B. Insulation Work shall be in accordance with the California Building Energy Efficiency Standards, CBC, and Uniform Mechanical Code and the California Green Building Standards Code.

C. Test Ratings:

1. Comply with provisions stated under Section 15440 and 15410 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or listing of satisfactory test results from the National Institute of Standards and Technology, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.
2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.
3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.
4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.

1.05 PRODUCT HANDLING

A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 15440: Common Work Results for Plumbing and 15410: Basic Plumbing Materials and Methods.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General:

1. Insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.

2. Insulating material shall be furnished with thickness indicated in Table 1, and shall furnish thermal resistance in the range of R-4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.

3. Asbestos in any quantity in insulating material is not permitted.

4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:

   a. Nylon anchors for installing insulation to equipment.

   b. Treated wood blocks.

5. Flame-proofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)
Insulation Thickness Required (in inches)

Piping System Type	Temp. Range (degrees F)	Runouts up to 2 (2)	1 and less	1.25 to 2	2.5 to 4	5 to 6	8 and larger
Service Water Heating Systems (recirculating, piping supply and return)							
Hot Water	Up to 180	0.5	1.0	1.0	1.5	1.5	1.5
Condensate Drain	½ inch minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From A/C Equipment:	Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES: (1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(2) Runouts to individual terminal units, not exceeding 12 feet in length.

B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.

C. Canvas Jackets: Provide 6 ounce, in accordance with square foot minimum, 48 by 48 thread count canvas jacketing.

D. Insulation Jackets:

1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing as basis of design, or Pabco, RPR, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.

2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of ½ inch to 8-inch shall be provided with Childers aluminum Ell-Jacs insulation covers as basis of design, or Pabco, RPR, or equal, manufactured from 1100 aluminum alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10-inch to 18-inch shall be provided with Childers 4- piece aluminum Ell-Jacs as basis of design, or Pabco, RPR, or equal.

3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, Pabco, RPR, or equal.

E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA 90A and NFPA 90B, have been tested according to relevant ASTM requirements, and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.

F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, Knauf Insulation, Speedline, or equal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.

B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.

C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.

D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where firestop or firesafing materials are required.

E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.

F. Insulation shall not be installed in the following locations unless otherwise noted:

1. On unions, flanged connections or valve handles.

2 Over edges of any manhole, clean-out hole, clean-out plug, and to restrict opening or identification of access.

3. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.02 INSTALLATION OF DOMESTIC HOT WATER PIPING SYSTEM INSULATION

A. General: Domestic hot water, tempered water supply and return piping and condensate return piping, after having been tested, shall be cleaned and insulated.

B. Application: Insulate condensate return piping, domestic hot water supply and return, including tempered supply and return piping in accordance with manufacturer's instructions and as specified herein.

1. Install insulation on valve bodies up to valve bonnet. Fill void in saddles, in accordance with Section 15410: Basic Plumbing Materials and Methods, with insulation and seal joints.

2. Install insulating material to fittings, valves, and strainers and smooth to thickness of adjacent covering. Leave strainer clean-out plugs accessible. Covers fabricated from polyvinyl chloride shall be furnished.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

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SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the basic requirements for electrical installations and includes requirements common to more than one section of Division 26. It expands and supplements the requirements specified in sections of Division 01.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-in-Place Concrete.
3. Section 09 9000 - Painting and Coating.
4. Division 14 - Conveying Equipment.
5. Division 23 - HVAC.
6. Division 27 – Communications.
7. Division 28 - Electronic Safety and Security.
8. Section 31 2323 - Excavation and Fill for Utilities.

C. Applicable Standards

1. ASTM D 709 (2007) – Laminated Thermosetting materials.
2. ANSI/NEMA FB-1 (2010) – Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
3. ANSI/NEMA 250 (2008) – Enclosure for Electrical Equipment (1000 Volts Maximum).
4. California Electrical Code (CEC).
5. IEEE C57.12.28 (2005) – Standard for Pad-Mounted equipment (Enclosure Integrity).
6. UL 1 (2005) – Standard for Flexible Metal Conduit.
7. UL 1242 (2007) – Standard for Electrical Intermediate Metal Conduit.
8. UL 506 (2008) – Specialty Transformers.
9. UL 6 (2010) – Electrical Rigid Metal Conduit-Steel.

10. UL 797 (2007) – Electrical Metallic Tubing-Steel.

11. UL 870 (2008) – Standard for Wireways, Auxiliary Gutters, and Associated Fittings

1.2 BASIC ELECTRICAL REQUIREMENTS

A. Quality Assurance:

1. Workers possessing the skills and experience obtained in performing work of similar scope and complexity shall perform the Work of this Division.

2. Refer to other sections of the Specifications for other qualification requirements.

B. Drawings and Specifications Coordination:

1. For purposes of clearness and legibility, Drawings are essentially diagrammatic and the size and location of equipment is indicated to scale whenever possible. Verify conditions, dimensions, indicated equipment sizes, and manufacturer's data and information as necessary to install the Work of this Division. Coordinate location and layout with other Work.

2. Verify final locations for rough-ins with field measurements and with the requirements of the equipment to be connected.

3. Drawings indicate required size and points of termination of conduits, number and size of conductors, and diagrammatic routing of conduit. Install conduits with minimum number of bends to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and comply with applicable code requirements.

4. Routing of conduits may be changed provided that the length of any conduit run is not increased more than 10 percent of length indicated on the Drawings.

5. Outlet locations shall be coordinated with architectural elements prior to start of construction. Locations indicated on the Drawings may be distorted for clarity.

6. Coordinate electrical equipment and materials installation with building components and the Work of other trades

7. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

8. Coordinate connection of electrical systems with existing underground utilities and services.

C. Terminology:

1. Signal Systems: Applies to clock, bell, fire alarm, annunciator, sound, public address, buzzer, telephone, television, inter-communication, elevator access controls, lighting control systems and security systems.

2. Low Voltage: Applies to signal systems operating at 120 volts and less, and power systems operating at less than 600 volts. Medium voltage: Applies to power systems operating at more than 600 volts.

3. UL: Underwriter's Laboratories Inc, Nationally Recognized Testing Laboratory (NRTL), or equal.

D. Regulations: Work shall comply with the requirements of authorities having jurisdiction and the California Electrical and Building Codes. Material shall conform to regulations of the National Board of Fire Underwriters for electrical wiring and apparatus. Materials shall be new and listed by UL, or another NRTL.

E. Structural Considerations for Conduit Routing:

1. Where conduits pass through or interfere with any structural member, or where notching, boring or cutting of the structure is necessary, or where special openings are required through walls, floors, footings, or other buildings elements, conform to CBC, Part 2, Title 24, Section 1906.3 for conduits and pipes embedded in concrete and Sections 2308.9.10 and 2308.9.11 for notches and bored holes in wood; for steel, as detailed on the structural steel Shop Drawings.

2. Where a concrete encasement for underground conduit abuts a foundation wall or underground structure which the conduits enter, encasement shall rest on a haunch integral with wall or structure, or shall extend down to footing projection, if any, or shall be doweled into structure unless otherwise indicated. Underground structures shall include maintenance holes; pull boxes, vaults, and buildings.

3. Holes required for conduit entrances into speaker poles, floodlight poles or other poles, shall be drilled with the conduit nipple or coupling welded to poles. Welds shall be provided by the electric arc process and shall be continuous around nipple or coupling.

F. Electrically Operated Equipment and Appliances:

1. Furnished Equipment and Appliances:

a. Work shall include furnishing and installing wiring enclosures for, and the complete connection of electrically operated equipment and appliances and electrical control devices which are specified to be furnished and installed in this or other sections of the Specifications, wiring enclosures shall be concealed except where exposed Work is indicated on the Drawings.

b. Connections shall be provided as necessary to install equipment ready for use. Equipment shall be tested for proper operation and, if motorized, for proper rotation. If outlets are of incorrect electrical characteristics or any specified equipment fails to operate properly, repair and/or replace the outlet and/or equipment.

2. Equipment and Appliances Furnished by Others:

   a. Equipment and appliances indicated on Drawings as "not in contract" (NIC), "furnished by others," or "furnished by the Owner," will be delivered to the Project site. Required electrical connections shall be performed for such equipment and appliances. Motorized equipment will be furnished factory-wired to a control panel or junction box unless otherwise indicated. Appliances will be furnished equipped with portable cord and cap. Provide disconnect switches where required.

   b. Connections to equipment furnished under this Division shall be part of the Work of this section. Work shall include internal wiring, installation, connection and adjustment of bolted drive motors in which the motor is supplied as a separate unit, and connections only for equipment furnished with factory installed internal wiring, except as further limited by Drawings and this Specification. Work shall include furnishing and installing suitable outlets, disconnecting devices, starters, push-button stations, selector switches, conduit, junction boxes, and wiring necessary for a complete electrical installation. Work shall also include furnishing and installing conduit and boxes for HVAC control systems, furnished under Division 23. Devices and equipment furnished shall be of same type used elsewhere on the Work or as specified.

   c. Electrical equipment furnished under other sections, for installation and connection under Work of this section, will be delivered to the Project site ready for installation.

   d. Mechanical equipment furnished under other sections, and requiring electrical connection under this section, will be set in place as part of the Work of the section furnishing such equipment unless noted otherwise.

   e. Suitability and condition of equipment furnished under other sections shall be determined in advance of installation. Immediate notice of damage, unsuitability, or lack of parts shall be given to the entity providing such equipment.

G. Protection of Materials:

   1. Protect materials and equipment from damage and provide adequate and proper storage facilities during progress of the Work. Damaged materials and/or equipment shall be replaced.

H. Cleaning:

   1. Exposed parts of Work shall be left in a neat, clean, usable condition. Finished painted surfaces shall be unblemished and metal surfaces shall be polished.

   2. Thoroughly clean parts of apparatus and equipment. Exposed parts to be painted shall be thoroughly cleaned of cement, plaster, and other materials. Remove grease and oil spots with solvent. Such surfaces shall be wiped and corners and cracks scraped out. Exposed rough metal shall be smooth, free of sharp edges, carefully steel brushed to remove rust and other spots, and left in proper condition to receive finish painting.

3. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

I. WARRANTIES

1. Provide one year warranty on all material and labor performed, unless noted otherwise in specific sections.

PART 2 - PRODUCTS - NOT USED PART

3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Advise the Inspector before starting the Work of this Division.

B. Exposed conduits shall be painted to match the surfaces adjacent to installation.

C. Salvaged materials removed from buildings shall be removed from the Project site as required by the OAR.

D. Trenches outside of barricade limits shall be backfilled and paved within 24 hours after being inspected by the Inspector. Provide traffic plates during the time that trenches are open in traffic areas and in areas accessible to students and staff.

E. Where existing structural walls are cored for new conduit runs, separation between cored holes shall be three inches edge to edge from new or existing holes, unless otherwise required by the Architect. All coring to be laid out and reviewed by Architect prior to drilling. Contractor to verify location of structural steel, rebar, stress cabling or similar prior to lay out.

F. Electrical equipment shall be braced and anchored for CBC Seismic Design requirements, or as otherwise indicated on the Drawings.

3.2 DELIVERY STORAGE AND HANDLING

A. Deliver products to project site with proper identification, which shall include names, model numbers, types, grades, compliance labels, and similar information needed for District identification; all products and materials shall be adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion.

3.3 CUTTING AND PATCHING

A. Cutting and patching of electrical equipment, components, and materials shall include the removal and legal disposal of selected materials, components, and equipment.

B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

C. Repair or restore other work, or surfaces damaged as a result of the work performed under this contract.

3.4 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

B. Remove equipment and implements of service, and leave entire work area neat and clean, to the satisfaction of the Owner Authorized Representative.

3.5 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 26 05 13 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Boxes, enclosures, keys and locks.
2. Receptacles and switches.
3. Identifications and signs.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Division 26 – Electrical.
3. Division 27 – Communications.
4. Division 28 - Electronic Safety and Security.

PART 2 - PRODUCTS

2.1 BOXES, ENCLOSURES, KEYS AND LOCKS

A. Outlet Boxes and Fittings:

1. Outlet boxes installed in concealed Work shall be galvanized steel, pressed, or welded type, with knockouts.
2. In exposed Work, where conduit runs change direction or size, outlet boxes and conduit fittings shall be cast metal with threaded hubs cast integral with box or fitting.
3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium-plated or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of cracks, gas holes, flaws, excessive shrinkage, and burnt-out sand.
4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for particular fitting installed.
5. Light fixture outlets shall be 4-inch octagon, 4-inch square, 2 1/8-inch deep or larger, depending upon number of conductors or conduits therein. Plaster rings shall be furnished with round opening with two ears drilled 2 23/32 inches center to center.

6. For local device outlets provide 4-inch square 2 1/8-inch deep, boxes for single gang, 5-inch square boxes for two-gang, and special solid gang boxes with gang plaster ring for more than two switches.

7. For TV outlets, and horns and strobes provide manufacturer's supplied back box as needed. For television outlets, provide 4-gang deep boxes and 4-gang plaster rings.

8. Plaster rings shall be provided on flush-mounted outlet boxes except where otherwise indicated or specified. Plaster rings shall be same depth as finished surface. Install approved ring extension to obtain depth to finish surface.

9. In existing plywood wall or drywall construction, and where flexible steel conduit is fished into walls, single-gang and 2-gang outlets for wiring devices may be sectional steel boxes with plaster ears. Boxes shall be fastened to plywood with flat- head screws in each plaster ear screw hole. Boxes fastened to gypsum board shall be Raco, Appleton, Cooper, Bowers, or equal.

10. Factory made knockout seals shall be installed to seal box knockouts, which are not intact.

11. Where flexible conduit is extended from flush outlet boxes, provide and install weatherproof universal box extension adapters.

B. Junction and Pull boxes:

1. Junction and pull boxes, in addition to those indicated, shall only be used in compliance with codes, recognized standards, and Contract Documents.

2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsion and deflecting forces. Boxes shall be furnished with auxiliary angle iron framing where necessary to ensure rigidity.

3. Covers shall be fastened to box with a sufficient number of machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws if boxes are not installed plumb. Surfaces of pull and junction boxes and covers shall be labeled in black marker ink designating system, panelboard and circuit designation contained in box. In exposed Work, designation shall be installed on inside of pullbox or junction box cover.

4. Weatherproof NEMA 3R pull and junction boxes shall conform to foregoing for interior boxes with following modifications:

   a. Cover of flush mounting boxes shall be furnished with a weather-tight gasket cemented to, and trimmed even with, cover all around.

   b. Surface or semi-flush mounting pull and junction boxes shall be UL, or another Nationally Recognized Testing Laboratory (NRTL) listed as rain-tight and shall be furnished complete with threaded conduit hubs.

c. Exposed portions of boxes shall be galvanized and finished with one prime coat and one coat of baked-on gray enamel, unless already furnished with factory baked-on finish.

5. Junction and pull boxes shall be rigidly fastened to structure and shall not depend on conduits for support.

6. Underground Concrete Pull Boxes:

a. Pre-cast concrete pull boxes. Concrete pull boxes shall be traffic type, reinforced for H-20 wheel loading, pre-cast concrete. Pull boxes with inside dimensions of 2 feet by 3 feet by 3 feet deep shall consist of a base section, top ring, and cover. Base section shall be furnished with 2 knockouts measuring 10 inch by 10 inch in each 3 feet side, and one 20 inch by 20 inch knockout in each 2-foot side. Pull boxes with inside dimension 4 feet by 4 feet by 4 feet deep shall consist of a base section, midsection, topping, and cover. Base section shall be furnished with 2 knockouts measuring 8-inch by 16-inch on each of two opposite sides, and one 20-inch by 20-inch knockout on each of other two opposite sides. Pull boxes shall be furnished with a minimum of 6-inch diameter sump knockout and one inch diameter ground rod knockout. In pull boxes, furnish and install cable racks on walls. Racks shall be furnished with 3 porcelain cable holders on vertical steel mounting bars. Pull boxes shall be furnished with 3/4 inch diameter pull irons. Covers shall be traffic-type consisting of steel safety plate bolted to frame. Covers shall be marked as electrical, power, or signal as required. Pull boxes shall be as manufactured by Oldcastle Precast, Jensen Precast, Kistner, Western Precast, or equal.

b. Provide end bells in duct entrances. Terminate each metal conduit with insulated bushing provided with a grounding terminal.

c. Install pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.

d. Remove floor drain knockout and provide a depth of 24 inches of crushed rock below box extending a minimum of 12 inches beyond on all sides.

e. Permanently and effectively ground metal equipment cases, cable racks, and similar items in pull boxes to site grounding electrode system. Provide grounding conductor in compliance with CEC Article 250.

f. Provide 6-inch deep sand base under pull boxes.

g. Identify power and signal cables by tagging in manholes and pull boxes. Tie securely to cables with nylon cord.

h. Top of steel plate shall provide a minimum coefficient of static friction of 0.5 for either wet or dry locations, when tested for any shoe sole material. Test shall comply with ASTM D 1047 or F 489 or F 609 standards. Submit manufacturer's test results for Architect's review as part of materials and equipment submittals.

i. The use of underground extension boxes shall be limited to not more than 1 times the original depth of pull box.

7. Underground utility boxes shall be reinforced concrete with non-setting shoulders to prevent settlement following installation. Boxes shall be furnished with cast iron cover with finger hole, size as indicated on Drawings. Utility boxes shall be as manufactured by Oldcastle,Jensen, Kistner, Western Precast, or equal.

8. Manholes, vaults, and pull boxes required by a utility company, and installed as part of this Contract, shall meet requirements of servicing utility company.

C. Floor Outlets:

1. Provided floor outlets, except for extension outlets, shall be Harvey Hubbell Inc. B- 2503, Thomas & Betts 640 series, Legrand Omnibox, or equal, adjustable, cast iron, watertight floor boxes with flush brass floor plates, and shall be set to finish flush with finish floor covering, whether it be carpeted, wood, resilient floor covering, or other finish materials. Floor boxes shall be used in office, classrooms, and in library areas only.

2. Telephones above floor outlets, where not subjected to water, shall be provided with Harvey Hubbell Inc. SC-3098 pedestals with SC309T plates, Legrand 525 series, Thomas & Betts FPT-400 Series, or equal. Refer to other Division 26 sections. Floor boxes shall be used in office, classrooms and in Library areas only.

3. Plugs above floor outlets where not subjected to water shall be provided with Legrand 525 series, Thomas & Betts FPT-400 Series, Harvey Hubbell Inc. SC-3098, or equal, pedestal and with SS309D, or equal, device plates. Refer to other Division 26 sections. Floor boxes shall be used in office, classrooms, and library areas only.

4. Plugs above floor outlets where subjected to water shall be provided with a Harvey Hubbell Inc. SA-6685 or equal, single-gang outlet box, or SA-6687 or equal, 2-gang outlet box. Provide required cover plate. Refer to other Division 26 sections. Floor outlets shall be used in Cafeteria, Cafeteria serving areas, or any areas where floors are subjected to water.

5. Furnished extension floor outlets shall be cast iron floor boxes with cast iron covers and 1/2 inch offset entries for above-floor conduit extensions; Harvey Hubbell F3186, or equal. Boxes shall be designed to permit access to wiring without disturbing above-floor extensions and shall be set flush with finish floor.

6. Furnished above floor service fittings for surge suppression receptacles shall be Hubbell SC3098 with cover plates SS309DS, Legrand 525 series, Thomas & Betts FPT-400 Series, or equal.

7. Furnished above floor service fittings for data outlets shall be Hubbell SC3098 with required cover plates, Legrand 525 Series, Thomas & Betts FPT-400 Series, or equal. Refer to other Division 26 sections.

D. Floor Pockets:

1. Three-Gang: Furnished three-gang floor lighting pockets shall be flush floor type, with cast iron floor plate and hinged cast iron door notched for cables. Three-gang floor pockets shall be owner approved Legrand or Hubbell Recessed Floor Boxes,
C.W. Cole TLS-353-6, or equal, for wood floors and C.W. Cole TLS-353-6-C, or equal, for concrete slabs. Each floor pocket shall be provided with three 20 amp, 3 wire, 125 volt receptacles with matching caps.

2. Single Gang:

   a. Receptacle floor pockets shall be single gang, flush floor type, with cast iron floor plate, hinged cast iron door notched for cable and cast iron box; C.W. Cole TLA-362-1-FE, or Owner approved Legrand or Hubbell recessed floor box or equal. Provide each pocket with a standard, single grounding type receptacle unless otherwise indicated. Provide C.W. Cole TLS- 362-1, or equal, in wood floors.

   b. Microphone or projector floor pockets shall be single gang flush floor type with cast iron floor plate, hinged cast iron door, notched for cable and cast iron box, or owner approved Legrand or Hubbell recessed floor box, C.W. Cole TLA-362-3-FE, C.W. Cole TLS-362-3,in wood floors, or equal.

E. Keys and Locks:

1. Provide two keys with furnished door locks, including cabinet door locks and switchboard locks, two keys for lock switches on switchboards or control panels, and two keys with interlocks or other furnished lock switches. Deliver keys to OAR.

2. Locks shall be keyed to Corbin No. 60 keys for access to operate equipment and Corbin 70 keys for service access. Special keys and locks shall only be provided where specified.

2.2 RECEPTACLES AND SWITCHES

A. Receptacles:

1. Duplex receptacles shall be heavy-duty specification grade, grounding type.
Terminal screws shall be back and side wired with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be PVC. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts.

NEMA #	Pass & Seymour	Hubbell	Leviton
(20 amps) NEMA 5-20	PS5362-I	HBL5362-I	5362-I
(15 amps) NEMA 5-15	PS5262-I	HBL5262-I	5262-I

2. Duplex receptacles on circuits supplied by panel boards with integral surge suppression shall be Pass & Seymour model number PS5262BL (blue), Hubbell DRUBTVSS15, Leviton 5262-SBU, 15 amps, 120 volts, or equal.

3. Single receptacles shall be heavy-duty specification grade, grounding type.
Terminal screws shall be back and side wire with internal screw pressure plates.

Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be thermoplastic. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts. For circuits consisting of one single receptacle only, ampere rating of receptacle shall be same as circuit breaker or fuse.

NEMA #	Pass & Seymour	Hubbell	Leviton
(20 amps) NEMA 5-20R	5361-I	HBL5361-I	5361-I
(15 amps) NEMA 5-15R	5261-I	HBL5261-I	5261-I

4. 15 and 20 amps single receptacles on circuits supplied by panel boards with integral surge suppression shall be Pass & Seymour NEMA 5-20R model number 5361-BL (blue), and NEMA 5-15R model number 5261-BL (blue) respectively. Equal receptacles by other Owner approved manufactures are acceptable.

5. For kiln receptacles and range receptacles, provide 3-pole, 4-wire, grounding type, rated 50 amps at 125/250 volts NEMA 14-50R. Provide with 2-gang, stainless steel plates, SS 703, or equal.

NEMA #	Pass & Seymour		Hubbell	Leviton
NEMA 14-50R	3894	HBL9450A	279	
WALL PLATE	SS703	S703	84026	

6. For dryer receptacles, provide 3-wire, non-grounding type, rated 30 amps at 125/250 volts, NEMA 10-30R, with 2-gang stainless steel plates. Coordinate location of junction box with the work of Section 10 2815, Hand and Hair Dryers.

NEMA #	Pass& Seymour		Hubbell	Leviton
NEMA 10-30R	3860	HBL9350	5207	
WALL PLATE	SS703	S703	84026	

7. Provide specification grade ground-fault circuit interrupter (GFCI) type receptacles in accordance with 2010 UL standards. GFCI receptacles shall have a trip indication light. Receptacle terminal screws shall be back and side wire with internal screw pressure plates. Test and reset buttons shall match device body and shall be ivory. GFCI receptacles shall be manufactured in standard configuration for installation with stainless steel smooth plates. Exterior mounted receptacles shall be mounted inside weatherproof enclosure.

NEMA #	Pass & Seymour	Hubbell	Leviton
NEMA 5-20R	2095-I GFR5352-IA	7899-I	
NEMA 5-15R	1595-I GFR5252-IA	8598-I	

8. Provide weatherproof receptacles, except where otherwise indicated or specified, consisting of GFCI receptacles, as specified herein, and metal plates with die-cast lockable hinged lids and weatherproof mats;

9. In Kindergarten and Early Education Center Classrooms provide tamper-resistant receptacles with thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects. Receptacles shall have extra heavy-duty brass, one- piece mounting strap with integral ground. Receptacles shall be ivory color, impact resistant nylon face and back body. For tamper-resistant receptacles rated 20

amps/125 volts, provide NEMA 5-20R, ivory in color,. For tamper-resistant receptacles rated 15 amps/125 volts, provide NEMA 5-15R, ivory in color.

NEMA #	Pass & Seymour	Arrow Hart	Leviton
(20 amps) NEMA 5-20R	TR63-I	TR8300V	8300SGI
(15 amps) NEMA 5-15R	TR62-I	TR8200V	8200SGI

10. Provide transient voltage surge suppression (TVSS) receptacles offering metal oxide varistors (MOVs) protecting normal and common modes, (L-N, L-G, N-G) with 500V suppressed voltage. TVSS devices shall offer 3-mode equal protection with 210 joules minimum per mode of energy absorption and 13,000 amp maximum surge capability. TVSS devices shall have 3 thermal fuses and two over-current protection fuses. TVSS devices shall have LED visual only surge status indicator to alert user to surge suppression circuit condition. Visual indicator will be illuminated (red) when power is on and surge suppression circuit is fully functional. Visual indicator will not be illuminated when power is off or unit experiences loss of surge suppression protection. Terminals shall be back and side wire including ground terminal. Color shall be blue.

NEMA #	Pass& Seymour	Hubbell	Leviton	
(20 amps) NEMA 5-20R		5352BLSP	HBL5360SA	5380B
(15 amps) NEMA 5-15R		5252BLSP	HBL5260SA	5280B

11. Receptacles within 6 feet of water fountains, counter tops, or any sources of water shall be GFCI type.

B. Switches:

1. Local Switches:

a. Provide local switches, high strength thermoplastic toggle, specification industrial grade, rated 20 amps at 120-277 volts AC only, with plaster ears, external screw pressure plate back and side wired, and standard size composition cups which fully enclose mechanism. Switches shall be approved for installation at currents up to full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80 percent of rating for motor loads. Switches shall have oversized silver alloy contacts for long life and better heat dissipation. Provide switches as single pole, double pole, 3-way, 4-way, non-lock type. Provide non-lock type switches with ivory handles;

Pass & Seymour	Hubbell	Leviton	
Single pole PS20AC1I	HBL1221I	1221-2I	
Double pole PS20AC2I	HBL1222I	1222-2I	
Three way PS20AC3I	HBL1223I	1223-2I	
Four way PS20AC4I	HBL1224I	1224-2I	

b. Provide lock type switches, specification industrial grade, 20 amp, 120-277 volts with metal or nylon key guides with on/off indication, and operable by same key. Key shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16-inch long forks, 5/32-inch spacing between forks and 5/16-inch width overall.

Pass & Seymour	Arrow Hart

Single pole PS20AC1L w/#500 Key-2L 1221L w/1201LK Key
Double pole PS20AC2Lw/#500 Key 1222L w/1201LK Key Three way PS20AC3L w/#500 Key 1223L w/1201LK Key
Four Way PS20AC4L w/#500 Key 1224L w/1201LK Key

c. Rotary lock switches shall incorporate a tumbler type lock to prevent unauthorized operation. Lock shall be tumbler type by Corbin, keyed to a HH41 key. Lock switch to be installed with pin tumblers facing downward. Key shall be removable in all positions. Each device shall be complete with 2 keys. Keys shall be delivered only to the OAR. Switches shall be rated at 20 amps, 120-277 volt AC. Switch plates shall be of stainless steel, engraved with on and off positions indicated.

Arrow Hart
Single pole AH1191N
Double pole AH1192N
Three way AH1193N

d. Pilot light switches shall be rated 20 amps and shall conform to specifications for local switches. Switches shall be furnished with red, Lexan handles that are lighted by long-lasting neon lamps. Pilot light shall light when load is on. Pilot light 120 volt switches

Pass& Seymour Hubbell Leviton Single
pole PS20AC1-RPL HBL1221-PL 1221-PLR
Double pole PS20AC2-RPL HBL1222-PL 1222-PLR
Three way PS20AC3-RPL HBL1223-PL 1223-PLR

Same as above except rated at 20 amps at 277 volts. Pass &

Seymour Leviton Hubbell
Single pole PS20AC1-RPL 1221-7PR HBL1221-PL7

e. Provide remote control switches for mechanically held contactors arranged for 3-wire control, toggle type, momentary contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclose mechanism, and ivory handles

Pass & Seymour Hubbell Leviton
1251-I HBL1557-I 1285-I

f. Provide remote control switches for magnetically held contactors arranged for 3-wire control, toggle type, maintained contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclosed mechanism, and ivory handles.

Pass and Seymour Hubbell Leviton 1225-I
HBL 1385 1285-I

g. Momentary Contact locking key type switch. 20A 120/277V center off. Key shall be District standardized vertically oriented, tamper resistant, forked key

with two each 5/16" long forks, 5/32" spacing between forks and 5/16" width overall.

Arrow Hart
AH1995L w/ AH2000 key

h. Momentary Contact switch low voltage 1 pole 3A 24VAC 3 position center off. Key for locking switch shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16" long forks, 5/31" spacing between forks and 5/16" width overall.

Pass and Seymour
Toggle 1081I
Locking 1081KGRY w/#500 Key

2. Time Switches and Photoelectric Controls for existing construction; use section 26 0923 for new construction.

a. Provide time switches with a 7-day, solid-state, electronic type capable of fully automatic or manual operation and housed in a sheet steel enclosure unless built into a panel or switchboard. Contacts rated for 25 amps resistive or inductive, each pole 240 VAC; 5 amps tungsten or 277 VAC pilot duty, each pole
240 VAC. Time switches to contain a non-volatile clock and non-volatile memory with a built-in rechargeable super capacitor power carry-over system. Battery carryover is not acceptable. Provide a minimum of 15 on/off set points per week. Timing to be in one minute increments with a minimum on or off time of one minute. Time switch digital displays to indicate days of week, hours, and minutes. Display to contain a load status light to indicate when equipment is in operation. Time switches; Paragon Model EC7000 Series, Tork Model EW 101B series, Intermatic ET7000 series, or equal. Features required for application:.

1) Liquid crystal display panel.

2) Holiday scheduling: Up to 40 dates may be assigned special holiday schedules, up to one year in advance.

3) Automatically adjusts to and from daylight savings time and for leap year.

4) Contact ratings: 10 amp at 240 VAC.

5) Safety override switch for each circuit to either provide shut down of circuit or to override on.

6) Selective review: All or part of schedule shall be displayed at touch of a key.

7) Super Capacitor for power carry over system.

8) Supply voltage: 120 V.

9) 365-day advance scheduling.

b. Photoelectric control: Shall be rated 2,000 watts, 120V with single pole, single throw, normally closed contact, enclosed in a die-cast aluminum gasketed enclosure with 1/2 inch conduit fitting, Tork series 2100, or equal.

3. Emergency Lighting Control Unit

a. The Emergency Lighting control Unit shall provide all required functionality to allow an standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.

b. The emergency lighting control unit shall allow control of emergency lighting fixture in tandem with normal lighting in an area while ensuring that emergency lighting will turn on immediately to full brightness upon loss of normal power supplying the control device. Emergency lighting operation shall be independent for each controlled area and shall not require a generalized power failure for proper operation.

c. The device shall have normally closed dry contacts capable of switching 10 amp emergency ballast loads at 120-277 VAC, 60 Hz, or 2 amp tungsten loads at 120 VAC, 60Hz.

d. The device shall have universal rated voltage inputs provided for normal power sense and normal switched power at 120-277 VAC, 60 Hz.

e. The device shall provide separate LEDs to indicate the presence of normal and emergency power sources. The LEDs shall indicate the unit's current operational mode (normal or emergency)

f. The device's normal power input terminal shall be connected to the line side of the control device such that any upstream fault causing a loss of power, including the tripping of the branch circuit breaker, will force the unit into the emergency mode and turn on the emergency lighting.

g. The unit shall automatically switch emergency lighting on and off as normal lighting is switched. When normal power is not available, the unit shall force and hold emergency lighting on regardless of the state of any external control device until normal power is restored.

h. Device shall be WattStopper ELCU-100 Emergency Lighting Control Unit, LVS #EPC-PM Series, Lighting Control Design #GR 2001 series or Equal.

4. School Main Entrance Intercom Station: See other Division 26 sections

a. Hands free single button telephone auto dialer with major applications access control. Dialer shall dial a primary telephone number. If the number is busy or does not answer, the unit shall hang up and dial up to nine backup numbers. When call is answered and the visitor is identified, the called individual depresses telephone button to gain access. Unit shall be provided with a black and white camera, lighted hood, and an interface for Proximity option. Unit shall be a stand alone entry

host for various types of access cards, through a 26-bit Wiegand protocol interface card.

b. Trigon Electronics HF-2 or equal.

c. Trigon Electronics HF-2 Weather mounts or equal.

2.3 IDENTIFICATION AND SIGNS

A. Identification Plates:

1. Provide identification plates for the following unless otherwise specified, for switchboards, unit substations, motor control centers, control panels, push-button stations, time switches, contactors, motor starters, motor switches, panelboards, and terminal cabinets.

2. Identification plates shall be of plastic stock and shall adequately describe function, voltage and phase of identified equipment. Where identification plates are detailed or described on Drawings, inscription and size of letters shall be as indicated. For lighting and power panels, identification plates shall indicate panel designation, voltage, and phase of panel. For terminal cabinets, identification plates shall indicate system contained in terminal cabinet.

3. Identification plates shall be black-and-white nameplate stock of bakelite with characters cut through black exposing white. Plates shall be furnished with beveled edges and shall be securely fastened in place with No. 4 Phillips-head, cadmium- plated steel, self-tapping screws. Characters shall be 3/16 inch high, unless otherwise indicated.

B. Markings:

1. Install identification markings to surface-mounted starters, switches, disconnect switches, contactors, and other devices controlling motors and appliances. Provide abbreviations required along with an identifying number. Markings to be provided with locking type stencils using paint of a contrasting color. Figures shall be 3/8 inch high unless otherwise indicated. Dymo Industries Inc., self-sticking plastic labels, with embossed characters made with a typewriter may be installed instead of stencils and paint; p-touch self adhesive plastic, or Brother P-Touch self sticking laminated plastic labels may be installed.

2. High Voltage: High voltage switchboards, cabinets, boxes, and conduits exposed in accessible locations, including under buildings and in attics, are required to be marked "WARNING-HIGH VOLTAGE- ABOVE 600 VOLTS". Markings for switchboards shall consist of 18 gage steel, porcelain enamel sign of standard manufacture. Markings for boxes, cabinets, and conduits shall be by means of stenciling or printed self-adhesive markers, Westline Tel-A-Pipe, or equal. Provide letters of black on orange background and not less than 1-7/8 inches high. On conduit runs, install markings at intervals not exceeding 10 feet in any individual area. Markings shall be installed after other painting Work is complete.

C. Warning Signs:

1. Provide a warning sign on outside of each door or gate to rooms or enclosures containing high voltage equipment. Signs required reading, "WARNING - HIGH VOLTAGE - KEEP OUT". Provide 2-inch high lettering.

2. Provide a warning sign on each high-voltage non-load break disconnect and fused cutout (not oil filled). Signs required reading, "DO NOT OPEN UNDER LOAD". Provide 2 inch high lettering.

3. Provide signs of standard manufacture, 18 gage steel, with porcelain enamel finish. Provide red lettering on a white background.

PART 3 - EXECUTION

3.1 INSTALLATION AND SUPPORT OF BOXES

A. Install outlet boxes flush with finished surface of wall or ceiling. Install plumb and securely fastened to structure, independent of conduit. Except where otherwise indicated, provide factory-fabricated adjustable attachment bar hangers between studs to support outlet boxes. When installation is performed in fire rated walls, maintain the wall's rating integrity by means of approved fire stop methods.

B. Outlet boxes installed in suspended or furred ceilings with steel runner or furring channels shall be supported, except where otherwise indicated, by a Unistrut P-4000 Tessco A1200HS-10, Cooper B-Line B22s-HG, or equal channel spanning main ceiling runner channels. Each box shall be supported from its channel by a 3/8 inch 16 threaded steel rod with a Unistrut P-4008, Fastenal #48604, Copper B-Line 78101140346 or equal nut and a Tomic No. 711-B Adapta-Stud, or equal. Rod shall be tightened to a jamb fit with channel and its nut. Box shall be locked to rod by means of a 1/2 inch locknut on stud and a 3/8 inch 16 hex nut locking stud to rod.

C. Heights of outlets and equipment indicated on Drawings shall govern. In absence of such indications, following heights shall be maintained with heights measured to centerline unless otherwise noted:

1. Install wall-mounted telephones, light switches, and other switches, 48 inches above finished floor. Refer to other Division 26, 27 and 28 Sections.

2. Outlet boxes for fire alarm pull stations shall be mounted at 45 inches above finished floor to insure that the operating handle of the initiating device is no higher than 48 inches at finished floor. Under no circumstances shall operating handle of the device exceed 48 inches above finished floor regardless of indicated height on drawing.

3. Wall mounted fire alarm strobe or horn/strobe devices shall be mounted such that the entire lens is not less than 80 inches above finished floor. If ceiling heights allow, wall mounted appliances shall have bottom of lens a minimum of 80 inches but not more than 96 inches to the top of lens.

4. Install outdoor fire alarm audible devices or fire alarm sprinkler flow bells at least 10 feet but not more than 12 feet above finished floor to center. Provide STI or equal protective covers for devices when required.

5. Voice evacuation speakers mounted indoors shall be mounted in ceiling space or if mounted on wall shall not be less than 10 feet to center above finished floor.

6. Install clocks and speakers, in classrooms and offices, 8 feet above finished floor. Unless otherwise indicated.

7. In rooms other than places of assembly such as, but not limited to, multipurpose rooms, auditoriums, and libraries, clock outlets and speakers in classrooms and offices shall be mounted 8 feet above finished floors. Other assembly areas such as gymnasiums shall be mounted 10 to 12 feet above finished floor. Provide STI, or equal protective covers for clocks when required.

8. Install fire alarm strobe lights 80 inches to bottom of light above finished floor.

9. Install outside bells and yard light outlets 4 feet above second floor level for 2 or more story buildings, 12 inches below top plate level for one story buildings without covered porch or arcade, and 12 inches below covered porch and arcade ceilings.

10. Install desk telephones, power receptacle outlets, and data outlets 15 inches above finished floor.

11. Install panelboards and terminal cabinets 6 feet 6 inches from finish floor to top of cabinet.

12. Install television outlets at a height corresponding to location of television monitor, or a minimum of 15 inches above finished floor.

13. The use of extension boxes shall be limited to not more than 1 times the original depth of junction box.

3.2 COVER PLATES

A. Provide a plate on each switch, plug, pilot light, data, interphone, public telephone, and television outlet, and on existing and reset outlets where so indicated or required. Plates shall be of stainless steel unless otherwise specified.

B. Flush wiring device and signal system outlets indicated to be blank covered, shall be covered with blank stainless steel plates. Flush lighting outlets to be blanked shall be covered with Wiremold 5736 steel covers, or equal, painted to match surrounding finish. Provide stainless steel covers to blank indicated or required surface-mounted outlets.

C. In the following cases, and at required locations. Switch and receptacle plates shall be engraved with the device(s), or fixtures being controlled, or as indicated:.

1. Three-gang and larger gang switches in locations other than classrooms.

2. Lock switches.

3. Pilot switches.

4. Switches so located that operator cannot see fixtures, or items of equipment controlled while his hand is on the switch.

5. Switches not in same room with fixtures or items of unit heaters, air curtains, fly fans, etcetera.

6. Receptacles operating at other than 120 V shall be identified with the operating voltage.

7. Switches operating on 277 V shall be identified with the operating voltage.

8. Where indicated on Drawings.

D. Designations shall be as indicated on Drawings or as specified by Architect.

E. Standard GFI cover plates shall be Pass & Seymour 4600, Raco 5028-0, or equal. GFI cover plates shall be provided with a CAM lock mechanism with two keys or a padlock hasp that does not protrude through the face of the cover and will allow the shank of locks keyed Corbin No. 60 keys.

3.3 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

A. Provide descriptive nameplates or tags permanently attached to switchboards, motor control centers, transformers, panelboards, circuit breakers, disconnect switches, starters, pushbutton control stations and other apparatus installed for operation or control of circuits, appliances, fire alarm control panel(s), fire alarm annunciator(s), power supplies, terminal cabinets, energy management control units, and Information technology system backbone and distribution equipment points.

B. Provide nameplates of engraved laminated plastic, or etched metal. Submit Shop Drawings denoting dimensions and format to Architect before installation. Fasten to equipment with escutcheon pins, rivets, self-tapping screws, or machine screws. Self- adhering or adhesive backed nameplates are not permitted.

C. Fasten tags to feeder wiring in conduits at every point where runs are broken or terminated, including pull wires in empty conduits. Indicate circuit, phase, and function. Tag branch circuits in panel boards and motor control centers. Tags may be manufactured of pressure-sensitive plastic or embossed self-attached stainless steel or brass ribbon.

D. Provide circuit identification cards and cardholders in all panel boards. Cardholders shall consist of metal frame retaining a clear plastic cover permanently attached to inside of panel door. List of circuits shall be typewritten on a card. Circuit description shall include name or number of circuit, area and connected load.

E. Junction and pull boxes shall have covers stenciled with box number when indicated on Drawings, or circuit numbers according to panel schedules. Data shall be lettered in a conspicuous manner with a color contrasting with finish.

F. Name shall be correctly engraved, with a legend indicating function or areas, when required by codes or indicated on Drawings.

3.4 PROTECTION

A. Protect Work of this section until Substantial Completion.

3.5 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

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WARRANTY FORM

(CONTRACTOR'S OR SUBCONTRACTOR'S LETTERHEAD)

Warranty for
We hereby warrant that all materials and equipment for the which we have installed at

are new unless otherwise specified, and that all work is of good quality, free from faults and defects and in conformance with the contract documents.

Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.

Within one year after the date of substantial completion of the work, or designated portion thereof, or within one yearafter acceptance by the owner of designated equipment, or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the contract documents, if any of the work is found to be defective or not in compliance with the contract documents, then we agree to correct it promptly after receipt of a written notice from the Owner to do so, unless the Owner has previously issued a written acceptance of such condition.
This obligation shall survive termination of the contract.

If we fail to comply with the above paragraph within 7 days after receipt of written notice from the Owner to correct defective or non-compliant Work, or fail to pursue such compliance with diligence, we jointly and severally do hereby authorize the Owner to proceed to have defects repaired and made good at our sole

expense, including compensation for the Architect's additional services made necessary by such default, and we will honor and pay all costs and charges for said repairs together, with interest, at the maximum rate permitted by governing state law at the time.

If we fail to fulfill the preceding obligations, and if the Owner brings action to enforce this warranty, we agree to pay the owner's reasonable attorney's fees incurred in connection therewith. This warranty is for the period of one year.

Signed (SUBCONTRACTOR)

Date COUNTERSIGNED (GENERAL CONTRACTOR)

WARRANTY FORM

PART G

ABATEMENT SPECIFICATIONS

Ellis Environmental Management, Inc.

430 Silver Spur Road, Suite 201
Rancho Palos Verdes, CA 90275
Tel: (310) 544 1837
Fax: (310) 544 2167

June 23, 2014

Ms. Diane Megerdichian, Business Manager
CITY OF TORRANCE
3350 Center Drive
Torrance, CA 90503

RE: Bulk Sampling for Asbestos & Lead
3624 West Artesia Boulevard, Torrance

Background

On June 13, 2014, Ellis conducted bulk sampling for asbestos and lead-containing materials at the subject property. Samples were collected from materials that may be impacted by planned renovation activities as identified by city inspector Steve Minor, who also provided access to the site.

Sampling and analysis were conducted for:

1. Lead in ceramic tile in impacted areas.
2. Asbestos-containing building materials within impacted areas.

Methodology

All samples were collected under the direction of Duane Behrens, CAC #92-0226 and DOHS Cert. #7914.

1. Asbestos Bulk 40CFR Part 763, Subpart F, Appendix A. (AHERA Final Rule). Results expressed in percent of measured area.

2. Lead. TTLC (ceramic tile), results expressed in mg/kg.

Inaccessible Areas

The entire Senior Center was investigated. In the two buildings adjacent to the Senior Center, only those materials and locations identified by the client were accessed and sampled.

In the Senior Center, wall space interiors and sub-ceilings were inspected wherever possible. However, not all walls, ceilings and floors were demolished to gain complete visual access. There is a chance that additional suspect materials (e.g., pipe insulation in walls, AC pipe beneath concrete, etc.) may be exposed during demolition or renovation activities. Such materials should be sampled and analyzed prior to further disturbance.

Results

Refer also to the attached laboratory reports.

Asbestos

Asbestos (>1%) was detected in:

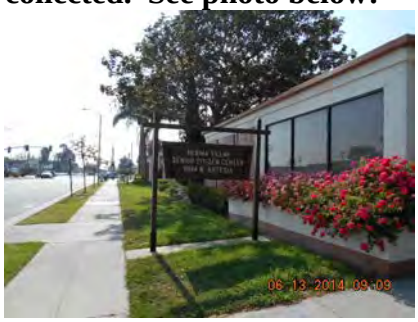
(above) 12" beige tile and mastic, all locations, both Sr. Center (shown) and adjacent buildings.

(not shown) 12" blue tile and mastic; sampled in Senior Center Women's restroom.

(above) Roof penetration and mastic, Sr. Center roof. (Adjacent roofs were not sampled.)

The above materials were assessed as "non-friable" (unable to be crushed using normal hand pressure) and were undamaged at the time of inspection. Where required, removal will be performed by a state-licensed abatement contractor under the requirements and guidelines of California Title 8 Section 1529 and SCAQMD Rule 1403.

Asbestos (<1%, or "trace") was also detected in one of three exterior stucco samples collected. See photo below:



Removal and transport of materials with <1% asbestos is not regulated under federal standards. However, materials containing asbestos concentrations between 0.1% and 1.0% *are* regulated under Cal-OSHA Title 8 Section 1529, which requires certain worker protection and handling methods. Prior to demolition, representative samples of the stucco should be analyzed by 1,000-point count methods, which can identify asbestos concentrations between 0.1 and 1.0%.

No asbestos was detected in samples collected from:

1. baseboard,
2. baseboard mastic,
3. 12" ceiling tile,
4. interior wall plaster (Sr. Center),
5. 2' x 4' lay-in ceiling tiles (north end of Sr. Center),
6. roofing debris (noted in Sr. Center sub-ceiling space),
7. grout under ceramic wall tile (although the wall tile did contain lead),
8. roofing core and parapet samples
9. window glazing

<u>Lead-Containing Ceramic Tile</u>

(above) Lead was identified in ceramic wall and floor tile in all restrooms and washroom walls.

(above) Lead is also assumed present in red primer paint on structural iron above the sub-ceiling of the senior center.

Disturbance of lead-containing materials is regulated under California Title 8 Section 1532.1.

Recommendations

Asbestos

Asbestos was detected in various building materials within the subject site. (See "Results" section above.) Notification to employees and occupants regarding the presence and location of asbestos materials is required under California Health and Safety Code 25914 and 25915. Removal of asbestos materials is regulated under California Title 8 1529, 29CFR 1926.1101, South Coast Air Quality Management District (SCAQMD) Rule 1403, and others.

Lead

Lead was identified in ceramic wall and floor tile, and is assumed present in red primer paint on structural iron. Removal will be performed by lead-certified workers following 5-day CDPH notification, under Cal. Title 8 S1532.1. Drum and profile all waste prior to transport and disposal. When profiling, do not mix potential lead-containing waste with any other materials (e.g. paper suits).

This report is not intended and should not be interpreted as an asbestos or lead survey of the entire building or site. Nor is it an endorsement or rejection of the means and methods used in the handling of potentially hazardous materials.

Ellis is a privately-held company and is not affiliated with any financial institution or other corporate entity. Ellis is retained as an independent contractor to provide objective, impartial investigatory or analytical service regarding environmentally regulated hazardous or toxic materials. This report is not an endorsement or rejection of any specific methods used in handling or transport of potentially hazardous chemicals. Ellis provides independent testing for indoor air contaminants and other potentially hazardous materials. The company and its employees are certified and licensed to practice in the State of California. Retained laboratories are accredited by the EPA (AREAL), NIOSH (AIHA), and the California Air Resources Board (CARB).

Respectfully,

Duane E. Behrens, R.E.A.
President
CAL/OSHA Cert. #92-0226
DOHS Cert. #7914

cc 14-161

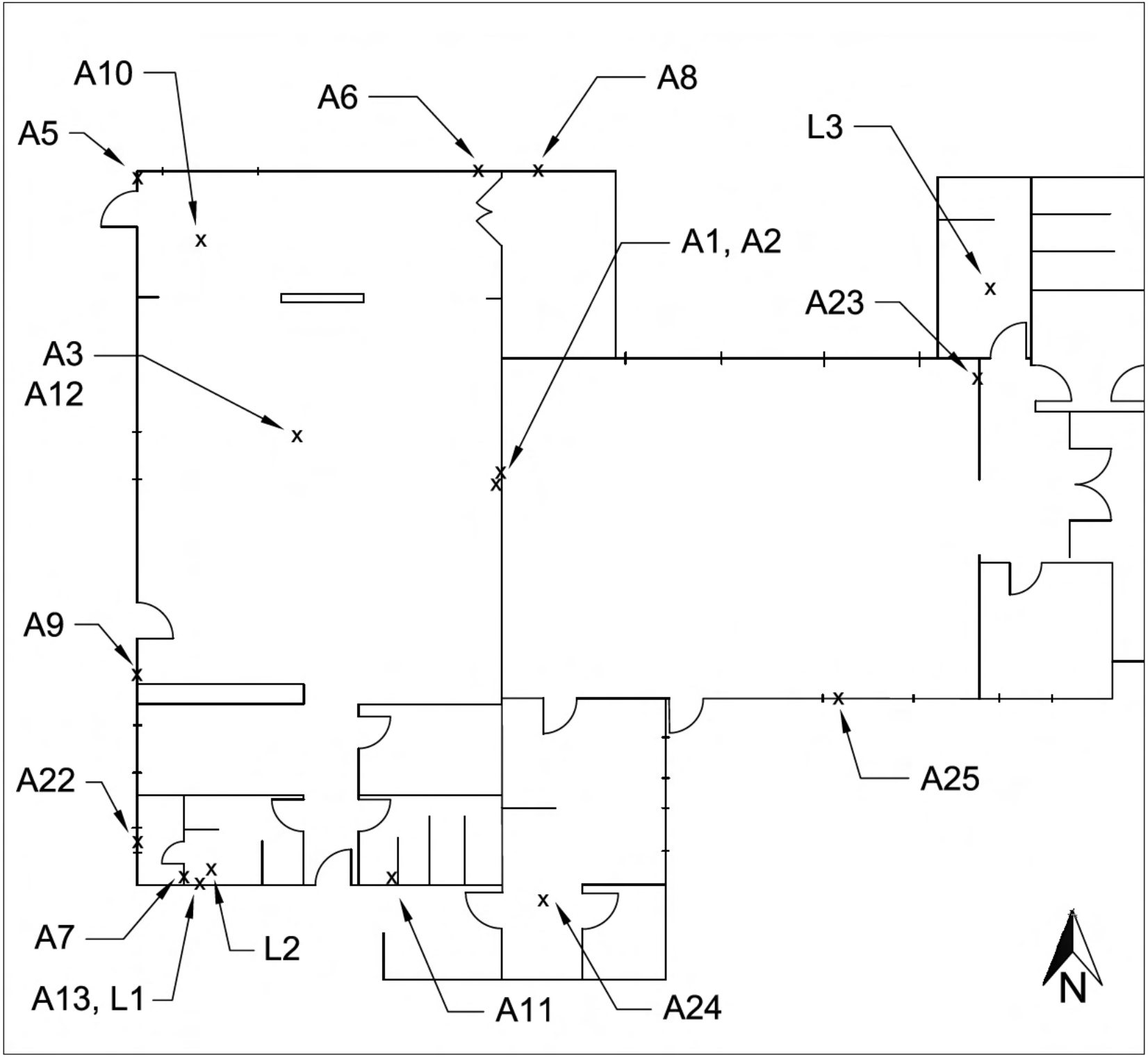


Figure 1: Sample Locations
Senior Community Center-McMaster Park
3624 W. Artesia Blvd. Torrance, CA

Firm Name and Address

Ellis Environmental Mgmt, Inc.
430 Silver Spur Rd., Suite 201
Rancho Palos Verdes, CA 90275

Client Name and Address

City of Torrance
3031 Torrance Blvd.
Torrance, CA 90503

Project #	Sheet
14-161	
Date 06/13/2014	1of 2

Ellis

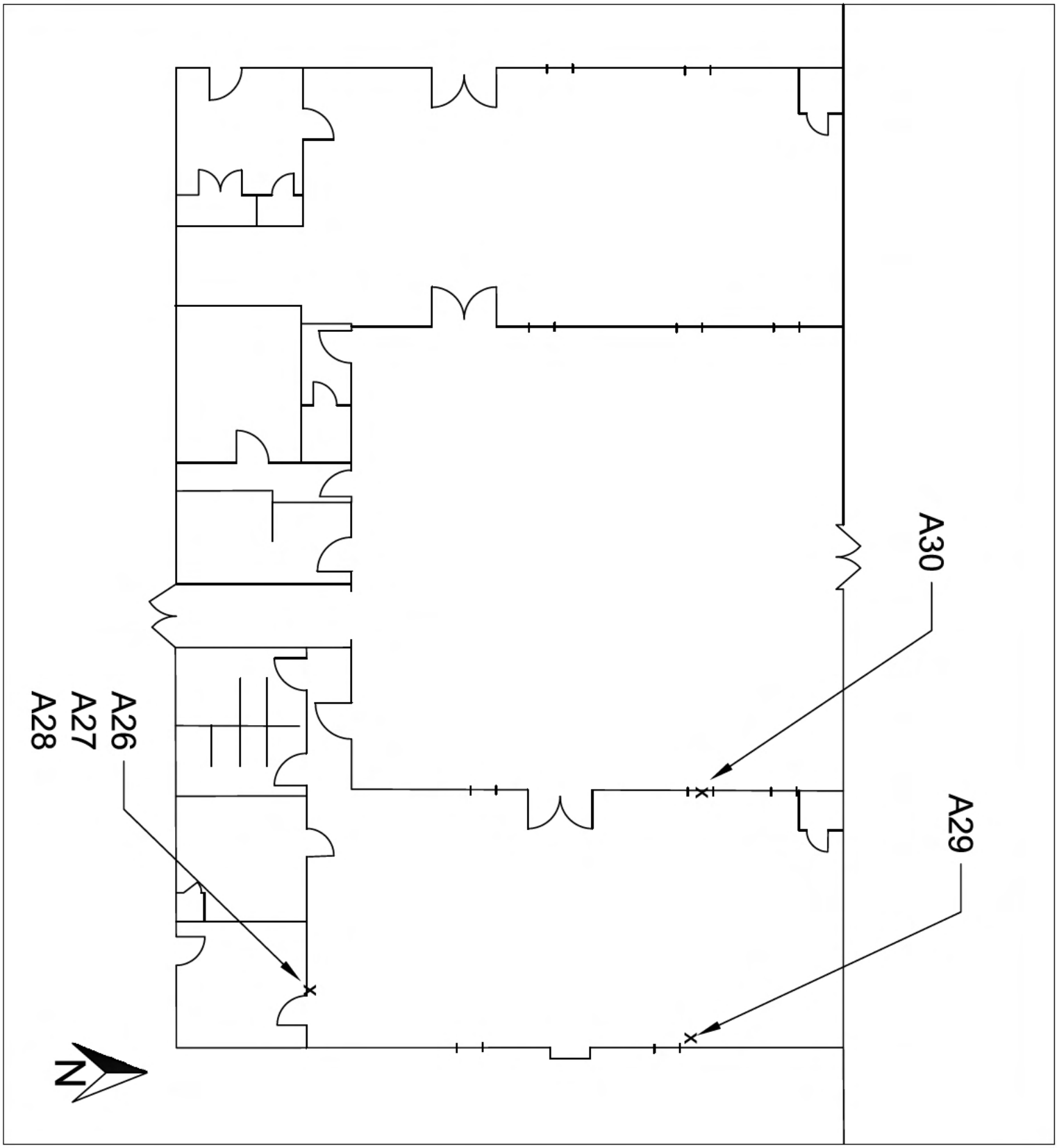


Figure 2: Sample Locations

Recreation Center-McMaster Park

3624 W. Artesia Blvd. Torrance, CA

Firm Name and Address

Ellis Environmental Mgmt, Inc.
430 Silver Spur Rd., Suite 201
Rancho Palos Verdes, CA 90275

Client Name and Address

City of Torrance
3031 Torrance Blvd.
Torrance, CA 90603.

Project #: 14-161

Date: 06/13/2014

Sheet: 2 of 2

Attachment A

Laboratory Results

AmeriSci Los Angeles
24416 S. Main Street, Ste 308
Carson, California 90745
TEL: (310) 834-4868 • FAX: (310) 834-4772

PLM Bulk Asbestos Report

Ellis Environmental Management, Inc.
Attn: Duane Behrens
430 Silver Spur Road
Suite 201
Rancho Palos Verdes, CA 90275

Date Received 06/13/14
Date Examined 06/16/14

AmeriSci Job # 914061516
P.O. #

RE: 14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A1	914061516-01L1	*No*	NAD (by CVES) by Raymundo Orozco on 06/16/14
Location: BB / Mastic			
Analyst Description: Brown, Homogeneous, Non-Fibrous, Cove Base			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A1	914061516-01L2	*No*	NAD (by CVES) by Raymundo Orozco on 06/16/14
Location: BB / Mastic			
Analyst Description: Beige/Brown, Homogeneous, Non-Fibrous, Mastic			
Asbestos Types:			
Other Material: Cellulose 90 %, Non-fibrous 10 %			
A2	914061516-02L1	*Yes*	2 % (by CVES) by Raymundo Orozco on 06/16/14
Location: 12" Beige Tile / Mastic			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Floor Tile			
Asbestos Types: Chrysotile 2.0 %			
Other Material: Non-fibrous 98 %			
A2	914061516-02L2	*Yes*	5 % (by CVES) by Raymundo Orozco on 06/16/14
Location: 12" Beige Tile / Mastic			
Analyst Description: Black, Homogeneous, Non-Fibrous, Mastic			
Asbestos Types: Chrysotile 5.0 %			
Other Material: Non-fibrous 95 %			
A3	914061516-03	*No*	NAD (by CVES) by Raymundo Orozco on 06/16/14
Location: 12" CT			
Analyst Description: Beige/Brown, Homogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 90 %, Non-fibrous 10 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A5	914061516-04.1	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Int. Plaster			
Analyst Description: Beige/Brown, Homogeneous, Fibrous, Drywall			
Asbestos Types:			
Other Material: Cellulose 10 %, Non-fibrous 90 %			
Comment: Plaster Not Found			
A5	914061516-04.2	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Int. Plaster			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Cementitious, Joint Compound			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A6	914061516-05.1	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Int. Plaster			
Analyst Description: Beige, Homogeneous, Fibrous, Drywall			
Asbestos Types:			
Other Material: Cellulose 10 %, Non-fibrous 90 %			
Comment: Plaster Not Found			
A6	914061516-05.2	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Int. Plaster			
Analyst Description: White, Heterogeneous, Non-Fibrous, Joint Compound			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A7	914061516-06	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Int. Plaster			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A8 **Location:** Int. Plaster	914061516-07.1	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Analyst Description: Beige/Brown, Homogeneous, Fibrous, Drywall **Asbestos Types:** **Other Material:** Cellulose 10 %, Non-fibrous 90 % **Comment:** Plaster Not Found			
A8 **Location:** Int. Plaster	914061516-07.2	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Analyst Description: White, Homogeneous, Non-Fibrous, Joint Compound **Asbestos Types:** **Other Material:** Non-fibrous 100 %			
A9 **Location:** Int. Plaster	914061516-08.1	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Analyst Description: Beige/Brown, Homogeneous, Fibrous, Drywall **Asbestos Types:** **Other Material:** Cellulose 10 %, Non-fibrous 90 % **Comment:** Plaster Not Found			
A9 **Location:** Int. Plaster	914061516-08.2	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Analyst Description: White, Homogeneous, Non-Fibrous, Joint Compound **Asbestos Types:** **Other Material:** Non-fibrous 100 %			
A10 **Location:** 2'x4' CT	914061516-09	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30 %, Fibrous glass 50 %, Non-fibrous 20 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A11	914061516-10L1	*No*	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Blue 12" Tile - RR			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Floor Tile			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A11	914061516-10L2	*Yes*	3 % (by CVES) by Raymundo Orozco on 06/13/14
Location: Blue 12" Tile - RR			
Analyst Description: Black, Homogeneous, Non-Fibrous, Mastic			
Asbestos Types: Chrysotile 3.0 %			
Other Material: Non-fibrous 97 %			
A12	914061516-11	*No*	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Roofing Debri - Attic			
Analyst Description: Grey/Black/Brown, Homogeneous, Non-Fibrous, Debris			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A13	914061516-12L1	*No*	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Wall Tile - Grout			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Ceramic Tile			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A13	914061516-12L2	*No*	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Wall Tile - Grout			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Grout			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A14	914061516-13	*No*	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Debri In Sub - Ceiling			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A15	914061516-14	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Ext. Stucco			
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A16	914061516-15	***Yes***	Trace (<1 %) (by CVES) by Raymundo Orozco on 06/13/14
Location: Ext. Stucco			
Analyst Description: Beige/Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile <1. %			
Other Material: Non-fibrous 100 %			
A17	914061516-16	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Ext. Stucco			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A18	914061516-17	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Upper Roof Parapet			
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Synthetic fibers 10 %, Non-fibrous 90 %			
A19	914061516-18	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Upper Roof Core			
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Synthetic fibers 10 %, Non-fibrous 90 %			
A20	914061516-19	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Flashing Sealant			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A21	914061516-20	***Yes***	5 % (by CVES) by Raymundo Orozco on 06/13/14
Location: Roof Penet. Mastic			
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material			
Asbestos Types: Chrysotile 5.0 %			
Other Material: Cellulose 10 %, Non-fibrous 85 %			
A22	914061516-21	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Window Putty			
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A23	914061516-22L1	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: BB / Mastic			
Analyst Description: Red, Homogeneous, Non-Fibrous, Cove Base			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A23	914061516-22L2	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: BB / Mastic			
Analyst Description: Cream, Homogeneous, Non-Fibrous, Mastic			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A24	914061516-23L1	***Yes***	2 % (by CVES) by Raymundo Orozco on 06/13/14
Location: 12" Beige Tile / Mastic			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Floor Tile			
Asbestos Types: Chrysotile 2.0 %			
Other Material: Non-fibrous 98 %			
A24	914061516-23L2	***Yes***	2 % (by CVES) by Raymundo Orozco on 06/13/14
Location: 12" Beige Tile / Mastic			
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 2.0 %			
Other Material: Non-fibrous 98 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A25	914061516-24	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Window Putty			
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A26	914061516-25L1	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: 12" Beige Tile - Top			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Floor Tile			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A26	914061516-25L2	***Yes***	2 % (by CVES) by Raymundo Orozco on 06/13/14
Location: 12" Beige Tile - Top			
Analyst Description: Black, Homogeneous, Non-Fibrous, Mastic			
Asbestos Types: Chrysotile 2.0 %			
Other Material: Non-fibrous 98 %			
A27	914061516-26L1	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Flooring - Bottom			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Floor Tile			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A27	914061516-26L2	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Flooring - Bottom			
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Leveling Compound			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A28	914061516-27	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: BB / Mastic			
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Wollastonite 2 %, Non-fibrous 98 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A29	914061516-28L1	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: 12" Beige Tile			
Analyst Description: Beige, Homogeneous, Non-Fibrous, Floor Tile			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
A29	914061516-28L2	***Yes***	4 % (by CVES) by Raymundo Orozco on 06/13/14
Location: 12" Beige Tile			
Analyst Description: Black, Homogeneous, Non-Fibrous, Mastic			
Asbestos Types: Chrysotile 4.0 %			
Other Material: Non-fibrous 96 %			
A30	914061516-29	***No***	NAD (by CVES) by Raymundo Orozco on 06/13/14
Location: Window Glazing			
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			

Reporting Notes:

Analyzed By: Raymundo Orozco _____; Date Analyzed: 6/16/2014 6/16/14

*NAD = no asbestos detected; Detection Limit <1%; Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; NA = not analyzed; NA/PS = not analyzed / positive stop; NVA = No Visible Asbestos; PLM (polarized light microscopy) Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab #200346-0, CA ELAP lab #2322); Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB materials. TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full with the approval of the laboratory. This PLM report relates ONLY to the items tested.

Reviewed By:_____

9140615160

Ellis Environmental Management, Inc.

430 Silver Spur Road, Suite 201
Rancho Palos Verdes, CA 90275
(310) 544-1837 (tel)
(310) 544-2167 (fax)

Project No: 14-161

Client: CITY OF TORRANCE

Location: 3624 W ARTESIA BLVD
MCMASTER PARK

Sampler: DB/MY

CHAIN OF CUSTODY RECORD

Sheet 1 of 3

Sample Number	Description	Date	Time	H20	Air	Solid	Tests Required
L1	CERAMIC WALL TILE	6/13/14	AM			✓	TTLC-LEAD
L2	CERAMIC FLOOR TILE	↓	↓			↓	↓ ↓
L3	CERAMIC TILE MEN'S RR	↓	↓			↓	↓ ↓
A1	BB/MASTIC	↓	↓			↓	PLM ASBESTOS
A2	12" BEIGE TILE/MASTIC	↓	↓			↓	↓ ↓
A3	12" CT	↓	↓			↓	↓ ↓
A5	INT. PLASTER	↓	↓			↓	↓ ↓
A6	" "	↓	↓			↓	↓ ↓
A7	" "	↓	↓			↓	↓ ↓
A8	" "	↓	↓			↓	↓ ↓
A9	" "	↓	↓			↓	↓ ↓
A10	2'x4' CT	↓	↓			↓	↓ ↓

Turnaround: ___ same day ___ 24 hrs. ✓ 48 hrs. ___ 3 days ___ 5 days (Standard)

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9140615116

Ellis Environmental Management, Inc.

430 Silver Spur Road, Suite 201
Rancho Palos Verdes, CA 90275
(310) 544-1837 (tel)
(310) 544-2167 (fax)

Project No.: 14-161

Client: CITY OF TORRANCE

Location: 3624 W ARTESIA BLVD
MCMASTER PARK

Sampler: DB/MY

CHAIN OF CUSTODY RECORD

Sheet 2 of 3

Sample Number	Description	Date	Time	H20	Air	Solid	Tests Required
A11	BLUE 12" TILE-RR	6/13/14	AM			✓	PLM ASBESTOS
A12	ROOFING DEBRI - ATTIC	6/13/14	↓			↓	↓
A13	WALL TILE-GROUT	↓	↓			↓	↓
A14	DEBRI IN SUB-CEILING	↓	↓			↓	↓
A15	EXT. STUCCO	↓	↓			↓	↓
A16	" "	↓	↓			↓	↓
A17	" "	↓	↓			↓	↓
A18	UPPER ROOF PARAPET	↓	↓			↓	↓
A19	UPPER ROOF CORE	↓	↓			↓	↓
A20	FLASHING SEALANT	↓	↓			↓	↓
A21	ROOF PENET. MASTIC	↓	↓			↓	↓
A22	WINDOW PUTTY	↓	↓			↓	↓

Turnaround: ___ same day ___ 24 hrs. ✓ 48 hrs. ___ 3 days ___ 5 days (Standard)

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914 061516

Ellis Environmental Management, Inc.

430 Silver Spur Road, Suite 201
Rancho Palos Verdes, CA 90275
(310) 544-1837 (tel)
(310) 544-2167 (fax)

Project No.: 14-161

Client: CITY OF TORRANCE

Location: 3624 W ARTESIA BLVD
McMaster Park

Sampler: DB/MY

CHAIN OF CUSTODY RECORD

Sheet 3 of 3

Sample Number	Description	Date	Time	H20	Air	Solid	Tests Required
A23	BB/MASTIC	6/13/14	A.M			✓	PLM ASBESTOS
A24	12" BEIGE TILE/MASTIC	↓	↓			↓	↓ ↓
A25	WINDOW PUTTY	↓	↓			↓	↓ ↓
A26	12" BEIGE TILE-TOP	↓	↓			↓	↓ ↓
A27	FLOORING-BOTTOM	↓	↓			↓	↓ ↓
A28	BB/MASTIC	↓	↓			↓	↓ ↓
A29	12" BEIGE TILE	↓	↓			↓	↓ ↓
A30	WINDOW GLAZING	↓	↓			↓	↓ ↓

Turnaround: ____ same day ____ 24 hrs. ✓ 48 hrs. ____ 3 days ____ 5 days (Standard)

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Please Reply To:

AmeriSci Los Angeles
24416 South Main Street, Suite 308
Carson, CA 90745
Phone 310-834-4868 / Fax 310-834-4772

FACSIMILE TELECOPY TRANSMISSION

To: Duane Behrens
Ellis Environmental Management
Fax # results@ellisenviron

duanebehrens@ellisenvironmental.com

AmeriSci Job# 1406-00028
Subject: City Of Torrance 14-161

Date: Friday, June 13, 2014
Time: 16:58:49

Comments:

This report consists of 5 pages, including:

Cover Page (Facsimile Telecopy Transmission)	1	pages
Laboratory Report	1	pages
Chain of Custody Record	3	pages
Air Bill		pages
Sample Receiving Form		pages
Miscellaneous		pages

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AmeriSci Los Angeles
24416 South Main Street, Suite 308
Carson, CA 90745
Phone 310-834-4868 / Fax 310-834-4772

Laboratory Report

Report Date: 6/13/2014
Workorder No.: 1406-00028

Customer: Ellis Environmental Management
430 Silver Spur Road Suite 201
Rancho Palos VICA 90275

Attention: Duane Behrens
Subject: City Of Torrance 14-161

Sample: 001 **Description:** L1 / Ceramic Wall Tile
Collection Date: 06/13/2014 **Received Date:** 06/13/2014 **Time:** 10:25:00
Matrix:

Parameter	Method	Results	Units	PQL	Tech	Analysis Date	Qual
Lead, Solid, AA	EPA SW-846 7000B/3050B	17000	mg/kg	400	DL	06/13/2014	

Sample: 002 **Description:** L2 / Ceramic Floor Tile
Collection Date: 06/13/2014 **Received Date:** 06/13/2014 **Time:** 10:25:00
Matrix:

Parameter	Method	Results	Units	PQL	Tech	Analysis Date	Qual
Lead, Solid, AA	EPA SW-846 7000B/3050B	140	mg/kg	20	DL	06/13/2014	

Sample: 003 **Description:** L3 / Ceramic Tile Men's RR
Collection Date: 06/13/2014 **Received Date:** 06/13/2014 **Time:** 10:25:00
Matrix:

Parameter	Method	Results	Units	PQL	Tech	Analysis Date	Qual
Lead, Solid, AA	EPA SW-846 7000B/3050B	48	mg/kg	20	DL	06/13/2014	

Unless otherwise specified, the samples were received in an acceptable condition and met all holding time and preservation-handling requirements. The laboratory does not correct for field or matrix blanks.

To the best of my knowledge this report is true and accurate.

Authorized By/Title: DENNIS LIU / CHEMIST Date: 6-13-14

The analytical results within this report relate only to the specific compounds and samples investigated and may not necessarily reflect other apparently similar material from the same or similar location.

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NOTE: All solid results are reported on a dry weight basis unless otherwise noted.

Certifications: CA ELAP: 2322

PQL= Practical Quantitation Limit MDL = Method Detection Limit

814060028

Ellis Environmental Management, Inc.

430 Silver Spur Road, Suite 201
Rancho Palos Verdes, CA 90275
(310) 544-1837 (tel)
(310) 544-2167 (fax)

Project No.: 14-161

Client: CITY OF TORRANCE

Location: 3624 W ARTESIA BLVD
MCMASTER PARK

Sampler: DB/MY

CHAIN OF CUSTODY RECORD

Sheet 1 of 3

Sample Number	Description	Date	Time	H20	Air	Solid	Tests Required
L1	CERAMIC WALL TILE	6/13/14	AM			✓	TTLC-LEAD
L2	CERAMIC FLOOR TILE	↓	↓			↓	↓ ↓
L3	CERAMIC TILE MEN'S RR	↓	↓			↓	↓ ↓
A1	BB/MASTIC	↓	↓			↓	PLM ASBESTOS
A2	12" BEIGE TILE/MASTIC	↓	↓			↓	↓ ↓
A3	12" CT	↓	↓			↓	↓ ↓
A5	INT. PLASTER	↓	↓			↓	↓ ↓
A6	" "	↓	↓			↓	↓ ↓
A7	" "	↓	↓			↓	↓ ↓
A8	" "	↓	↓			↓	↓ ↓
A9	" "	↓	↓			↓	↓ ↓
A10	2'x4' CT	↓	↓			↓	↓ ↓

Turnaround: ___ same day ___ 24 hrs. ✓ 48 hrs. ___ 3 days ___ 5 days (Standard)

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814060028

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430 Silver Spur Road, Suite 201
Rancho Palos Verdes, CA 90275
(310) 544-1837 (tel)
(310) 544-2167 (fax)

CHAIN OF CUSTODY RECORD

Project No.: 14-161

Client: CITY OF TORRANCE

Location: 3624 W ARTESIA BLVD
McMASTER PARK

Sampler: DB/MY

Sheet 2 of 3

Sample Number	Description	Date	Time	H20	Air	Solid	Tests Required
A11	BLUE 12" TILE - RR	6/13/14	A.M			✓	PLM ASBESTOS
A12	ROOFING DEBRI - ATTIC	6/13/14					
A13	WALL TILE - GROUT						
A14	DEBRI IN SUB-CEILING						
A15	EXT. STUCCO						
A16	" "						
A17	" "						
A18	UPPER ROOF PARAPET						
A19	UPPER ROOF CORE						
A20	FLASHING SEALANT						
A21	ROOF PENET. MASTIC						
A22	WINDOW PUTTY						

Turnaround: ____ same day ____ 24 hrs. ✓ 48 hrs. ____ 3 days ____ 5 days (Standard)

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8140600088

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(310) 544-1837 (tel)
(310) 544-2167 (fax)

CHAIN OF CUSTODY RECORD

Project No.: 14-161

Client: CITY OF TORRANCE

Location: 3624 W ARTESIA BLVD
McMaster Park

Sampler: DB/MY

Sheet 3 of 3

Sample Number	Description	Date	Time	H20	Air	Solid	Tests Required
A23	BB/MASTIC	6/13/14	AM			✓	PLM ASBESTOS
A24	12" BEIGE TILE/MASTIC	↓	↓			↓	↓ ↓
A25	WINDOW PUTTY	↓	↓			↓	↓ ↓
A26	12" BEIGE TILE-TOP	↓	↓			↓	↓ ↓
A27	FLOORING-BOTTOM	↓	↓			↓	↓ ↓
A28	BB/MASTIC	↓	↓			↓	↓ ↓
A29	12" BEIGE TILE	↓	↓			↓	↓ ↓
A30	WINDOW GLAZING	↓	↓			↓	↓ ↓

Turnaround: ____ same day ____ 24 hrs. ✓ 48 hrs. ____ 3 days ____ 5 days (Standard)

Special Instructions:

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6/13/14	[signature]	K. [signature] 6/13	14@1025

Ellis Environmental Management, Inc.

430 Silver Spur Road, Suite 201
Rancho Palos Verdes, CA 90275
Tel: (310) 544 1837
Fax: (310) 544 2167

Memo

To:	Ms. Diane Megerdichian City of Torrance
VIA:	e-mail
CC:	14-161
From:	Duane Behrens Cal-OSHA Cert. 92-0226
Phone:	(310) 544 1837
Email:	duanebehrens@ellisenvironmental.com
Date:	June 26, 2014
RE:	***Point Count Results – Asbestos*** ***3624 West Artesia Blvd., Torrance, CA***

Bulk samples collected from exterior wall stucco were collected at the subject site on June 13 and were analyzed by polarized light microscopy using EPA Method 600/M4-82-020 per 40 CFR 763. Three samples of exterior stucco were collected, two of those samples indicated that no asbestos was detected. One of the samples indicated asbestos (<1%) was detected. In all states except California, this would qualify a building material as "non-asbestos containing." In California, however, any material with greater than 0.1% (one tenth of a percent) asbestos is regulated as asbestos under Title 8 Section 1529. To see whether removal of the exterior stucco is subject to OSHA rules, the three stucco samples were combined and re-analyzed by 600/M4-82-020, 1000 Point Count Procedure.

Raw material results are attached. They indicate less than 0.1% asbestos. Based on these results, the material is not considered to be "asbestos containing" under current State or Federal guidelines.

Removal of asbestos materials is regulated under California Title 8 §1529, which also requires personal monitoring of employees performing the removal and engineering controls to limit and control airborne dust. Analysis results as reported are not intended and should not be interpreted as a survey of the entire building or facility. Nor are they an endorsement or rejection of the use, handling or transport of potentially hazardous materials. Ellis Environmental Management, Inc., provides Phase I environmental site assessments (ESAs), monitoring for indoor contaminants (IAQ studies), testing for and administration of the removal of potentially hazardous building materials. Licensed to practice in the state of California, employees conducting asbestos surveys are certified by Cal-OSHA pursuant to regulations required by subdivision (b) of Section 9021.5 of the Labor Code, and have taken and passed an EPA-approved Building Inspector course. Retained laboratories are accredited by the EPA, AREAL), National Institute of Occupational Safety and Health (NIOSH), California Department of Health Services (DOHS), the American Industrial Hygiene Association (AIHA), the National Voluntary Laboratory Accreditation (NVLAP) program and the California Air Resources Board (CARB).

Please Reply To:

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24416 S. Main Street, Ste 308
Carson, California 90745
TEL: (310) 834-4868 • FAX: (310) 834-4772

FACSIMILE TELECOPY TRANSMISSION

To: Duane Behrens
Ellis Environmental Management, Inc.

Fax #:

Email: duanebehrens@ellisenvironmental.com,results@ellisenvironmental.com

From: Raymundo Orozco

AmeriSci Job #: 914061917

Subject: PLM 1000 point count 24 hour Res

Client Project: 14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

3

Date: Wednesday, June 25, 2014

Time: 07:04:33

Comments:

Number of Pages: _____
(including cover sheet)

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AmeriSci Los Angeles
24416 S. Main Street, Ste 308
Carson, California 90745
TEL: (310) 834-4868 • FAX: (310) 834-4772

PLM Bulk Asbestos Report

Ellis Environmental Management, Inc.
Attn: Duane Behrens
430 Silver Spur Road
Suite 201
Rancho Palos Verdes, CA 90275

Date Received 06/24/14
Date Examined 06/25/14

AmeriSci Job # 914061917
P.O. #
Page 1 **of** 1

RE: 14-161; City Of Torrance; 3624 W. Artesia Blvd. McMaster Park

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
A15, A16, A17 **Location:** Ext. Stucco	914061917-01	***Yes***	Trace (<0.1 % pc) [1] (by 1000 pt ct) by Raymundo Orozco on 06/25/14

Analyst Description: Beige/Grey, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile <0.1 % pc
Other Material: Non-fibrous 56.9 %
Comment: Heat Sensitive (organic): 12.2%; Acid Soluble (inorganic): 30.8%; Inert (Non-asbestos): 56.9%

Reporting Notes:

(1) 1000 Point Count Analysis performed on Inert Residue remaining after 480C heat and HCl acid treatments

Analyzed By: Raymundo Orozco _____; Date Analyzed: 6/25/2014 6/25/14

*NAD = no asbestos detected; Detection Limit <1%; Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; NA = not analyzed; NA/PS = not analyzed / positive stop; NVA = No Visible Asbestos; PLM (polarized light microscopy) Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab #200346-0, CA ELAP lab #2322); Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB materials. TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full with the approval of the laboratory. This PLM report relates ONLY to the items tested.

Reviewed By: _____ 6/25/14

914061917

Subject: RE: Emailing: 914061516E 14-161 City Of Torrance 3624 W. Artesia Blvd.
From: "Duane Behrens" <duanebehrens@ellisenvironmental.com>
Date: 6/22/2014 3:55 PM
To: <mdavid@amerisci.com>, <results@ellisenvironmental.com>
CC: "'ELLIS - Ryan Davidson'" <ryandavidson@ellisenvironmental.com>, <maxyourman@ellisenvironmental.com>, <janecornish@ellisenvironmental.com>

Please composite and analyze sample Nos. A-15 through A-17 by 1000-pt. count analysis. 24 hour results. Thank you

-----Original Message-----
From: AmeriSci LA [mailto:ameriscila@amerisci.com]
Sent: Monday, June 16, 2014 1:20 PM
To: Duane Behrens; results@ellisenvironmental.com
Subject: Emailing: 914061516E 14-161 City Of Torrance 3624 W. Artesia Blvd.

The message is ready to be sent with the following file or link attachments:
914061516E

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.

Recd By: K.M
6/24/14 @ 0805

ASBESTOS REMOVAL WORK PLAN

PART 1 - GENERAL

1.1 PROJECT SITE

A. The project is identified as:

Asbestos and Lead Abatement
3624 West Artesia Boulevard

located in Torrance, California.

Do not prepare bids based solely on quantities listed herein; all quantities shall be field verified. Notify any discrepancies to Owner during bid phase and prior to deadline for questions.

1.2 SCOPE OF WORK

General Notes

1.2.1 Field-verify all dimensions; do not scale from drawings.

1.2.2 Flooring: If mechanical means (chipper or buffer machine) are used, the work is OSHA Class 1 abatement, friable asbestos waste. If hand methods are used, the work is Class 2 abatement.

1.2.3 Original walls are plaster and are non-asbestos-containing. Newer partition walls may in some cases be constructed of wallboard ("drywall" or "sheetrock"). Field verify composition of walls intended for demolition. Wallboard is assumed to contain asbestos in joint compound.

1.2.4 Assume multiple layers of flooring. 12" tile may be found over older 9" tile in some areas. In all cases, provide a concrete substrate that has been cleaned and is free of mastic residue.

1.2.5 Locations and approximate quantities of potentially hazardous materials are listed below:

a. 12" beige flooring and mastic, Senior Center. App. 2250 s.f. flooring, 2250 s.f. mastic on concrete. See demolition drawings. Following abatement the Senior Center will be demolished.

b. Roof penetration mastics and sealants, Senior Center. App. 100 locations.

c. 12" beige flooring and mastic, Teen Center kitchen. App. 240 s.f. flooring, 240 s.f. mastic on concrete

d. 12" beige flooring and mastic, Rec Center East. Main room, toy storage, restrooms and kitchen. App. 1850 s.f. tile, 1850 s.f. mastic.

e. 12" beige flooring and mastic, Rec Center West. Main room, kitchen and storage. App. 2000 s.f. tile, 2000 s.f. mastic.

f. Ceramic Tile (LEAD): Remove ceramic wall tile as shown on demolition plan and as identified by general contractor, pursuant to Title 8 1532.1, at the following locations: Senior Center, restroom wall and floor, app. 60 s.f. ; Rec Center East, counter area, 50 s.f. ; Rec Center West, counter area, 150 s.f.; Teen Center, restroom wall tile, app. 200 s.f.

g. Light Tubes and Ballasts: Remove, package and dispose of light tubes and ballasts from all fluorescent fixtures as noted in demolition drawings, in impacted areas and as identified by general contractor. Separate those ballasts marked "No PCBs" from unmarked ballasts. Drum, transport and dispose of PCB Ballasts as hazardous waste. Provide proof of notification and acceptance by disposal facility.

h. Mercury-containing thermostats, where present. Investigate for the presence of mercury vials prior to demolition. Remove and dispose of in an intact state as RCRA waste.

1.2.6 All work shall be supervised by experienced persons trained, knowledgeable and qualified in the techniques of asbestos abatement, handling and disposal of asbestos containing, and asbestos contaminated, materials and the subsequent cleaning of contaminated areas.

1.2.7 Contractor shall furnish all labor, materials, services, insurance (specifically covering the handling and transportation of asbestos material), and equipment which is specified, shown or reasonably implied for the removal, transport, and disposal of asbestos-containing materials. Field-verify all quantities and substrate conditions. Do not scale drawings.

1.2.8 The Work also includes removal, transport, and disposal of the following materials.

1. All materials used for work area preparation.
2. All discarded personnel protective equipment. (Do not mix PPE with lead tile or any other potentially hazardous waste.)

3. All materials contaminated by asbestos or lead, either before or during the work of this project.
4. Removal and proper disposal of light tubes, ballasts.
5. Removal and proper disposal of lead ceramic wall tile
6. Removal, packaging and disposal of mercury-containing thermostats.
7. Spot abatement of red iron (lead) at demolition torch points as required.

1.2.9 Other items of work may include attendant demolition activities required to access asbestos materials.

1.2.10 Replacement of asbestos containing materials is not part of this Contract.

1.2.11 Furnishings, cabinets, moveable objects, and equipment temporarily removed to gain access to asbestos containing materials shall be cleaned and stored at an Owner-designated location.

1.2.12 Damage to permanent structures and finishes, caused during the performance of abatement activities (not including incidental tape damage) shall be repaired by Contractor at no expense to Owner.

1.3 WORK TO BE PERFORMED BY OTHERS

1.3.1 Although no other contract work will be performed during abatement, the Contractor will be expected to provide access to the Owner and other trades as required during setup and cleaning activities in all work areas not under abatement.

1.4 RESPONSIBILITIES OF THE OWNER

1.4.1 As required by California Business and Professionals Code 7187, the Owner will provide for independent oversight and clearance air monitoring of the asbestos removal.

1.4.2 The Owner will provide existing water, at no cost to the Contractor, for construction purposes.

1.4.3 The Owner will provide existing electrical power, at no cost to the Contractor, for construction purposes. Contractor shall provide spider box and “pigtails” - Owner’s electrician will assist in making connection to panel.

1.5 REQUIRED LICENSURE

1.5.1 Contractor shall be licensed by the State of California, Contractors State License Board and be registered to perform asbestos related work with the Division of

Occupational Safety and Health, Department of Industrial Relations. At a minimum contractor shall hold the following license classifications:

1. ASB- Asbestos Certification (licenses that have the ASB certification with "for bidding purposes only" not acceptable as the listed abatement contractor).
2. Class B Contractor (B&P Code Div. 3 Ch. 9 ' 7000).
3. Hazardous Waste Contractor (PCB - HAZWOPER)
4. EPA RRP Lead Contractor

1.5.2 Transportation of Friable and Non-Friable Asbestos Containing Materials: Contractor shall itself be or have a subcontractor who is a registered hazardous waste transporter with the State of California.

1.5.3 Subcontractors shall hold all licenses applicable to specified trade work. Provide a list of any subcontractors anticipated for this project.

1.6 PERMITS

1.6.1 Provide applications to city governments, local fire department and other regulatory agencies as required.

1.7 NOTIFICATIONS

1.7.1 Contractor shall make all required written notification to regulatory agencies including the following:

1. California Division of Occupational Safety and Health
2. South Coast Air Quality Management District
3. City Fire Department

1.8 INSURANCE REQUIREMENTS

[see Contract]

1.9 BONDING REQUIREMENTS

[see Contract]

1.10 PROJECT SCHEDULE

1.10.1 Hours of Work: [see Contract]

1.10.2 The Contractor shall start work and complete work based on the contract.

1.10.3 For the purpose of this Work Plan, the "submittal due date" shall mean the day on which submittals required by Article 1.12 shall be received by the Project Owner's Representative. "Start Work" shall mean the day Contractor arrives on the project site, and "completion date" shall mean the day Contractor leaves the project site, including final clearance testing and demobilization.

1.11 PROCEDURES

1.11.1 Contractor shall perform all Work in compliance with the most recent edition of all applicable federal, state, and local regulations, standards and codes governing asbestos abatement, transport, and disposal of asbestos containing/contaminated materials.

1. Requirements include obtaining permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with codes, regulations, and standards.

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1.11.2 Regulations, Standards and Codes (General):

1. General applicability of federal, state, and local regulations, standards and codes governing asbestos abatement, transport, and disposal, except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable regulations, standards, and codes have the same force and effect and are made a part of the contract documents as if copied directly into the contract documents, or as if published copies are bound herewith.

1.11.3 Contractor Responsibility: The Contractor shall assume full responsibility and liability for the compliance with all applicable federal, state, and local regulations pertaining to work practices, transport, disposal, and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The contractor is responsible for providing training, medical examinations and maintaining training/medical records of personnel as required by the applicable federal, state, and local regulations. The Contractor shall hold the Owner and Project Owner's Representative harmless for failure to comply with any applicable asbestos abatement, transport, disposal, safety, health or other regulation on the part of himself, his employees, or his subcontractors.

1.12 SUBMITTALS

1.12.1 Prior to commencement of work, Contractor shall submit (two copies) to Project Owner's Representative documentation that includes, without limitation, the following:

1. Submit copies of licenses and registrations required by Article 1.5 Required Licensure (include copies of subcontractors licenses).

2. Submit copies of written notification to the following regulatory agencies:

   a. California Division of Occupational Safety and Health
   b. South Coast Air Quality Management District. Provide copies of renotification.
   c. Local Fire Department
   d. CDPH 8551 (Lead)

3. Submit proof of insurance coverage required by Article 1.8 Insurance Requirements and/or main Contract (include proof of insurance for subcontractors).

4. AQMD certification for HEPA-filtered equipment.

5. Submit a construction schedule indicating milestones and dates of completion for each phase of the Work.

6. Submit documentation that Contractor's employees, including foreman, supervisor, and any other company personnel or agents who may be exposed to airborne asbestos fibers or who may be responsible for any aspects of abatement activities, have received training as required by CFR 1926.1101 and 1532.1. For workers who will be dismantling light fixtures, removing and transporting potential PCB ballasts, provide copies of 40 hr. HAZWOPER training.\

7. Submit documentation from Physician that all employees or agents who may be exposed to airborne asbestos fibers in excess of background levels have received medical monitoring to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health effects. The Contractor must be aware and provide information to the examining physician about unusual conditions in the workplace environment (e.g. high temperatures, humidity, chemical contaminants) that may impact on the employee's ability to perform work activities.

8. Submit documentation of respirator fit-testing for all Contractor employees and agents who must enter the work area. This fit testing shall be in accordance with qualitative procedures as required by OSHA regulations or be quantative in nature.

1.12.2 During abatement activities, Contractor shall submit to Project Owner's Representative documentation that includes the following:

1. Submit copies of the work area entry/exit logbook. Logbook must record name, affiliation, time in, and time out for each entry into the work area.

2. Submit copies of logs documenting filter changes on respirators, HEPA vacuums, differential pressure air filtration devices, water filtration device, and other engineering controls.

3. Submit copies of Material Safety Data Sheets (MSDS) for solvents, encapsulants, wetting agents and replacement materials, as necessary.

4. Submit results of all required OSHA air monitoring. Results shall be available prior to the start of the following shift and within 24-hours of completion of the last shift.

5. Submit copies of all accident/incident reports where injury or damage has occurred on or to the Owner's property.

6. Submit copies of all signed transport manifests, trip tickets and disposal receipts for all hazardous waste materials (asbestos, lead and PCBs) removed from the work area within 24 hours of the transport. Send to:

   The City of Torrance
   Attn. Ms. Diane Megerdichian
   3350 Civic Center Drive
   Torrance, CA 90503

1.13 NOTICES

1.13.1 Post in the clean room area of the worker decontamination enclosure a list containing the names, and telephone numbers of Owner's Representative(s) and Contractor.

1.13.2 Additional postings shall include:

1. Employee Daily Sign in Log.
2. Emergency Procedures.

1.14 SITE USE AND SECURITY

1.14.1 Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond which work is indicated are not to be disturbed.

1.14.2 The work area shall be restricted only as authorized, trained and protected personnel, including Contractor, Contractor's employees, Owner employees, Building Management, and Project Owner's Representative, State and Local inspectors.

1.14.3 Entry into the work area by unauthorized individuals shall be reported immediately to the Project Owner's Representative.

1.14.4 Contractor shall be responsible for Project site security during abatement operations in order to protect work efforts and equipment.

1.15 EMERGENCY PLANNING

1.15.1 Emergency planning and procedures shall be developed by Contractor prior to abatement initiation.

1.15.2. Emergency procedures shall be in written form and prominently posted. Contractor shall ensure that all persons entering the work area read these procedures and understand the Project site layout, location of emergency exits and emergency procedures.

1.15.3 Emergency planning shall include considerations of fire, explosion, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Written procedures shall be developed and employee training in procedures shall be provided by Contractor.

1.15.4 Employees shall be trained in evacuation procedures in the event of work place emergencies.

1. For non-life-threatening situations, employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the work place to obtain proper medical treatment.

2. For life-threatening injury or illness, worker decontamination shall take least priority. After measures to stabilize the injured worker, remove him from the work place and secure proper medical treatment.

3. Telephone numbers of all emergency response personnel shall be prominently posted in the clean and equipment rooms.

1.16 FIRE PROTECTION

1.16.1 **All plastic, spray-on strippable coatings, and structural materials used in the asbestos abatement process shall be UL approved and certified as fire retardant or noncombustible**.

1.16.2 Wood shall be pressure impregnable and certified as fire retardant.

1.16.3 Material Safety Data Sheets (MSDS) for fire retardant materials shall be made available upon request.

1.16.4 All combustible rubbish and debris, including properly bagged asbestos shall be properly disposed of at the end of each working day.

1.16.5 A minimum of one (1) 4A/60BC dry-chemical extinguisher shall be maintained at each of the following locations:

1. At each corner of the work area. Where no clear corners exist, four (4) extinguishers shall be placed around the exterior wall of the work area so that they are approximately 25 percent of the total distance apart.

    a. Exception: Where the total abatement containment area is less than 1,000 square feet, two (2) 4A/60BC extinguishers shall be provided. All extinguishers shall be clearly identified with red tape.

2. Contractor shall ensure that on site personnel are aware of the location and proper use of all extinguishers and other fire/life safety equipment.

1.16.6 All existing and operable fire detection, alarm systems, connections and standpipes shall remain in place, active and unobstructed. Any alteration to this equipment must be approved by Project Owner′s Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 General: Contractor shall carefully adhere to the following:

1. **All plastic, spray-on strippable coatings and structural materials used shall be UL certified as fire retardant or non-combustible.**

2. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and brand name (where applicable).

3. Polyethylene sheeting utilized for worker decontamination and barriers shall be a minimum of 6 mil. thick.

4. Disposal bags shall be of 6-mil. polyethylene, pre-printed with labels as required by EPA regulation 40 CFR 61.152 (b) (I) (iv) or applicable CAL-OSHA requirements.

5. Stick-on labels as per EPA or CAL-OSHA requirements for disposal drums.

6. Mastic solvent: **Franmar BEAN-e-doo mastic remover**. No exceptions. .

2.1.2 Removal and Encapsulation

1. Surfactant (wetting agent) shall be a 50/50 mixture of polyoxyethylene ether and polyoxyethylene ester, or equivalent, mixed in proportion of 1 fluid ounce to 5 gallons. The encapsulating agent to be applied shall adhere to the substrate surfaces from which asbestos-containing material has been stripped.

2. The encapsulating agent shall not be flammable and should not be solvent-based or utilize a vehicle (the liquid in which the solid parts of the encapsulant are suspended) consisting of hydrocarbon.

2.1.3 Replacement:

1. Submit manufacturer's certification indicating that replacement materials (if used) do not contain asbestos.

2.2 EQUIPMENT

2.2.1 General:

1. A sufficient quantity of HEPA vacuums and/or differential pressure air filtration devices equipped with HEPA. To calculate total air flow requirement:

$$\text{Total ft3/min} \text{ ‘ } \frac{\text{Vol. of work area (in ft3)}}{\text{15 min}}$$

To calculate the number of units needed for the abatement:

$$\text{Number of units needed ‘ } \frac{\text{[total ft3/min]}}{\text{[capacity of unit in ft3/min]}}$$

2. Type AB″ powered air purifying respirators (PAPR) at minimum shall be utilized during removal of any friable asbestos containing material.

3. Air purifying respirators with dual HEPA/organic cartridges shall be utilized during floor tile and associated mastic removal.

4. Respirators shall be furnished to the abatement workers by Contractor. The respirators shall have been tested and approved by National Institute of Occupational Safety and Health (NIOSH) for use in asbestos contaminated atmospheres.

5. Full body disposable protective clothing, including head, body, and foot coverings shall be furnished to visitors in sizes adequate to accommodate movement without tearing.

6. Additional safety equipment (e.g. hard hats meeting the requirements of ANSI Standard Z89.1-1981, eye protection meeting the requirements of ANSI Standard Z87.1-1979, safety shoes meeting the requirements of ANSI Standard Z41.1-1967, disposable gloves), as necessary, shall be furnished to all workers and authorized visitors.

7. Non-skid foot wear shall be furnished to all abatement workers. Disposable clothing shall be adequately sealed to the footwear to prevent body contamination.

8. Furnish a sufficient supply of disposable mops, rags, and sponges for work area decontamination.

2.2.2 Removal:

1. A sufficient supply of scaffolds, ladders, lifts and hand tools (e.g. scrapers, wire cutters, brushes, utility knives, wire saws, etc.) Shall be furnished as needed.

2. Rubber dustpans and rubber squeegees shall be furnished for cleanup.

3. Brushes utilized for removing loose asbestos containing material shall have nylon or fiber bristles, not metal.

4. A sufficient supply of HEPA filtered vacuum systems shall be furnished during cleanup.

2.2.3 Encapsulation: Encapsulants shall be sprayed using airless spray equipment or hand pressurized sprayer.

2.2.4 Enclosure: Hand tools equipped with HEPA filtered local exhaust ventilation shall be utilized during the installation of enclosures and supports if there is any need to disturb asbestos containing materials during this process. As an alternative asbestos material may be partially removed following controlled removal procedures approved by the Project Owner's Representative.

PART 3 - EXECUTION

3.1 FLOOR TILE & MASTIC REMOVAL PROCEDURES

3.1.1 Asbestos Containing Floor Tile and Associated Mastic: The following procedure may be used as an alternate to full containment in areas where asbestos containing floor tile and associated mastic will be removed independent of friable asbestos containing materials.

3.1.2 Post warning signs meeting the specifications of CAL/OSHA General Industry Safety Order Section 520B and 29 CFR 1926.1101 at any location and approaches to a location where airborne concentration of asbestos fibers may exceed ambient background levels. Signs shall be posted at a distance sufficiently far enough away from a work area to permit a person to read the sign and take necessary protective measures to avoid exposure.

3.1.3 Install worker decontamination unit described in Article 3.5 or as agreed upon with Project Owner's Representative.

3.1.4 Asbestos handlers shall don personal protective equipment as required by Material Safety Data Sheet (MSDS) and Article 2.2 - Equipment.

3.1.5 Isolate work area by installing critical barriers or curtained doorways across all openings where airborne asbestos fiber migration may cause secondary asbestos contamination.

3.1.6 For non-mechanical (hand) removal methods, walls within the work area shall be

protected with a minimum of one (1) layer of 4 mil polyethylene sheeting extending a minimum of six (6) feet above the floor.

3.1.7 Plastic shall be sized to minimize seams. Seams shall be staggered and separated by a distance of at least six feet.

3.1.8 Wall sheeting shall be secured adequately to prevent it from falling. This may require additional support/attachment when differential pressure filtration devices are utilized.

3.1.9 Seal all floor penetrations.

3.1.10 Establish localized negative pressure differential isolation and air circulation in the work area.

3.1.11 The Contractor shall carry out all asbestos floor tile removal and associated mastic removal in a manner that will minimize pulverizing, breaking or abrading of tiles, adhesive or felt backing (if present).

3.1.12 The Contractor shall wet floor with amended water or removal encapsulant so that entire surface is wet. Do not allow amended water or removal encapsulant to puddle or run off to other areas. If a removal encapsulant is used, use in strict accordance with the manufacturers instructions. Keep floor continuously wet through removal operations.

3.1.13 Manually remove tile/flooring in full pieces if possible. Pry tiles/flooring from substrate with hand tools. Do no use electric or propane-powered chipping equipment. If visible dust is produced at any time, immediately stop work and mist area with amended water.

3.1.14 Clean concrete floor of all adhesive residue by wet mopping with “BEAN-e-doo”, no-odor mastic remover. (No exceptions without prior approval.) When removing mastic, remove all dimensional material (material capable of being lifted with a small pocketknife).

3.1.15 After confirming compatibility with proposed new flooring materials, encapsulate cleaned floor with one coat of bridging type encapsulant. Clean the floor of all standing water and/or encapsulant prior to clearance monitoring.

3.1.16 Dispose of all asbestos containing/contaminated waste in accordance with Article 3.6 - Disposal Procedures.

3.2 WALLS AND CEILINGS – The following will apply wherever wallboard/joint compound systems (not wall plaster) are encountered during demolition.

3.2.1 Class 1 Abatement as described by federal OSHA 1926.1101.

3.2.2 Post warning signs meeting the specifications of CAL/OSHA General Industry Safety Order Section 520B and 29 CFR 1926.1101 at any location and approaches to a location where airborne concentration of asbestos fibers may exceed ambient background levels. Signs shall be posted at a distance far enough away from a work area to permit a person to read the sign and take necessary protective measures to avoid exposure.

3.2.3 Install worker decontamination unit described in Article 3.5 or as agreed upon with Project Owner's Representative.

3.2.4 Asbestos handlers shall don personal protective equipment as required by Material Safety Data Sheet (MSDS) and Article 2.2 - Equipment.

3.2.5 Isolate work area by installing critical barriers or curtained doorways across all openings where airborne asbestos fiber migration may cause secondary asbestos contamination.

3.2.6 Walls within the work area that are specified to remain shall be protected with a minimum of one (1) layer of 4 mil polyethylene sheeting floor to ceiling, and one layer of 6-mil poly sheeting, also extending floor to ceiling. Install floor sheeting to entirely cover floor, in sufficient layers and of sufficient size and thickness to prevent water or other damage to underlying surfaces. Bring floor poly up walls behind wall sheeting a minimum of 6" at all locations.

3.2.7 Plastic shall be sized to minimize seams. Seams shall be staggered and separated by a distance of at least six feet.

3.2.8 Wall sheeting shall be secured adequately to prevent it from falling. This may require additional support/attachment when differential pressure filtration devices are utilized.

3.2.9 Seal all floor penetrations prior to installation of floor sheeting.

3.2.10 Establish localized negative pressure differential isolation and air circulation in the work area.

3.2.11 Remove walls and ceilings using appropriate wet methods and respiratory protection. Maintain 0.02 in. pressure differential throughout.

3.2.12 Saturate materials with amended water to the extent possible; this may require a soaking period. Remove material to wood substrate. Protect electrical wiring and

conduit in place. Do not allow amended water to puddle or run off to other areas. Keep floor clean during removal. Bag all waste immediately.

3.2.13 Do not use electric or propane-powered chipping equipment without prior approval. If visible dust is produced at any time, immediately stop work and mist area with amended water.

3.2.14 Clean remaining surfaces with wet wiping techniques. Following inspection and approval, apply a light mist of encapsulant to cleaned surfaces.

3.2.15 Prior to final cleaning and encapsulation, the innermost layer of poly sheeting (floors and walls) may be removed. Inspect remaining layers for damage.

3.2.16 Dispose of all asbestos containing/contaminated material as friable asbestos waste.

3.3 ROOFING PENETRATION MASTIC

3.3.1 Min. Resp. Protection: 1/2 face. Organic filters as necessary. Provide personal monitoring and otherwise comply with CAL/OSHA requirements during removal.

3.3.2 Preparation:

- Remove all objects not fastened to existing structure from work area prior to commencement of removal activities.

- Cover all stationary objects and surfaces not intended for removal or stripping of asbestos containing roofing material. Cover and render air-tight all air passageways, such as doors, windows, skylights, air circulating units, vents and registers in the work area, with plastic sheeting, or hard wood barriers with studded support.

- Confine all debris associated with roofing removal activities and prevent dispersal into the facility structure.

- Utilize plastic sheeting catch devices inside attic spaces and/or secured at the structure foundation to contain incidental falling roofing debris.

3.3.3 Removal and Handling:

- When cleaning roof surface do not use tools or device which would cause debris to become airborne i.e., brooms, blowers, high pressure rinse, etc.

- Adequately wet with amended water the area(s) to be worked prior to the

initiation of the removal process. Amended water will be used continually throughout the work period to ensure that any asbestos-containing material, exposed by manual force of saw cutting, is wet and remains wet until final disposal.

- The wetting solution shall be applied with airless spray or low pressure spray equipment to avoid displacement and dispersal of asbestos fibers.

- All efforts shall be made to manually loosen and remove the roofing material limiting breaking and chipping.

- Roofing material, excluding transite roofing tiles, may be cut into smaller, manageable sizes depending upon more of transport and method of disposal.

- A penetrating encapsulant shall be used at all times during the cutting process to prevent asbestos fiber release.

- Encapsulate all broken corners and edges of Class 1 non-friable asbestos-containing roofing materials. Containerize all debris in 2 (minimum) 6-mil (minimum) disposal bags, individually sealed with standard grey duct tape in "gooseneck" fashion. Clearly label each bag with Generator information and asbestos warning labels prior to placing in chute or asbestos dumpster.

- Carefully lower bagged asbestos-containing material that has been removed in unit(s) or section(s) to the ground or a lower floor without dropping, throwing, sliding, or otherwise damaging the asbestos-containing material, or transport the asbestos-containing material to the ground or a lower floor via leak-tight chute(s) or container(s) when removal occurs more than 50 feet above the ground level and where not removed in unit(s) or in section(s).

- Roofing material must be immediately sealed into a leak tight container

- Immediately following removal of roofing materials from deck, apply a light mist of amended water to entire exposed surface.

- Remaining wetted asbestos-containing waste materials, including plastic or wooded barriers, 2 sealed plastic bags, 6 mil. thickness minimum, labeled as noted above.

- Maintain on-site storage of encapsulated materials or leak-tight containers within an enclosed storage area prior to transportation. Leak-tight containers and encapsulated material shall not be accessible to the general public and shall be locked when not in use.

3.3.4 Disposal: Where materials have remained non-friable during removal, dispose of as Class II non-friable asbestos-containing waste at Azusa Land Reclamation, Azusa, California.

3.3.5 Comments: Remove all dimensional material (material capable of being lifted with a small pocket knife).

3.4 CLEAN-UP PROCEDURES

3.4.1 Remove and containerize all visible accumulations of asbestos-containing material and asbestos contaminated debris using rubber dust pans and rubber squeegees to move material. Do not use metal shovels to pick up or move accumulated waste. Asbestos containing/contaminated waste shall be placed in disposal bags. Disposal bags shall be doubled 6-mil polyethylene, pre-printed with labels as required by EPA regulation 40 CFR 61.152 (b) (I) (iv), Cal-OSHA Title 8 CCR Section 5208, and if applicable Title 22 CCR Section 66504.

3.4.2. Wet clean all surfaces in the work area using rags, mops and sponges as appropriate.

3.4.3. Remove the cleaned layer of plastic sheeting from walls. Windows, doors, HVAC system vents and all other openings shall remain sealed. The differential pressure air filtration devices shall remain in continuous operation. Decontamination enclosure systems shall remain in place and be utilized.

3.4.4 After cleaning the work area, provide a period of time to allow fibers to settle, then perform additional HEPA vacuuming and wet cleaning of all objects and surfaces in the work area.

3.4.5 Remove all containerized waste from the work area and waste container pass-out airlock.

3.4.6 Decontaminate all tools and equipment and remove at the appropriate time in the cleaning sequence.

3.4.7 Project Owner's Representative will inspect the work area for visible residue. If any accumulation of residue is observed, it will be assumed to be asbestos and a second settling period and cleaning cycle repeated at no additional cost to Owner.

3.4.8 Following the satisfactory completion of clearance air monitoring, the remaining barriers may be removed and prepared for proper disposal. A final visual inspection by Project Owner's Representative will be performed. Unsatisfactory conditions may require additional cleaning and air monitoring at no additional cost to Owner.

3.5 WORKER DECONTAMINATION SYSTEMS

3.5.1 Worker decontamination enclosure systems shall be provided at all locations where workers will enter or exit the work area to remove friable or interior asbestos materials. As a minimum, install one system at each location where friable or interior materials will be removed.

3.5.2 Worker decontamination enclosure systems constructed at the project site shall utilize opaque 6-mil. Polyethylene sheeting or other approved materials for privacy.

3.5.3 The personnel decontamination unity shall not be located inside the work area unless otherwise authorized by Consultant.

3.6 DISPOSAL PROCEDURES

3.6.1 All asbestos containing ceiling materials and other asbestos-containing or contaminated debris which has become friable (able to be crushed or pulverized with hand pressure) shall be disposed of as friable asbestos-containing waste. All flooring, ceiling tile mastic and associated debris still in a non-friable state shall be disposed of as Class I nonfriable asbestos waste. All asbestos waste shall be placed and stored in sealed, locked and labeled containers and transported to an appropriate landfill as approved by the Owner for disposal.

3.6.2 All friable and non-friable ACM/PACM shall be transported by a certified hazardous waste hauler as approved by Owner (see submittal section).

3.6.3 **All manifests (hazardous and non-hazardous) must be signed by an Owner representative. Provide at least 24 hours notice prior to anticipated waste pick-up and transportation.**

3.6.4. All asbestos waste manifests or non-hazardous material data forms shall be delivered to the Consultant. Record keeping format shall be delivered to the Consultant. Record keeping format shall utilize a chain of custody form which includes the names and addresses of the Generator (Owner), Contractor, Waste Hauler, pickup site, disposal site, estimated quantity of asbestos waste and the type of containers used. The form shall be signed by the Generator, Contractor, waste hauler and the disposal site operator as the responsibility for the material changes hands.

3.7 REESTABLISHMENT OF THE WORK AREA

3.7.1 Reestablishment of the work area shall only occur following the completion of cleanup procedures and after clearance air monitoring has been performed and documented to the satisfaction of Consultant.

3.7.2 Contractor and Consultant shall visually inspect the work area for any remaining

visible residue. Evidence of contamination will necessitate additional cleaning and air monitoring at no additional cost to Owner.

3.7.3 Upon approval by Consultant, the Contractor shall remove remaining poly sheeting, critical barriers, and decontamination unit.

3.8 ALTERNATIVE PROCEDURES

3.8.1 If specified procedures cannot be utilized, a request shall be made in writing to Consultant providing details of the problem encountered and recommended alternatives.

3.8.2 Alternative procedures shall provide equivalent or greater protection than procedures that are replaced.

3.8.3 Any alternative procedure must be approved in writing by the Project Owner's Representative prior to the implementation of the procedure.

3.9 AIR MONITORING

3.9.1 Air monitoring will be carried out by the Project Owner's Representative on behalf of the Owner to verify that the building beyond the contamination area and the outside environment, remains uncontaminated.

3.9.2 Background Air Monitoring: If requested by abatement contractor, the Project Owner's Representative will conduct pre-abatement air monitoring to determine ambient fiber levels prior to abatement. The analytical method shall be Phase Contrast Microscopy (PCM) using the NIOSH 7400 Method.

3.9.3 Area Air Monitoring: The Project Owner's Representative will conduct in-progress air monitoring daily to determine area fiber levels within the confines of the work area.

1. Environmental Air Sampling: On each shift, environmental air samples are taken and analyzed to indicate fiber migration from the containment area to the environment. Should any environmental sample exceed the base line of 0.01 f/cc, or established background concentrations, as determined by PCM analysis, all work will be immediately halted except for corrective work. The Project Owner's Representative shall inspect and determine the source of the high fiber count and notify the contractor with directions for the appropriate corrective action.

3.9.4 Clearance Air Monitoring:

1. Following the completion of clean-up operations, notify Project Owner′s Representative that work areas are ready for clearance air monitoring.

2. Project Owner′s Representative will then sample the air in the work area for airborne fiber concentrations.

3. Phase Contrast Microscopy (PCM): In each homogeneous work area after completion of all cleaning work, a minimum of 2 samples will be taken and analyzed by NIOSH 7400 Method.

   a. Release Criteria: Decontamination of the work site is complete when each sample analyzed reveals airborne asbestos fiber concentrations are at or below 0.01 f/cc, or established background concentrations.

   b. If these conditions are not met then the decontamination is incomplete and the cleaning procedures noted in 3.4 above shall be repeated. The area shall be retested at no additional cost to Owner until satisfactory levels are obtained.

3.10 OSHA PERSONNEL AIR MONITORING

3.10.1 Air monitoring required by OSHA is work of the contractor. The contractor is responsible for providing daily OSHA compliance monitoring as per 29 CFR 1926.1101.

1. At minimum, Contractor shall conduct representative (25% of crew) breathing zone personal air monitoring of its employees twice each shift and repeated daily or until a negative exposure assessment″, as derived in accordance with 1926.1101 (f) (2)(iii), can be established.

2. Monitoring shall be conducted by a qualified air professional experienced and knowledgeable about the methods of air monitoring and in accordance with CFR 1926.1101.

3. Monitoring results and appropriate laboratory analysis work shall be submitted to Project Owner′s Representative within twenty-four (24) hours of the monitoring work.

Lead-Based Ceramic Tile Abatement and Cleanup Guidelines

These guidelines were prepared and designed by Ellis Environmental Management for the express and sole use of the City of Torrance for the following project:

3624 West Artesia Boulevard, Torrance, CA

Unauthorized duplication or distribution is prohibited.

A. Scope:

1. Lead-related work under this contract includes the following. Quantities shown are not for bidding purposes; field verify all dimensions.

    a. Senior Center, Restroom walls and floors 50 s.f. wall, 10 s.f. floor.
    b. Rec Center east kitchen counter. 50 s.f.
    c. Rec Center west kitchen counters. 150 s.f.
    d. Teen Center, restroom walls. 200 s.f.

2. The contractor shall provide all labor, materials, tools, equipment, services, testing supervision and incidentals necessary to perform lead-related work under this contract and in accordance with the following sections. Following removal, an independent testing agency will perform clearance testing in accordance with the procedures outlined below.

B. General Requirements:

All workers who perform lead-related work shall be currently certified by the Lead Accreditation and Certification Unit, California Department of Health Services.

C. Insurance:

See Owner's General Conditions.

D. Submittals:

On April 22, 2008, EPA issued the Renovation, Repair and Painting Rule, requiring that firms performing renovation, repair, and painting projects that disturb lead-

based paint in pre-1978 homes, child care facilities and schools be certified by EPA and that they use certified renovators who are trained by EPA-approved training providers to follow lead-safe work practices.

Recognizing that (a) worker requirements under California Title 8 Section 1532 .1 are more stringent than the EPA's RRP program, and (b) that engineering controls, worker protection and training requirements for asbestos and lead abatement projects are similar (and often overlap), the following minimum licensure, training and record-keeping requirements will be required for this project:

1. Proof of registration as a licensed asbestos removal contractor by the Department of Industrial Relations. (CSLB #).

2. Proof of contractor and supervisor certification under the EPA's RRP program.

3. For all workers engaged in lead abatement activities, Contractor shall be able to provide blood lead level (BLL) records over the past six months, and/or extending backward to that employee's hire date.

4. Statement that a current written respiratory protection plan is in place and available for review.

5. For all workers assigned to the project, a copy of their (a) current fit test for PAPR and APR respirators, (b) medical clearance to wear a respirator, and (c) current certificate of lead worker training complying with California lead worker training requirements.

6. Notification to CDPH Form 8551, 5 days prior to work.

E. Schedule:

Work shall be commenced on the date stipulated in the Client's Notice to Proceed.

F. Removal Sections

Section 1.0 <u>Protection of Occupants</u>

1.1 Insure that the interior of the work area remains unoccupied throughout the lead abatement project. Post appropriate notices at all containment entrances. Install poly at all windows, doors, supply ducts and other potential air entries to the building interior. Notify Ellis and call for inspection of engineering controls prior to beginning removal. Do not allow re-occupancy until after successful clearance sampling has been documented inside the structure. All wipe samples collected

inside the work area must be less than 40 ug/s.f. prior to removal of engineering controls.

Section 2.0 Site Preparation

2.1 Post flagging or rope around the work area with signs reading, "CAUTION. LEAD HAZARD. DO NOT ENTER THIS WORK AREA UNLESS AUTHORIZED." At the entrance to the work area, post the phone numbers of the designated emergency coordinator (usually the Client's representative), a copy of all required notifications, and the location of emergency equipment such as fire extinguishers.

2.2 Correct any conditions that may impede work. Remove or protect all items which must remain in the work area. Identify sources for water and electrical power. Notify Client's representative if power sources within the building will not be sufficient.

2.3 Install fire-resistant polyethylene sheeting at all work area penetrations. Install regulated area with caution tape and hazardous warning tape. Place 2-stage (min) decontamination unit at work area entrance.

2.4 [reserved]

2.5 Seal any floor penetrations and/or seams where water or debris may enter into drains.

2.6 Install a cleaning chamber for workers, to include a walk off pan, water, towels, etc. Dispose of contaminated work suits and other materials as lead waste. Arrange cleaning chamber and visual barriers to prohibit workers being seen in public wearing respirators or other personal protective equipment.

2.7 Sandblasting or other mechanical removal methods will require prior written authorization by Owner or Owner's representative. Where approved, install full containment consisting of 2 layers of poly sheeting on non-abated surfaces, a 3-stage decon unit, negative air enclosure, etc. Call for inspection. Provide a means of wetting and misting the work area in areas where sandblasting is required. Generally, this will require an electric airless sprayer located in the work area with 25-50' reinforced hoses and a mister gun. Submit any alternative for approval.

2.8 Protect adjacent surfaces not scheduled for stabilization with fire-resistant polyethylene sheeting or other temporary cover.

2.9 Provide sufficient drums to (a) store generated ceramic tile debris and blasting media, and (b) store filtered water prior to testing and disposal. Do not allow protective clothing and respirators to be worn outside of the regulated area.

2.10 [reserved]

Section 3.0 Waste Storage and Transport

3.1 Coordinate with the Client for safe storage of waste on-site in **sealed drums** prior to disposal. Provide a staged filtering system sufficient to bring all water generated during stabilization into state and local wastewater compliance (5 ppm). Provide certified test results prior to disposal. Store water on site in drums or approved tank until results are received.

3.2 Contractor will need to contract for the transport of generated hazardous (dry) waste. Contractor is responsible to restrict access to storage areas by use of locks and fencing as necessary. Provide and install appropriate labels on the exterior of all waste drums. Separate hazardous from non-hazardous waste (if any).

3.3 Do not mix hazardous and non-hazardous waste. Do not mix personal protective equipment (e.g. paper suits) with ceramic tile. Do not mix several different hazardous wastes. Avoid spills or leaks, since cleanup materials and tools must then also be considered hazardous.

3.4 When containers, such as drums, must be stored outside an approved dumpster, mark each container clearly; include the contents and the date the waste was generated. Such temporary storage shall be as a last resort, in a positively secured area, and only with approval of the Client.

Section 4.0 Maintenance of Regulated Area

4.1 Maintain the integrity of all poly sheeting, signs and visual barriers throughout the work period, regardless of work activities. Inspect the work area at least twice daily. Replace damaged materials immediately.

Section 5.0 Control of the Work Area

5.1 At all times, control access to sandblasting work area only to the Contractor's work force, authorized Client's representatives and authorized federal, state and local authorities. For each person entering the work area, require and record identification and sign-in prior to entrance.

5.2 Avoid dispersion of dust by requiring disposable foot booties within the work

area. Maintain an ongoing cleaning program at all times work is in progress, to include (1) immediate bagging of all debris (2) maintenance of the worker decontamination system, and (3) wet-wiping of interior containment barriers. Provide for regular cleaning of all tools, equipment, and worker protection gear.

Section 6.0 Encapsulation

6.1 Encapsulate abated, stripped and/or stabilized surfaces with an approved encapsulant. Check with owner/ general contractor to insure compatibility with subsequent surface coatings.

Section 7.0 Chemical Removal Methods

7.0.1 [reserved]
7.0.2 [reserved]
7.0.3 Provide MSD information for any chemicals employed. Contractor assumes full responsibility for using the product according to manufacturer's recommendations and warranty.

Section 8.0 Mechanical and Water Removal Methods

8.1 Do not use abrasive disk sanders as a removal method; a HEPA sander may be used with prior approval. The potential for production of lead dust increases when the sanding disk is wider than the surface being abated. For all areas where abrasive sanding is required, provide HEPA ventilation at the source of removal.

8.2 [reserved]

8.3 [reserved]

8.4 When removing ceramic tile from substrate, take care not to damage the substrate during scraping or sanding operations.

8.5 Sand, feather and/or smooth stabilized surfaces to allow for installation of new materials as required. Coordinate required finished surface with general contractor.

8.6 Protect adjacent surfaces from damage during work.

Section 9.0 Daily Cleanup

9.1 Sweep up and collect small debris only after the affected surfaces have been sprayed with a fine mist of water, to keep surface dust from becoming airborne

and potentially contaminating other areas of the property and abatement workers. Dry sweeping is prohibited. Drum as lead-contaminated waste.

Section 10.0 Final Cleanup

10.1 At the conclusion of the abatement process, clean all accessible surfaces in the work area with a HEPA-filtered vacuum and/or wet wiping techniques. Start at the highest accessible point and work down. Provide sufficient time within the abatement process to perform this cleanup step thoroughly.

10.2 Use detergent as part of the cleanup process only with prior approval and only in conjunction with HEPA vacuuming techniques. Do not use high-phosphate detergents. Follow manufacturer's directions.

10.3 Supply an adequate supply of wringer buckets, mops, squeegee sponge mops, variously sized hand sponges, and rags.

10.4 Change the cleaning mixture frequently.

10.5 Following successful clearance sampling (see below), plastic sheeting covering floors and walls shall be sprayed, lifted and HEPA vacuumed prior to removal. Carefully fold sheeting from corners and ends toward the middle and place into 6-mil bags; seal. Store in designated storage areas.

Section 11.0 Visual Inspections

11.1 Call for a visual inspection of all affected areas following the preliminary cleanup. If the results of the visual inspection are unsatisfactory, re-clean affected surfaces in accordance with the inspector's instructions until satisfactory results are achieved.

Section 12.0 Clearance Testing

12.1 Following successful initial and final visual inspections, surface dust sampling will be conducted by the Client's representative, using EPA approved wipes moistened with a non-alcohol wetting agent. Samples will be collected from non-lead surfaces adjacent to abated surfaces both inside and outside the work area, and/or as deemed appropriate by Owner's representative. Results shall be less than 40 ug/sf. If >40 ug/sf, repeat cleaning process and call for new inspection until passing results are achieved.

Section 13.0 Waste Evaluation

13.1 Contractor, at his/her option, may perform a small test removal as the initial step of the abatement process. Request profiling by Owner's representative. Evaluate the waste from this test removal to ensure effective planning for proper waste storage and disposal. For bidding purposes, assume drummed ceramic wall and floor tile will be transported and disposed of as RCRA waste.

13.2 Avoid mixing hazardous and non-hazardous wastes. Separate each waste category into one of the following:

- Lead ceramic tile.
- Non-lead containing debris (decontaminated plastic sheeting, tape, etc.)
- Other construction waste.

Section 14.0 Generator Status/EPA Generator Number

14.1 Coordinate procurement of appropriate EPA generator numbers with the Client's representative after performing an accurate profile and categorization of generated waste.

Section 15.0 Worker Protection

15.1 All workers shall have successfully completed training in Lead Abatement Health and Safety Training. The Contractor shall additionally adhere to all worker training requirements listed in 29CFR 1532.1.

15.2 All workers shall be provided with baseline and post stabilization blood lead level screens determined by the whole blood lead method utilizing Vena-Puncture technique. In addition, the Contractor shall have a physical performed on each employee. Workers shall be removed from the work area if his or her blood lead level is 50 ug/dl or greater. If requested to do so, submit results of medical surveillance to the Client's representative prior to final payment.

15.3 Provide approved respirators for all workers, foremen, superintendents and authorized visitors. Provide a sufficient number of replacement filters.

15.4 Refer to CFR29 1532.1 (e) Table 1 - Respiratory Protection for Lead Aerosols. Provide minimum respiratory protection as indicated.

15.5 Workers shall wear full body disposable suits with hoods and booties. A TYVEK or similar type of suit may be worn. Suits will be worn inside the work area after the area passes pre-stabilization inspection and shall remain in use until the area passes final clearance.

15.6 Goggles with side shields will be worn when working with a material that may splash or fragment, or if protective eye wear is specified on an MSDS sheet.

15.7 Additional respiratory protection by supplemental filters, such as organic vapor cartridges, may be required when handling some products. Consult the appropriate MSDS sheet and obtain proper filters as necessary.

15.8 Do not eat, drink or smoke in the work area.

15.9 Ensure that each worker thoroughly washes and decontaminates prior to leaving the work area. Provide wash facilities to include running potable water, towels, and a HEPA vacuum. Upon leaving the work area, each worker will remove and dispose of work suit, wash and dry face and hands, and vacuum.

15.10 Don disposable clothing prior to entering work area. Provide a clean room to put on suits and other personal protective equipment. Use disposable clothing only once.

15.11 Provide portable restrooms at a location designated by Client. Clean daily.

PART H
GEOTECHINICAL REPORT
Well No. 9

Converse Consultants

Geotechnical Engineering
Environmental & Groundwater Science
Inspection & Testing Services

GEOTECHNICAL STUDY REPORT
Well No. 9 Equipment Building
Mc Master Park Water Facility
17537 Yukon Avenue
Torrance, California

November 4, 2008

Converse Project No. 07-31-364-01

Prepared for:

Boyle Engineering Corporation
1501 Quail Street
Newport Beach, California

Converse Consultants

Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

November 4, 2008

Mr. Russ Hulse
Boyle Engineering Corporation
1501 Quail Street
Newport Beach, CA 92660

Subject: **GEOTECHNICAL STUDY REPORT**
Well No. 9 Equipment Building
Mc Master Park Water Facility
17537 Yukon Avenue
Torrance, California
Converse Project No. 07-31-364-01

Dear Mr. Hulse:

Enclosed is the report of the geotechnical study performed by Converse Consultants (Converse) at the site for the proposed Well No. 9 Equipment Building in the City of Torrance, California. Our services were performed in accordance to our December 18, 2007 proposal and our Agreement with Subconsultant for Professional Services, dated March 21, 2008.

Based on our field investigation, laboratory testing, geologic evaluation and geotechnical analysis, the site is suitable from a geotechnical standpoint for the proposed Well No. 9 Equipment Building, provided our conclusions and recommendations are implemented during design and construction.

We appreciate the opportunity to be of service to the Boyle Engineering. If you should have any questions, please do not hesitate to contact us at (626) 930-1200.

CONVERSE CONSULTANTS

William Chu, P.E., G. E.
Sr. Vice President/ Principal Engineer

Dist: 5/Addressee

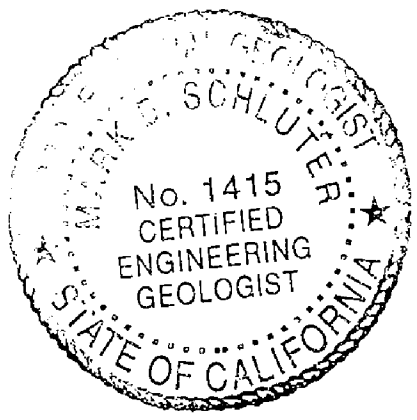
MBS/WHC/dlr

Printed on Recycled Paper

222 East Huntington Drive, Suite 211, Monrovia, California 91016-3500
Telephone: (626) 930-1200 ♦ Facsimile: (626) 930-1212 ♦ e-mail: converse@converseconsultants.com

PROFESSIONAL CERTIFICATION

This report for the proposed Well No. 9 Equipment Building in the City of Torrance, California has been prepared by the staff of Converse under the professional supervision of the individuals whose seals and signatures appear hereon. The findings, recommendations, specifications, or professional opinions contained in this report were prepared in accordance with generally accepted professional engineering and engineering geologic principles and practice in this area of Southern California. There is no warranty, either expressed or implied.



Mark B. Schluter, P.G., C.E.G.
Senior Engineering Geologist

William H. Chu, P.E., G.E.
Principal Engineer

EXECUTIVE SUMMARY

The following is a summary of our geotechnical investigation, conclusions, and recommendations, as presented in the body of this report. Please refer to the appropriate sections of the report for complete conclusions and recommendations. In the event of a conflict between this summary and the report, or an omission in the summary, the report shall prevail.

- The proposed Well No. 9 Equipment Building is located in the City of Torrance, California. The site is located along the east side of Mc Master Park and is bounded by existing condominiums to the north, Yukon Avenue to the east, a park parking lot and access road to the south and an existing steel water reservoir to the southwest.
- Based on the information provided to our office, it is understood that the proposed project includes construction of a one story equipment building and related facilities for proposed Well No. 9.
- Our scope of work included field exploration, laboratory testing, engineering analysis, and preparation of this report.
- The site for the equipment building is currently a grassed landscape area with trees along the north side of an existing park access road and parking lot area.
- Field exploration included drilling one (1) soil boring within the footprint of the proposed building up to a maximum depth of 51.5 feet below existing ground surface.
- Undocumented fill to a depth of two (2) feet was encountered in the vicinity of the equipment building. The undocumented fill soils consist of sandy silt. Native soil deposits, generally consist of clay, sandy silt, silty sand, sand and sandy clay, were encountered in our boring.
- Groundwater was encountered in our boring at a depth of 33 feet below existing ground surface during drilling. Based on the Open File Report 98-26 for the Torrance Quadrangle, historical high groundwater level in the vicinity of the project is reported to be within 20 to 30 feet of the existing ground surface.
- Laboratory tests were conducted on representative soil samples for the purpose of classification and evaluation of the physical properties and engineering characteristics. These tests included grain-size distribution, percent finer than the No. 200 sieve, maximum dry density and optimum moisture, Atterberg limits, direct shear test, and soil corrosivity.
- Based on the consolidation test, the native silty sandy soils have 1.0 percent collapse and it is considered as negligible collapse potential.
- There are no active faults projecting toward or crossing the site. The site is not situated within a currently designated State of California Earthquake Fault Zone.

The site is, however, located in a seismically active area of southern California. Ground shaking from earthquakes associated with nearby and distant faults may occur during the lifetime of the project.

- Based on the results of our borings, and laboratory testing, and in accordance with the California Building Code (2007 CBC, Table 1613A.5.2) the site should be considered as Site Class D. The Site Coefficients F_a, F_v, defined from 2007 CBC, Tables 1613A.5.3 (1), and 1613A.5.3(2), as following:

  F_a=1.0 F_v=1.5

  The mapped maximum considered earthquake spectral response acceleration at short period, S_s, and at 1-second period, S_1, for a site Class B is as following:

  S_s=1.572 S_1= 0.637

  The mapped maximum considered earthquake spectral response acceleration at short period, S_s, and at 1-second period, S_1, for the subject Class D site is as following:

  $$S_{MS} = F_a S_s = 1.572$$
  $$S_{M1} = F_v S_1 = 0.955$$

  The 5 percent damped design spectral response acceleration at short period, S_{DS}, and at 1-second period, S_{D1}, for the subject site is as following:

  $$S_{DS} = 2/3\ S_{MS} = 1.048$$
  $$S_{D1} = 2/3\ S_{M1} = 0.637$$

- According to the State of California Seismic Hazard Zones Map (March, 1999 Torrance Quadrangle), published by California Division of Mines and Geology, the subject site is not located within an area considered to be liquefiable.

- Converse performed a site-specific liquefaction analyses using field and laboratory data. Our analyses indicate that a layer of sandy soils encountered in the boring at depths of 35 and 44 feet below ground surface in the vicinity of control building have a low liquefiable potential in the event of a major earthquake. If this occurs, the control building may undergo settlement of 0.88-inches with a differential settlement of 0.44 to 0.58-inches.

- Site soils should be excavatable with conventional heavy-duty earth-moving equipment. Excavated site soils, free of organic matter, are suitable for placement as compacted fill after proper processing. Such processing may include moisture conditioning and mixing.

- Shallow conventional footings founded on a layer of two (2) feet of compacted fill underneath all the footings or a mat foundation founded on a layer of two (2) feet of compacted fill may be used to support the equipment building.

- Compacted fill should extend at least five (5) feet beyond the edges of exterior footings where possible. The actual depth of removal should be determined based on observation made during grading. Some overexcavation may be required to remove unsuitable surficial loose soils, tree stumps, tree roots and to prepare a suitable compacted structural fill mat to receive new fill and/or structures, including buildings, slabs-on-grade, and the pavement areas.

- The bottom of the excavations should be scarified to a depth of at least six (6) inches. The scarified soils should be brought to near-optimum moisture content and compacted to at least 90 percent of the laboratory maximum dry density to produce a firm and unyielding surface. Fill should then be placed on the compacted natural soil in loose lifts of eight (8) inches or less; moisture conditioned to near-optimum moisture content, and compacted to at least 90 percent relative compaction.

- Site soils have moderate levels of soluble sulfate. Type II cement is recommended for all foundation and slabs in contact with site soils. The measured value of the minimum electrical resistivity of the site soils at saturated water content was found to be 450 ohm-cm. Site soils at this electrical resistivity could be categorized as severely corrosive.

- Mat foundations may be designed for a net bearing pressure of 1,500 psf for combined dead plus live loads with one-third increase for all loads including wind or seismic and the mat foundation shall be supported on two (2) feet of compacted fill.

- Shallow footings, founded on a layer of two (2) feet of compacted fill, may be designed for an allowable net bearing capacity of 2,000 pounds per square foot (psf) and this value may be increased by 250 psf for each additional foot of depth. The maximum allowable bearing capacity should be limited to 3,000 psf. This value may be increased by 33 percent for transient wind and seismic forces. Footings should be at least 18 inches wide and embedded at least 18 inches below the lowest adjacent final soil grade.

- Resistance to lateral loads may be provided by the passive earth pressures acting behind the footings and by the frictional resistance at the base. An allowable value

of the passive earth pressure resistance of 275 psf per foot of footing depth may be used for design. The passive resistance should be limited to a maximum of 2,000 psf. An ultimate value of the frictional coefficient of 0.4 may be used to evaluate base frictional forces between soil and concrete.

- The results of our investigation indicate that the site is suitable from a geotechnical standpoint for the proposed development provided the recommendations contained in this report are incorporated into the design and construction of the project. A site grading plan was not available at the time this report was prepared. The site grading and design recommendations provided in this report should be considered preliminary and are based on our understanding of the project and experience with similar projects in the area. Final grading and building plans should be reviewed for compliance with our recommendations. If necessary, an updated report should be prepared.

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1.0 INTRODUCTION

This report contains the findings of our geotechnical study performed at the site for the proposed equipment building and related facilities for proposed Well No. 9 in the City of Torrance, California. The purpose of this study was to evaluate the nature and pertinent engineering properties of the subsurface materials at the site and to provide recommendations regarding geotechnical parameters for the design of the proposed project.

The project site is located along the east side of Mc Master Park about 150 feet west of Yukon Avenue as shown on Drawing No. 1, *Site Location Map*. The project site is located just northwest of an existing Torrance Municipal Water Department steel reservoir tank and pumping facility. The proposed new Well No. 9 and the equipment building are located within a grassed landscape area along the north side of an existing park access road and parking lot.

2.0 PROJECT DESCRIPTION

Based on the site plan, it is our understanding that the project consists of constructing a single story equipment building for the proposed Well No. 9 and related site improvements.

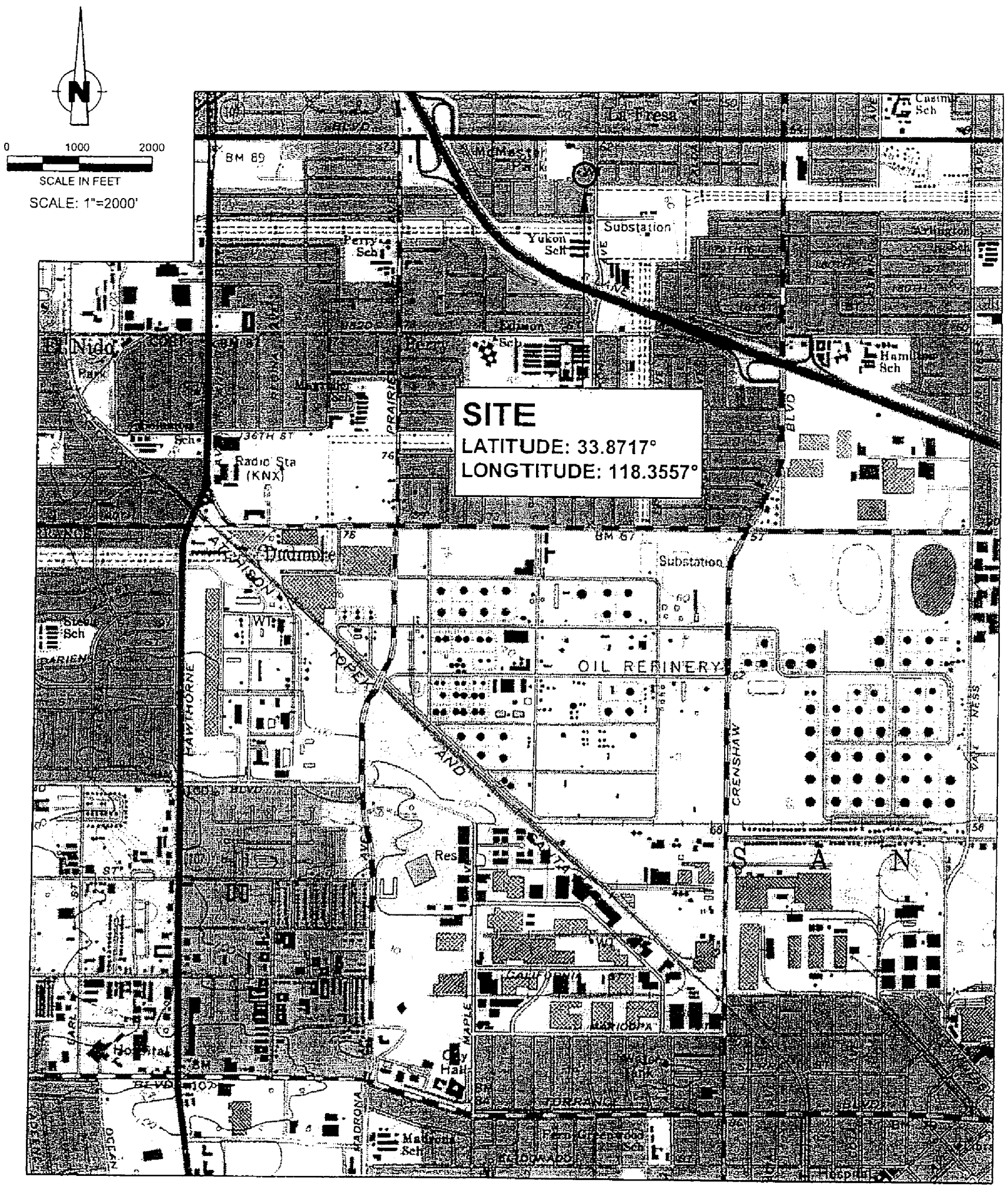
3.0 SCOPE OF WORK

Converse performed one (1) exploratory boring for the investigation at the subject site on August 20, 2008 to evaluate the soil conditions of the project site.

Our scope of work consisted of the tasks described in the following subsections.

3.1 Subsurface Exploration

One (1) test boring (BH-1) was drilled on the site on August 20, 2008 at the location shown on Drawing No. 2, *Approximate Boring Location Plan*. The boring was drilled within the footprint of the proposed equipment building area. The boring was drilled with an 8-inch diameter hollow-stem auger drill rig to 51.5 feet below the existing grade. Logs of the subsurface conditions as encountered in the test boring were recorded at the time of drilling and are presented on the boring logs included in Appendix A, *Field Exploration*. Relatively undisturbed ring samples and bulk samples of subsurface materials were obtained at frequent intervals below the ground surface and were taken to the laboratory for observation and testing. A brief description of the drilling and sampling operation is included in Appendix A, *Field Exploration.*



REFERENCE: USGS MAP
TORRANCE QUADRANGLE 1981

SITE LOCATION MAP

PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-17537 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No.
07-31-364-01

Drawing No.
1

Converse Consultants

PARK ACCESS ROAD

EXISTING CONDOMINIUMS

VAULT

AC

BLOCK WALL

(TYP)

CONC

GRASS

CONC WALK

20'

18'

10'

BH-1

PROPOSED WELL NO.9

PARKING LOT

RESERVOIR

DRIVEWAY

YUKON AVENUE

DIRT

GRASS

EXPLANATION

BH-1 APPROXIMATE LOCATION OF BORING

0 20 40

APPROXIMATE SCALE IN FEET

APPROXIMATE BORING LOCATION PLAN

Converse Consultants

PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-17537 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No. 07-31-364-01

Drawing No. 2

3.2 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in classification and to evaluate relevant engineering properties. The tests performed included:

- Visual-Manual Classification (ASTM Standard D2488)
- Grain Size Distribution Analysis (ASTM Standard D422)
- Percent Passing Sieve No. 200 (ASTM Standard D1140)
- Maximum Dry Density and Optimum Moisture Content Relationship (ASTM Standard D1557)
- Atterberg Limits (ASTM Standard D4318-00)
- Direct Shear (ASTM Standard D3080)
- Consolidation (ASTM Standard D2435)
- Soil Corrosivity tests (CALTRANS Standards 643, 422, 417, 532)

For *in situ* moisture and density data, see the Boring Log in Appendix A, *Field Exploration*. For a description of the laboratory test methods and test results, see Appendix B, *Laboratory Testing Program*.

3.3 Analyses and Report

Data obtained from the exploratory fieldwork and laboratory-testing program were analyzed and evaluated. This report was prepared to provide the findings, conclusions, and recommendations developed during our investigation.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 Site Description

The project site is located along the east side of Mc Master Park about 150 feet west of Yukon Avenue as shown on Drawing No. 2, *Approximate Boring Location Plan*. The proposed Well No. 9 Equipment Building is located within a grassed landscape area along the north side of an existing park access road and parking lot. The project site is located about 50 feet northwest of an existing Torrance Municipal Water Department steel reservoir tank and groundwater pumping facility.

A number of trees with large branch canopies were located around the project site during field exploration. The Park Department was planning to remove some of the trees to permit well drilling and construction. The tree stumps and larger root systems

will require removal during project site grading for the proposed Well No. 9 Equipment Building.

An exiting 6 to 7-foot high concrete block was located along the north side of the project site and formed the property line wall between Mc Master Park and the existing condominiums to the north. Special care may be required to protect the block wall from damage during grading and construction.

4.2 Subsurface Conditions

Evidence of artificial fill was encountered in the boring drilled for this investigation. Boring BH-1 encountered about 2 feet of fill below the existing ground surface. The undocumented fill soils were likely placed during original site grading. The fill soils consisted of sandy silt with clay. The fill soils contained significant amounts of roots near the trees.

Alluvial deposits were encountered at the project site to the maximum explored depth of 51.5 feet below ground surface. The alluvial sediment consisted of clay, silty sand, sandy silt, sand and sandy clay. The sand layer encountered from 35 to 44 feet below ground surface contained layers and lenses of sea shells and shell fragments.

Additional information on the subsurface conditions is presented on the Log of Borings in Appendix A, *Field Exploration.*

4.3 Groundwater

Groundwater was encountered in Boring BH-1 at a depth of 33 feet below the existing ground surface. The historical highest ground water level at the subject site is about 20 to 30 feet below the existing ground surface. The groundwater level could vary depending upon the seasonal precipitation and possible groundwater pumping and recharge activity in the site vicinity. The groundwater level should not need to be considered during the design and construction of the proposed equipment building.

4.4 Subsurface Variations

Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and depositional characteristics of the earth material at the site, care should be exercised interpolating or extrapolating subsurface conditions between or beyond the boring locations. If, during construction, subsurface conditions different from those presented in this report are encountered, this office should be notified immediately so that recommendations can be modified, if necessary.

5.0 FAULTING AND SEISMICITY

The site is situated within the seismically active region of southern California. Although there are no known active faults projecting towards or traversing the site, there are a number of nearby faults, which could produce significant ground shaking at the site during a major earthquake.

Earthquake intensities will vary throughout southern California, depending upon the magnitude of the earthquake, the distance of the site from the causative fault, and the type of materials underlying the site.

Based on ground motion data discussed in the *Seismic Hazard Evaluation Report (Open File Report 98-26) for the Torrance 7.5-Minute Quadrangle,* it was reported that the site could be subjected to a peak ground acceleration of 0.47g with a 10 percent probability of exceedance in 50 years. A magnitude 7.1 earthquake on the Newport-Inglewood fault as the predominant earthquake that contributes most to the hazard at 10 percent probability of exceedance in 50 years on the alluvial site condition.

5.1 CBC Seismic Parameters

Based on the results of our borings, and laboratory testing, and in accordance with the California Building Code (2007 CBC, Table 1613A.5.2) the site should be considered as Site Class D. The Site Coefficients F_a, F_v, defined from 2007 CBC, Tables 1613A.5.3 (1), and 1613A.5.3 (2), as following:

$$F_a=1.0 \qquad F_v=1.5$$

The mapped maximum considered earthquake spectral response acceleration at short period, S_s, and at 1-second period, S_1, for a site Class B is as following:

$$S_s=1.572 \qquad S_1= 0.637$$

The mapped maximum considered earthquake spectral response acceleration at short period, S_s, and at 1-second period, S_1, for the subject Class D site is as following:

$$S_{MS} = F_a\, S_s = 1.572$$
$$S_{M1} = F_v\, S_1 = 0.955$$

The 5 percent damped design spectral response acceleration at short period, S_{DS}, and at 1-second period, S_{D1}, for the subject site is as following:

$$S_{DS} = 2/3\, S_{MS} = 1.048$$
$$S_{D1} = 2/3\, S_{M1} = 0.637$$

5.2 *Geologic Hazards Due to Seismic Activities*

In addition to ground shaking, effects of seismic activity on a project site may include ground surface rupture, soil liquefaction, seismically induced differential settlement of structures, ground lurching, landsliding, lateral spreading, earthquake-induced flooding, seiches, and tsunamis. Results of a site-specific evaluation of each of the above possible secondary effects are explained below:

Ground Surface Rupture

The project site is not located within a currently designated State of California Earthquake Fault Zone. Based on our review of existing geologic information, no known faults project toward or traverses the project site. The potential for ground surface rupture at the project site resulting from the movement of a previously unrecognized fault is not known with certainty but is considered low.

Liquefaction Potential

Soil liquefaction is a phenomenon in which saturated cohesionless soil layers, located within about 50 feet of the ground surface, lose strength during cyclic loading, as caused by earthquakes. During the loss of strength, the soil acquires a "mobility" sufficient to permit both horizontal and vertical movements. Soils that are most susceptible to liquefaction are clean, loose, saturated, and uniformly graded, fine-grained sands that lie below the groundwater table within a depth usually considered to be about 50 feet. The factors known to influence liquefaction potential include soil type and depth, grain size, relative density, groundwater level, degree of saturation, and both the intensity and duration of ground shaking.

Groundwater was encountered at a depth of 33 feet below the existing ground surface to a maximum explored depth of 51.5 feet during drilling for this study.

Based on the seismic hazard zone report for the Torrance Quadrangle, the subject site is not within the potential liquefaction zone.

Converse performed the site specific liquefaction analysis and results are presented in Appendix C, *Liquefaction Analysis*. The results of the liquefaction analysis indicates that a layer of sandy soils encountered in the boring at depths of 35 and 44 feet below ground surface has a calculated factor of safety less than 1.0 during a seismic event. The location of the liquefiable layers are shown on Plate C-1 included in Appendix C of this report. Computer outputs are all included. Based on our analysis and under current site conditions, we estimate that the maximum total potential liquefaction-induced ground settlements at the site would be on the order of 0.88-inches or less

during a postulated earthquake. Differential settlements of approximately 0.44 to 0.58-inches or less could occur. However, it is our opinion that potential liquefaction from the localized sandy soils below historical high ground water table at the site have a low potential for liquefaction.

Landslides

Seismically induced landslides and other slope failures are common occurrences in areas of significant ground slopes during or soon after earthquakes. The project site is essentially flat-lying and does not have adjacent hillside slopes. The potential for seismically induced landslides to affect the project site is considered low.

Lateral Spreading

Seismically induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking. It differs from the slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The topography at the project site and in the immediate vicinity of the site is relatively flat. The potential for lateral spreading at the subject site is considered low.

Differential Settlement Due to Seismic Shaking

The potential of settlement due to seismic shaking is computed to be 0.88-inches with the seismic induced differential settlement of 0.44 to 0.58-inches.

Tsunamis

Tsunamis, or seismic sea waves, are long-period waves generated in large bodies of water by fault displacement or major ground movement of the sea floor. Based on the location of the site, tsunamis do not pose a hazard to this site.

Seiches

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Based on our review, no significant dams or other enclosed bodies of water are present in the vicinity of the site. It is our opinion that the potential for damage due to seiches is considered low.

Earthquake-Induced Flooding

Flooding may be caused by failure of dams or other water retaining structures due to earthquake. The project site is located 50 feet northwest of an existing Torrance Municipal Water Department steel reservoir tank. The potential for catastrophic failure of the tank is considered low. The potential of earthquake-induced flooding is considered low.

6.0 ENGINEERING EVALUATION, CONCLUSIONS AND RECOMMENDATIONS

6.1 General

Based on the results of our field exploration and laboratory tests, combined with our engineering analysis, experience and judgment, it is our professional opinion that the construction of the equipment building and associated facilities for the project is feasible from a geotechnical engineering standpoint provided that the conclusions and recommendations presented herein are incorporated in the design of the project.

The primary geotechnical consideration for foundation design is as follows:

Undocumented Fill: Up to two (2) feet of fill was encountered at the location of the boring. The fill is non-uniform and potentially compressible. No documentation was available at the time of this report to verify that the fill was placed in accordance with engineering standards. The fill soils contain tree roots. The non-uniform nature of the fill is considered to have the potential to experience detrimental differential settlement.

The undocumented fill material is not suitable for foundation support without some form of ground improvement. The structures should be supported on either a shallow or mat foundation system founded on improved soils/engineered fill.

6.2 Discussion of Foundation Alternatives

Several alternatives were evaluated for foundation support of the structures. The selected alternative should be based on effectiveness of the system and economics. The alternatives are presented below:

Fill Removal and Replacement: Site preparation for the proposed structure will require removal of undocumented fill soils, disturbed soils, tree stumps and roots and deleterious materials.

The site soils can be excavated utilizing conventional heavy-duty earth-moving equipment. The excavated site soils, free of vegetation, shrub and debris, may be placed as compacted fill in structural areas after proper processing. Rocks larger than three-inches in the largest dimension should not be placed as fill.

Soils containing organic materials should not be used as structural fill. The extent of removal should be determined by the geotechnical representative based on soil observation during grading.

Removals should extend a minimum of five feet beyond the outside limits of perimeter footings, or as limited by the existing structures or property lines. Excavation activities should not disturb existing utilities, buildings, and structures to remain. Existing utilities should be removed and adequately capped at the project boundary line, or salvaged / rerouted as designed.

Following observation of the excavation bottom, subgrade soil surfaces should be scarified to a depth of at least six inches. The on-site near surface soils are likely to have medium expansion potential. The scarified soil should be moisture-conditioned to between optimum moisture content for sandy soils and three (3) percent above the optimum moisture content for fine-grained soils. Scarified soil shall be compacted to a minimum 90 percent of the laboratory maximum dry density as determined by the ASTM Standard D1557 test method.

Excavated site soils, free of deleterious materials and rock particles larger than three inches in the largest dimension, should be suitable for placement as compacted fill. Any import fill should be tested and approved by Converse. The import fill should have an expansion potential less than 20.

Prior to compaction, fill materials should be thoroughly mixed and moisture conditioned when necessary within two (2) percent of optimum moisture content for granular soils and three (3) percent above the optimum moisture content for fine-grained soils. All fill, if not specified otherwise elsewhere in this report, should be compacted to at least 90 percent of the laboratory dry density in accordance with the ASTM Standard D 1557 test method. Maximum allowable thickness of each lift of compacted fill material is eight (8) inches.

Conventional Footings: To minimize the potential of the building undergoing adverse settlements due to the non uniformity of the near surface fill soils and seismically induced differential settlement, we recommend that all fill and the upper soils within the footprint of the proposed building be entirely removed and replaced as compacted fill. This compacted fill should extend at least two (2) feet below the bottom of all footings and slabs. The removal and recompaction should extend at least five (5) feet beyond

the limits of the building and appendages. The building may then be supported on conventional shallow spread and continuous footings founded on the compacted fill.

Mat Foundation: As an alternative to the conventional footing, a mat foundation in conjunction with removal and re-compaction of the undocumented fill may be used to support the building. We recommend that the existing fill beneath the mat foundation be removed to a depth of two (2) feet below the mat foundation and be re-compacted. The removal and recompaction should extend at least five (5) feet beyond the limits of the building and appendages. A mat foundation is a more rigid system.

6.3 Site Preparation and Grading

The location of the proposed building should be cleared of all surface items, existing structures, near surface disturbed soil, tree stumps, tree roots, highly organic topsoil, deleterious materials, vegetation and utilities. For the building to be supported by conventional footings with slab on grade, a minimum removal and re-compaction of two (2) feet below the bottom of the foundation, and slab-on-grade should be provided. If the mat foundation is selected as an alternative, then the removal should extend two (2) feet below the mat foundation. The removal and re-compaction should extend at least five (5) feet beyond the limits (to the extent possible) of the foundation. For concrete flatwork, driveway, parking, and for minor non-load bearing structures, a minimum of 12 inches of removal and re-compaction is recommended. The actual depth of removal and re-compaction should be determined in the field by the geotechnical engineer at the time of construction. Fill for the building pad should not contain rocks or lumps larger than three (3) inches.

Additional excavation may be necessary if any disturbed soil or other unsuitable deposits are exposed. We recommend that the exposed surface be scarified to a minimum depth of six (6) inches and be compacted to a minimum density of 90 percent relative compaction as determined by ASTM Designation D1557.

The excavated on-site soils may be reused as compacted fill provided they are free of deleterious substances, and are relatively free of the cobble and boulder size particles discussed above. Any soils imported from off-site sources for use within the structure areas and to five (5) feet beyond the building limits should be non-expansive with an expansion index of less than 20, and be approved by the geotechnical engineer prior to placement.

Acceptable fill material should be placed in lifts not exceeding eight (8) inches in thickness when loose and should be properly compacted to at least 90 percent of the maximum dry density as determined by ASTM Test Method D1557. The placement and compaction of all fill should be performed under the observation and testing of Converse Consultant's representative.

Shrinkage is the loss of soil volume caused by compaction of the soil to a density greater than before grading. For an earthwork volume estimate, a shrinkage value on the order of 10 to 15 percent may be assumed for the near surface soils.

6.4 Temporary Sloped Excavation

Based on our boring, the over excavation for the equipment building, in our opinion, may be accomplished with conventional excavation equipment capable of excavating to the depths of the proposed subgrade. The excavations are not expected to stand vertically for any extended period of time, and all excavations must be sloped or shored. Where sufficient space is available for a sloped excavation, the excavations in the medium dense silty sand deposits should be sloped no steeper than 1:1 (horizontal to vertical). The exposed slope faces should be kept moist and not allowed to dry out.

Surcharge loads should not be permitted within five feet from the top of the slopes, unless the cut is properly shored. The contractor should be aware that neither slope height, slope inclination, nor excavation depths should exceed those specified in local, state or federal safety regulations, e.g. OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if violated, the owner and/or the contractor could be liable for substantial penalties. For excavations extending to a depth of more than 20 feet, OSHA requires the side slopes and shoring for such excavations be designed by a professional engineer registered in the State of California.

It is important to note that soil conditions may vary significantly within the footprint of the expansion. Our preliminary soil classifications are based solely on the materials encountered at the actual boring locations. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, we recommend that our office be contacted immediately to evaluate the conditions encountered.

6.5 Foundation Support

6.5.1 Shallow Foundation

The proposed building may be supported on continuous or isolated spread footings founded on at least two (2) feet of compacted fill. All continuous interior and isolated footings should be founded at least 18 inches below the lowest adjacent final grade and should be at least 18 inches wide. Footing design may be based on a maximum allowable net bearing value of 2,000 psf for continuous and isolated spread footings and this value may be increased by 250 psf for each additional foot of depth. This value may be increased by 33 percent for transient wind and seismic forces.

Based on the loads, total and differential settlement of the structure designed in accordance with the recommendations provided in this report is expected to be within tolerable limits for this type of construction. For example settlement of 18 inches square footing is expected to be within ½ inch, with the differential settlement between footings to be within ¼ inch. Most of the settlement is expected to occur during construction.

6.5.2 Mat Foundation

As an alternate to the conventional foundation system, the building may be supported on a reinforced mat foundation bearing on a layer of compacted fill. The mat may be designed for a net bearing pressure of 1,500 psf for combined dead plus live loads with one-third increase for all loads including wind or seismic. The total settlement of the mat foundation under the anticipated structural loads and the potential seismic load is estimated to be within 2 inches with differential settlement on the order of about 1 inch. In addition, a modulus of subgrade reaction of between 150 pounds per square inch per inch can be used for the design of the mat. Mat foundation may be supported on at least two (2) feet of properly compacted fill.

6.5.3 Slab-On-Grade

The design of slabs-on-grade, among other factors, will depend on the expansion potential of the pad soils. The site soils are likely to have module expansion potential. The expansion potential of site soils should be verified after the grading. Specific recommendations regarding the type of slabs-on-grade should be based on testing of the expansion index of the pad sub-grade soils at the completion of grading.

Slab-on-grade should be designed based on pre-saturation of the upper 18 inches of sub-grade soils to approximately three (3) percent above optimum moisture content. Slab-on-grade should have a minimum thickness of five (5) inches for support of nominal ground-floor live loads. Minimum reinforcement for slab-on-grade will be No. 4 reinforcing bars, spaced at 16 inches on-center each way. The thickness and reinforcement of more heavily loaded slabs will be dependent upon the anticipated loads and shall be designed by a structural engineer. A static modulus of sub-grade reaction equal to 150 psi may be used in structural design of concrete slab-on-grade.

Structural designs may require slab thickness and/or reinforcement greater than recommended herein. It is recommended that adequate reinforcement be provided for preventing development of shrinkage cracks.

Slabs-on-grade should be underlain by a 10-mil Visqueen (or equivalent) moisture barrier. To help break capillary rise of soil moisture, to aid concrete curing and to prevent puncture, we recommend that at least two (2) inches of clean sand be placed

above the moisture barrier. Joints in the moisture barrier should be lapped a minimum of six (6) inches and properly sealed.

Slabs-on-grade sub-grade soils must be firm and uniform. All loose or disturbed soils including under slab utility trench backfills should be re-compacted prior to the placement of clean sand base underneath the moisture barrier.

Joints for concrete slabs-on-grade must be carefully designed. Joint spacing is dependent upon slab thickness and concrete properties and should be selected by the structural engineer. Joints should be properly sealed. Unless local conditions and concrete properties indicate otherwise, the joint spacing (in feet) should not exceed approximately twice the slab thickness (in inches). Joint spacing may be increased if slabs are heavily reinforced.

During hot weather, the contractor should take appropriate curing precautions after placement of concrete to minimize cracking of the slabs. The potential for slab cracking may be lessened by the addition of fiber mesh to the concrete, and/or control of water/cement ratio. Concrete should be cured by protecting it against loss of moisture and rapid temperature change for at least seven (7) days after placement. Moist curing, waterproof paper, white polyethylene sheeting, white liquid membrane compound, or a combination thereof may be used after finishing operations have been completed. The edges of concrete slabs exposed after removal of forms should be immediately protected to provide continuous curing.

6.5.4 Concrete Flatwork

All exterior slabs and concrete flatwork including the sidewalks should be supported directly on at least 12 inches of properly compacted fill. We recommend that concrete slabs be at least six inches thick and properly reinforced in accordance with the structural requirements.

6.6 Resistance to Lateral Loads

Resistance to lateral loads can be assumed to be provided by passive earth pressure and by friction acting on structural components in permanent contact with the subgrade soils, by the pile caps, and by the lateral resistance of the piles.

Passive earth pressure on the sides of footings, grade beams may be assumed equal to that exerted by an equivalent fluid weighing 275 pcf, subject to a maximum pressure of 2,000 psf. A coefficient of friction of 0.40 may be assumed with dead load forces of slab-on-grade/mat in permanent contact with subgrade soils. A friction factor of 0.3 is considered appropriate for concrete slabs underlain by a moisture barrier.

6.7 Utilities

The on-site soils are suitable for backfill of utility trenches from one foot above the top of the pipe to the surface, provided the material is free of organic matter and deleterious substances.

It is anticipated that the natural soils will provide a firm foundation for site utilities. Any soft and/or unstable material encountered at the pipe invert should be removed and replaced with an adequate bedding material.

The on-site soils are not considered suitable for bedding or shading of utilities. Therefore, we recommend that non-expansive granular soils with a Sand Equivalent (SE) greater than 30 as determined by ASTM Test Method D2419 be imported for that purpose. Trench backfill soils should be compacted to at least 90 percent of the maximum dry density as determined by ASTM Test Method D1557.

6.8 Surface Drainage

Positive surface drainage should be provided adjacent to the structures to direct surface water away form the foundations and slabs toward suitable discharge facilities. Ponding of surface water should be designed with a minimum slope of two (2) percent. Desirable slopes in paved areas are at least one (1) percent.

6.9 Soil Corrosivity

EGL Inc., Arcadia, CA tested one soil sample obtained from the site. The test includes minimum resistivity, pH, soluble sulfates, and chloride content. The results are included in Appendix B, *Laboratory Testing Program* and are discussed below.

The sulfate content of the sample tested was 0.026 percentage by weight, which indicates that the site soils are moderately corrosive to concrete. Type II Portland cement should be used for the construction of the foundations.

The results indicate that the chloride content was 360 ppm, and the pH value was 7.78. The measured value of the minimum electrical resistivity when saturated was 450 ohm-cm. These values indicate that site soil is severely corrosive to ferrous metals. The test results are presented in Appendix B, *Laboratory Testing Program*. A corrosion engineer may be consulted to provide mitigation recommendations.

Some general, conventional corrosion mitigation measures include the following:

- All steel reinforcement should have at least three (3) inches of concrete cover where cast against soil, unformed.

- As a minimum, below-grade ferrous metals should be given a high-quality protective coating, such as 18-mil plastic tape, extruded polyethylene, coal-tar enamel or Portland cement mortar.

Below-grade metals should be electrically insulated (isolated) from above-grade metals by means of dielectric fittings in ferrous utilities and/or exposed metal structures breaking grade.

6.10 Plan Review, Observations and Testing

As the final project plans and specifications are completed, they should be forwarded to Converse Consultants for review for conformance with the intent of these recommendations. All excavation and the placement and compaction of backfill should be performed under the observation of and testing by Converse Consultants. All structure backfill and excavations should be observed prior to placing the bedding material to verify that pipe bedding materials and any structures, are founded on satisfactory soils, and that the excavations are free of loose and disturbed materials.

7.0 CLOSURE

This report has been prepared for the exclusive use of Boyle Engineering Corporation and their design consultants to assist in the design and construction of the site improvement for Well No. 9. Any reliance on this report by third parties shall be at third party's sole risk. Our services have been performed in accordance with applicable state and local ordinances, and generally accepted practices within our profession.

Converse Consultants is not responsible or liable for any claims or damages associated with interpretation of available information provided by others. Site exploration identifies actual soil conditions only at those points where samples are taken, when they are taken. Data derived through sampling and analytical testing are extrapolated by Converse employees who render an opinion about the overall soil conditions. Actual conditions in areas not sampled may differ. In the event that changes to the property occur, or additional, relevant information about the property is brought to our attention, the recommendations contained in this report may not be valid unless these changes and additional relevant information are reviewed and the recommendations of this report are modified or verified in writing.

Our findings and recommendations were obtained in accordance with generally accepted professional principles practiced in geotechnical engineering. We make no other warranty, either express or implied.

8.0 REFERENCES

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CALIFORNIA DIVISION OF MINES AND GEOLOGY (1994), *Fault Activity Map of California and Adjacent Areas, DMG Geologic Data Map No. 6.*

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APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

Our field investigation included a site reconnaissance of the site and a subsurface exploration program consisting of drilling one test boring. During the site reconnaissance, the surface conditions were noted and the location of the test boring was determined. The test boring was located by measurements with existing topography and boundary features, and should be considered accurate only to the degree implied by the method used.

The test boring was advanced using a truck-mounted rig equipped with eight-inch diameter hollow-stem auger for soil sampling. One (1) boring was drilled on August 20, 2008 to a depth of 51.5 feet. Soils encountered in the boring were logged by our field geologist and classified in the field by visual examination in accordance with the Unified Soil Classification System. The field descriptions have been modified where appropriate to reflect laboratory test results.

Relatively undisturbed ring samples and bulk samples of the subsurface soils were obtained at frequent intervals in the borings. The relatively undisturbed samples were obtained using a California Drive Sampler (2.4-inch inside diameter [I.D.], 3.0-inch outside diameter [O.D.]) lined with thin sample rings, and disturbed (bulk) samples were obtained using a split spoon sampler (1⅜-inch I.D. and 2-inch O.D). Both sampler types are indicated in the "drive samples" column of the boring logs as presented in this appendix.

Resistance blow counts were obtained with the sampler by dropping a 140-pound automatic hammer through a 30-inch free fall. The sampler was driven 18 inches, and the number of blows were recorded for each 6-inch interval of penetration. The blows per foot recorded on the boring logs represent the accumulated number of blows required for each 6-inch interval or shorter distance as indicated when refusal was encountered.

Standard Penetration Tests (SPTs) were also performed using a standard (1.4 inches inside diameter and 2.0 inches outside diameter) split-barrel sampler. The mechanically driven hammer for the SPT sampler was 140 pounds, falling 30 inches for each blow. The recorded blow counts for each 6-inch interval of sampler penetration are shown on the Logs of Borings in the "blows" column. The standard penetration tests were performed in accordance with the ASTM Standard D1586 test method. Bulk samples retrieved inside the SPTs sampler were collected in zip lock plastic bags and shipped to our laboratory.

For a key to soil symbols and terminology used in the boring log, refer to Drawing No. A-1, *Unified Soil Classification and Key to Boring Log Symbols*. For logs of the borings, see Drawing No. A-2, *Log of Boring*.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING LOG SYMBOLS

SAMPLE TYPE

- STANDARD PENETRATION TEST — Split barrel sampler in accordance with ASTM D-1586-84 Standard Test Method
- DRIVE SAMPLE — 2.42" I.D. sampler.
- DRIVE SAMPLE — No recovery
- BULK SAMPLE
- GROUNDWATER WHILE DRILLING
- GROUNDWATER AFTER DRILLING

LABORATORY TESTING ABBREVIATIONS

TEST TYPE
(Results shown in Appendix B)

CLASSIFICATION

Plasticity	pi
Grain Size Analysis	ma
Passing No. 200 Sieve	wa
Sand Equivalent	se
Expansion Index	ei
Compaction Curve	max
Hydrometer	h

STRENGTH

Pocket Penetrometer	p
Direct Shear	ds
Direct Shear (single point)	ds*
Unconfined Compression	uc
Triaxial Compression	tx
Vane Shear	vs
Consolidation	c
Collapse Test	col
Resistance (R) Value	r
Chemical Analysis	ca
Electrical Resistivity	er

UNIFIED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

Converse Consultants

Project Name
PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-1737 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No. 07-31-364-01

Drawing No. A-1

Log of Boring No. BH-1

Dates Drilled: 8/20/2008 Logged by: MBS Checked By: WHC

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): ±62' Depth to Water (ft): 33

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		SAND WITH SILT (SP-SM): fine to medium-grained sand, light brown.	X		6/10/17	27		wa(12%)
40		-with shells and shell fragment lenses, trace gravels	■		15/50(5")			
45		**SANDY CLAY(CL):** fine-grained sand, some silt, mottled, oxidation discoloration, light brown to olive brown.	X		10/17/10	28		wa(88%)
50		**SANDY SILT(ML):** fine-grained sand, olive brown.	■		7/15/19	37		wa(86%)
		End of boring at 51.5 feet. Groundwater encountered at 33 feet during drilling. Boring backfilled with 1 bag of bentonite chips and soil cuttings.						

Converse Consultants

Project Name
PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-1737 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No. 07-31-364-01

Drawing No. A-2b

APPENDIX B

LABORATORY TEST PROGRAM

APPENDIX B

LABORATORY TEST PROGRAM

Tests were conducted in our laboratory on representative soil samples for the purpose of classification and evaluation of their relevant physical characteristics and engineering properties. The amount and selection of tests were based on the geotechnical requirements of the project. Test results are presented herein and on the Logs of Boring in Appendix A, *Field Exploration*. The following is a summary of the various laboratory tests conducted for this project.

Moisture Content and Dry Density

Results of moisture content and dry density tests, performed on relatively undisturbed ring samples were used to aid in the classification of the soils and to provide quantitative measure of the *in situ* dry density. Data obtained from this test provides qualitative information on strength and compressibility characteristics of site soils. For test results, see the Logs of Boring in Appendix A, *Field Exploration*.

Grain-Size Analysis

To assist in classification of soils, mechanical grain-size analyses were performed on one (1) selected bulk sample. Testing was performed in general accordance with the ASTM Standard C136 test method. Grain-size curve is shown in Drawing No. B-1, Grain Size Distribution Result.

Amounts of Material in Soils Finer Than the No. 200 Sieve

Five (5) selected samples were tested in accordance with the ASTM Standard D1140 test method to determine the amounts of materials finer than U.S. Standard Sieve No. 200. This information is summarized in the table below.

Table No. B-1, Percent Finer than #200 Sieve Results

Boring No.	Depth (ft)	Soil Classification	Percent Finer Than No. 200 Sieve (%)
BH-1*	0-5	Sandy Silt (ML)	85
BH-1	15	Clay (CL)	100
BH-1	25	Silty Sand (SM)	34
BH-1	35	Sand (SP)	5
BH-1	45	Sandy Clay (CL)	88
BH-1	50	Sandy Silt (ML)	86

*Note: * - Test result from grain-size analysis.

Laboratory Maximum Density Test

One (1) laboratory maximum density-moisture content relationship test was performed on a representative bulk sample. The test was conducted in accordance with ASTM Standard D1557 laboratory procedure. The test result is presented on Drawing No. B-2, *Moisture-Density Relationship Result.*

Atterberg Limits

Atterberg Limits tests were performed on one (1) sample from the site to determine the plasticity of the sampled materials. The liquid limit (LL), plastic limit (PL) and plasticity index (PI) of the samples were determined in accordance with ASTM Standard D4318. Test results are presented on Drawing No. B-3, *"Atterberg Limits Results"*.

Direct Shear Tests

A direct shear test was performed on an undisturbed sample at soaked moisture conditions. Three samples, contained in brass sampler rings, were placed, one at a time, directly into the test apparatus and subjected to a range of normal loads appropriate for the anticipated conditions. The sample was then sheared at a constant strain rate of 0.01 inch/second. Shear deformation was recorded until a maximum of about 0.30-inch shear displacement was achieved. Peak strength was selected from the shear-stress deformation data and plotted to determine the shear strength parameters. For test datum, including sample density and moisture content, see Drawing No. B-4, *Direct Shear Test Result* and the table below.

Table No. B-2, Summary of Direct Shear Test Result

Boring No.	Depth (feet)	Soil Classification	Peak Strength Parameters	
			Friction Angle (degrees)	Cohesion (psf)
BH-1	7	Silty Clay (CL)	27	350

Consolidation Test

Consolidation test was performed on one (1) relatively undisturbed sample. Data obtained from this test was used to evaluate the settlement characteristics of the foundation soils under load. Preparation for this test involved trimming the sample and placing the one-inch high brass ring into the test apparatus, which contained porous stones, both top and bottom, to accommodate drainage during testing. Normal axial loads were applied to one end of the sample through the porous stones, and the resulting deflections were recorded at various time periods. The load was increased after the sample reached a reasonable state equilibrium. Normal loads were applied at a constant load-increment ratio, successive loads being generally twice the preceding load. The sample was tested at field and submerged conditions. The test results, including sample density and moisture content, are presented in Drawing No. B-5, *Consolidation Test Results.*

Soil Corrosivity

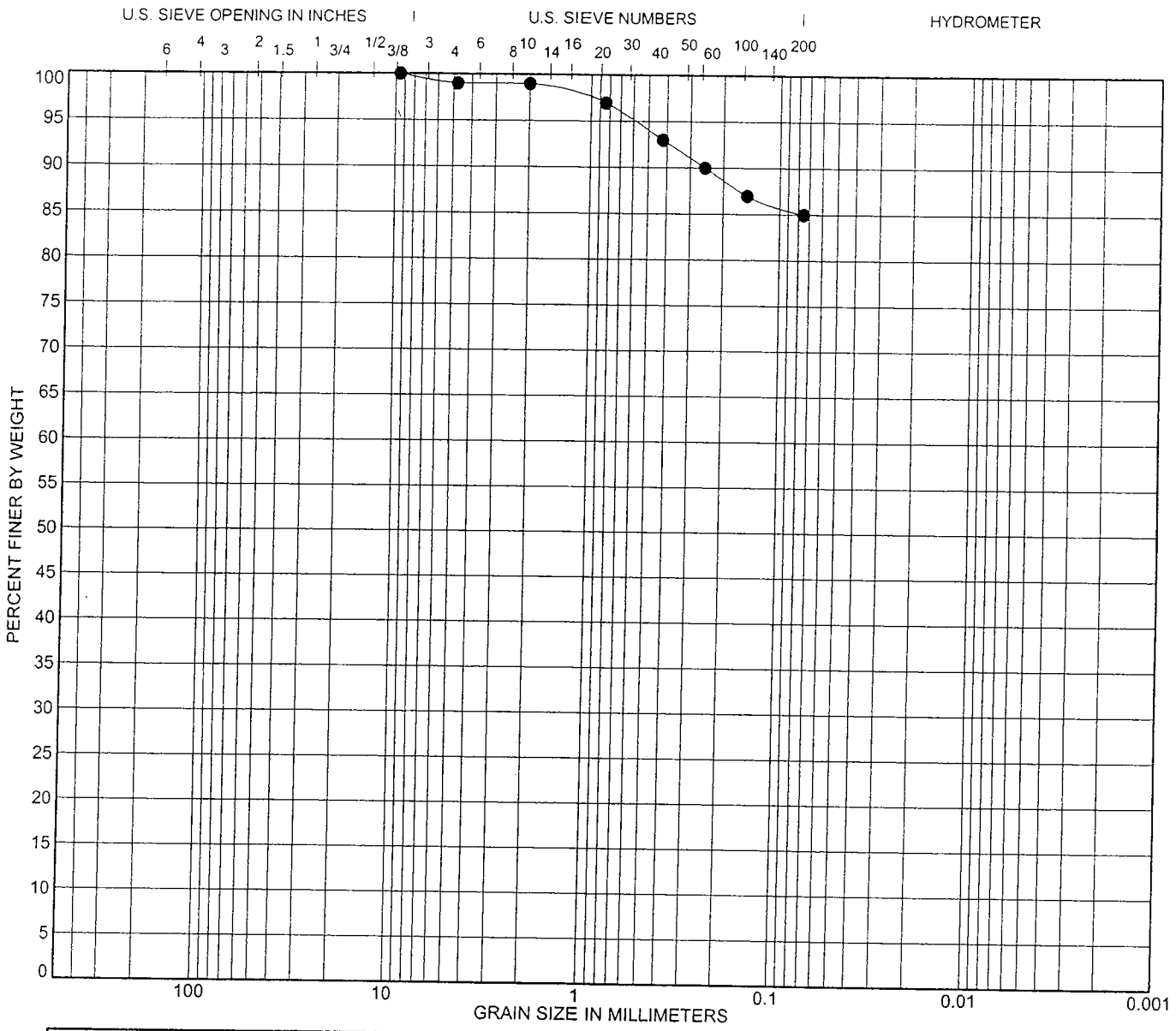
One representative soil sample was tested to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purpose of these tests is to determine the corrosion potential of site soils when placed in contact with common construction materials. These tests were performed by EGL Inc. in Arcadia, California. For test results, see the following table.

Table No. B-3, Soil Corrosivity Test Result

Boring No./Depth	pH	Chloride (ppm)	Sulfate (% by weight)	Min. Resistivity (as-received) (ohm-cm)
BH-1 / 1'-5'	7.78	360	0.026	450

Sample Storage

Soil samples presently stored in our laboratory will be discarded 30 days after the date of this report, unless this office receives a specific request to retain the samples for a longer period.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	**BH-1**	**0-5**	**SANDY SILT (ML)**					

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-1**	**0-5**	**9.5**				**1.0**	**14.0**	**85.0**	

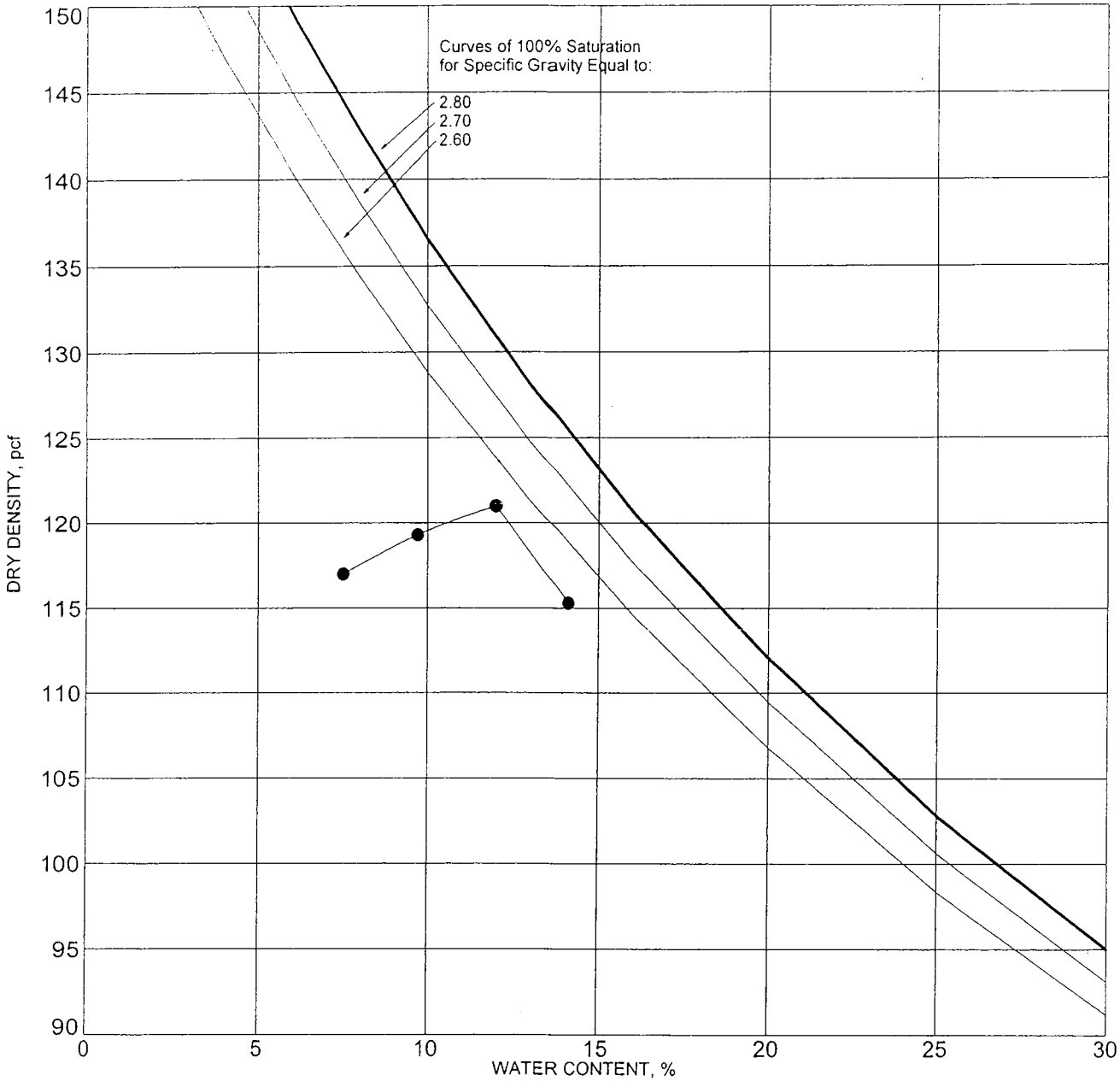
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

Project Name
PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-1737 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No.
07-31-364-01

Drawing No.
B-1



SYMBOL	BORING NO.	DEPTH (ft)	DESCRIPTION	ASTM TEST METHOD	OPTIMUM WATER, %	MAXIMUM DRY DENSITY, pcf
●	BH-1	0-5	SANDY SILT (ML)	D1557 Method B	12	121

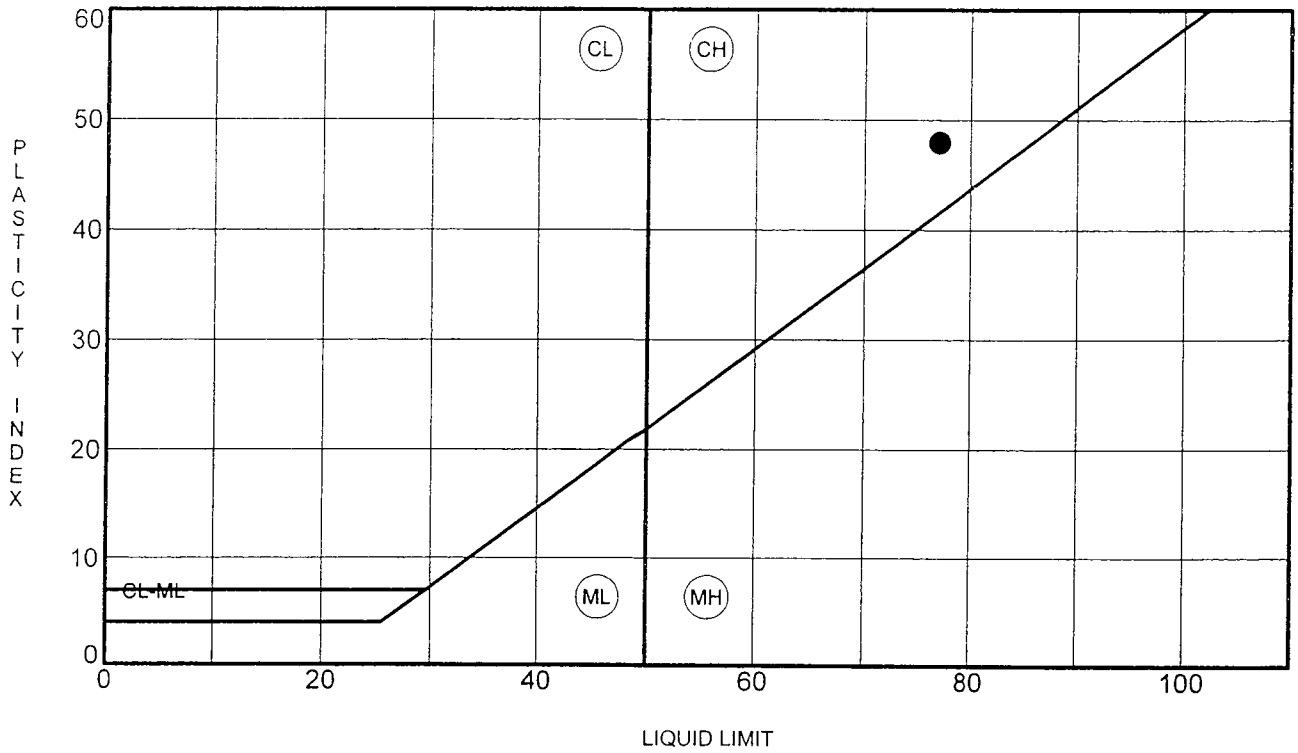
MOISTURE-DENSITY RELATIONSHIP RESULTS

Converse Consultants

Project Name
PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-1737 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No.
07-31-364-01

Drawing No.
B-2



Symbol	Boring No.	Depth (ft)	LL (%)	PL (%)	PI (%)	Description
●	BH-1	15-16.5	77	29	48	FAT CLAY (CH)

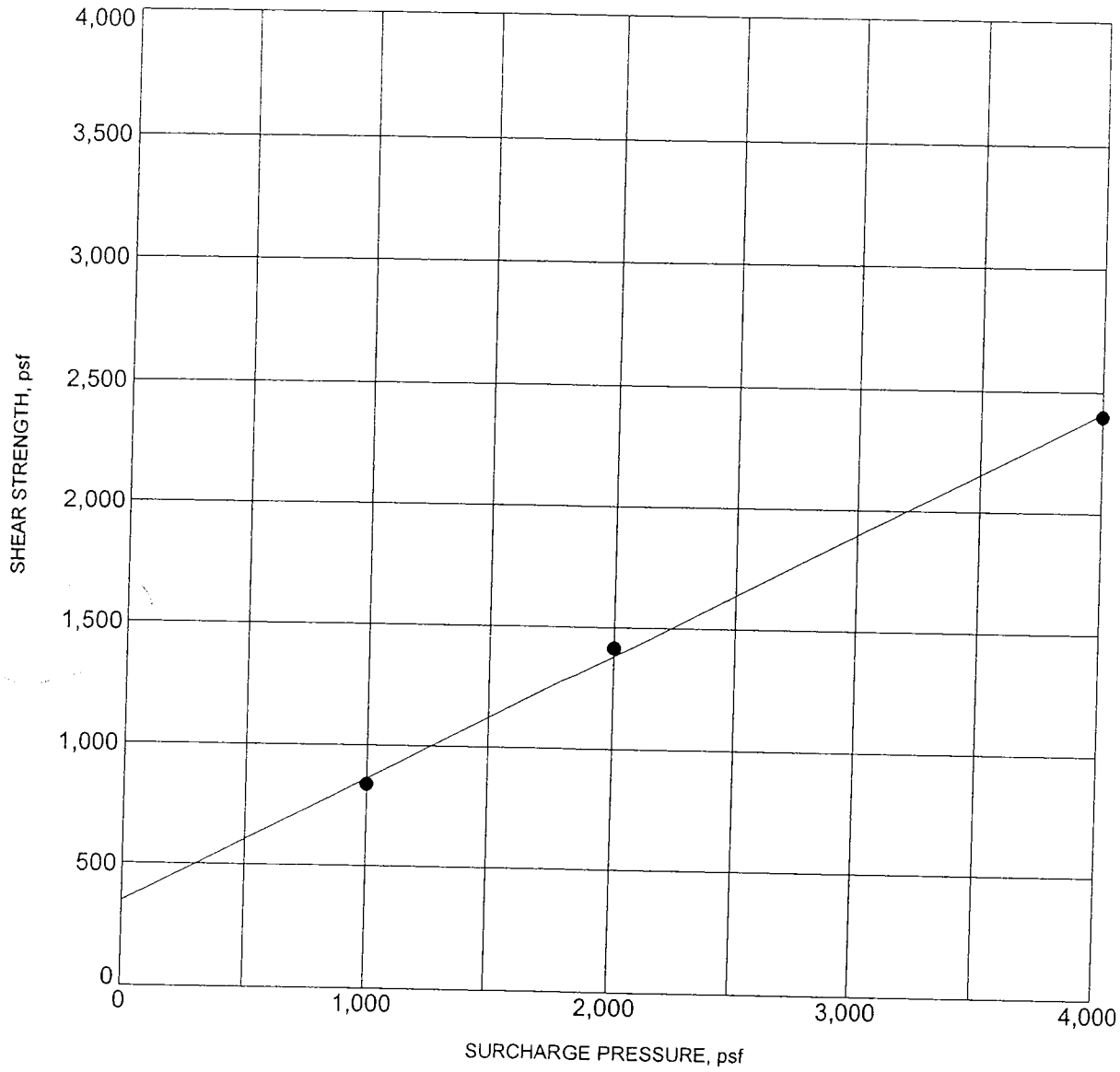
ATTERBERG LIMITS RESULTS

Converse Consultants

Project Name
PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-1737 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No.
07-31-364-01

Drawing No.
B-3



BORING NO. :	BH-1	DEPTH (ft) :	7
DESCRIPTION :	CLAY (CL)		
COHESION (psf) :	350	FRICTION ANGLE (degrees):	27
MOISTURE CONTENT (%) :	33.6	DRY DENSITY (pcf) :	96.9

NOTE: Ultimate Strength.

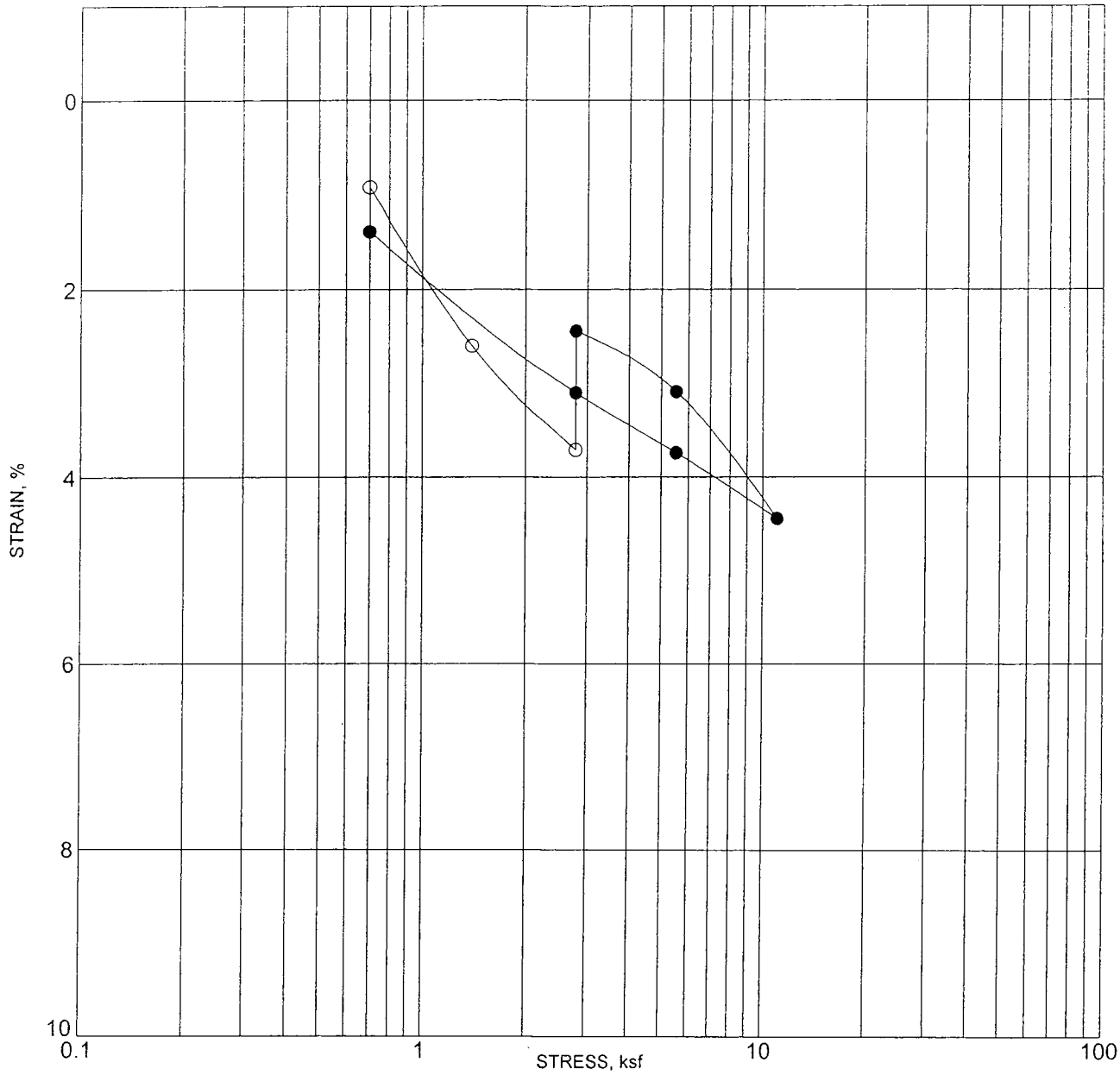
DIRECT SHEAR TEST RESULTS

Converse Consultants

Project Name
PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-1737 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No. 07-31-364-01

Drawing No. B-4



BORING NO. :	BH-1	DEPTH (ft) :	10
DESCRIPTION :	CLAY (CL)		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	24.5	96.4		
FINAL	28.4	96.5		

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

CONSOLIDATION TEST RESULTS

Converse Consultants

Project Name
PROPOSED WELL NO.9 EQUIPMENT BUILDING
McMASTER PARK-1737 YUKON AVENUE
TORRANCE, CALIFORNIA

Project No. 07-31-364-01

Drawing No. B-5

Environmental Geotechnology Laboratory, Inc.

September 24, 2008

Converse Consultants
222 E. Huntington Dr. #211-A
Monrovia, CA 91016

Attn: Mr. Juan Martinez

RE: LABORATORY TEST RESULTS/REPORT
Project Name: Boyle Eng. / Torrance Well No. 9 Bldg
Project No.: 07-31-364-01
EGL Job No.: 08-118-009

Dear Mr. Juan Martinez:

We have completed the testing program conducted on samples from the above project. The tests were performed in accordance with testing procedures as follows:

TEST	METHOD
Corrosion	CT-417, 422, 532, 643

Enclosed is the Summary of Test Results.

We appreciate the opportunity to provide testing services to Converse Consultants. Should you have any questions, please call the undersigned.

Sincerely yours,
Environmental Geotechnology Laboratory, Inc.

Hank Jong, PE, GE
President

Enclosure

11819 Goldring Road, Suite A, Arcadia, CA 91006 • Tel.: (626) 263-3588, Fax: (626) 263-3599
E-MAIL: MAIL@EGLAB.COM

SUMMARY OF CORROSION TEST RESULTS

PROJECT NAME: Boyle Eng. / Torrance Well No. 9 Bldg

EGL JOB NO.: 08-118-009

PROJECT NO.: 07-31-364-01

CLIENT: Converse Consultant

DATE: 09-08-08

SUMMARIZED BY: VW

BORING NO	SAMPLE NO	DEPTH (ft)	pH CALTRANS 643	CHLORIDE CONTENT CALTRANS 422 (ppm)	SULFATE CONTENT CALTRANS 417 (% by weight)	MINIMUM RESISTIVITY CALTRANS 643 (ohm-cm)
BH-1	N/A	1-5	7.78	360	0.026	450

APPENDIX C

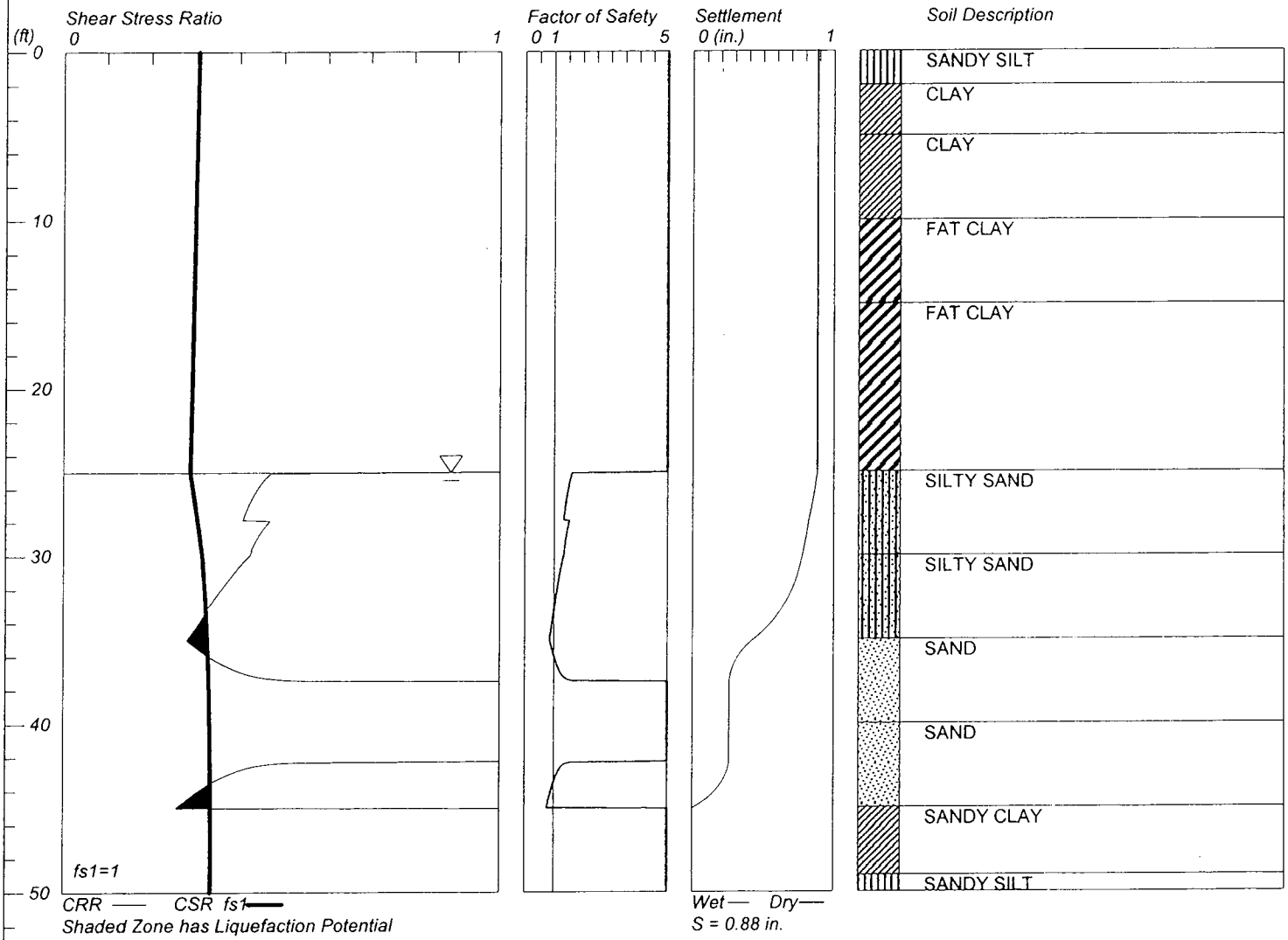
LIQUEFACTION ANALYSIS

LIQUEFACTION ANALYSIS

PROPOSED EQUIPMENT BUILDING

Hole No.=B-1 Water Depth=25 ft Surface Elev.=62 ft

Magnitude=7.1
Acceleration=.47g



LiquefyPro CivilTech Software USA www.civiltech.com

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*****

LIQUEFACTION ANALYSIS CALCULATION SHEET
CONVERSE CONSULTANT
www.converseconsultants.com
(626)-930-1200

****
*****

Licensed to , 10/28/2008 3:26:12 PM

Input File Name: C:\Documents and Settings\abakane\Desktop\Liquepro v4.4b\Project Id
07-31-364-01.liq
Title: PROPOSED EQUIPMENT BUILDING
Subtitle: 07-31-364-01

Surface Elev.=62 ft
Hole No.=B-1
Depth of Hole= 50.0 ft
Water Table during Earthquake= 25.0 ft
Water Table during In-Situ Testing= 33.0 ft
Max. Acceleration= 0.47 g
Earthquake Magnitude= 7.1

Input Data:
Surface Elev.=62 ft
Hole No.=B-1
Depth of Hole=50.0 ft
Water Table during Earthquake= 25.0 ft
Water Table during In-Situ Testing= 33.0 ft
Max. Acceleration=0.47 g
Earthquake Magnitude=7.1

Earthquake Magnitude=7.1
2. Settlement Analysis Method: Ishihara / Yoshimine*
3. Fines Correction for Liquefaction: Idriss/Seed (SPT only)
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1
9. User request factor of safety (apply to CSR) , User= 1
Plot one CSR curve (fs1=1)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
0.0	20.0	110.0	NoLiq
5.0	25.0	105.0	NoLiq
7.0	22.0	110.0	NoLiq
10.0	27.0	110.0	NoLiq
15.0	19.0	100.0	NoLiq
20.0	27.0	100.0	NoLiq
25.0	25.0	100.0	34.0
30.0	25.0	100.0	34.0
35.0	27.0	110.0	12.0
40.0	48.0	110.0	12.0
45.0	27.0	92.0	NoLiq
50.0	22.0	90.0	NoLiq

Output Results:

Settlement of saturated sands=0.88 in.
Settlement of dry sands=0.00 in.
Total settlement of saturated and dry sands=0.88 in.
Differential Settlement=0.441 to 0.582 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	2.00	0.31	5.00	0.88	0.00	0.88
0.05	2.00	0.31	5.00	0.88	0.00	0.88
0.10	2.00	0.31	5.00	0.88	0.00	0.88
0.15	2.00	0.31	5.00	0.88	0.00	0.88
0.20	2.00	0.31	5.00	0.88	0.00	0.88
0.25	2.00	0.31	5.00	0.88	0.00	0.88
0.30	2.00	0.31	5.00	0.88	0.00	0.88
0.35	2.00	0.31	5.00	0.88	0.00	0.88
0.40	2.00	0.31	5.00	0.88	0.00	0.88
0.45	2.00	0.31	5.00	0.88	0.00	0.88
0.50	2.00	0.31	5.00	0.88	0.00	0.88
0.55	2.00	0.31	5.00	0.88	0.00	0.88
0.60	2.00	0.31	5.00	0.88	0.00	0.88
0.65	2.00	0.31	5.00	0.88	0.00	0.88
0.70	2.00	0.31	5.00	0.88	0.00	0.88
0.75	2.00	0.30	5.00	0.88	0.00	0.88
0.80	2.00	0.30	5.00	0.88	0.00	0.88
0.85	2.00	0.30	5.00	0.88	0.00	0.88
0.90	2.00	0.30	5.00	0.88	0.00	0.88
0.95	2.00	0.30	5.00	0.88	0.00	0.88
1.00	2.00	0.30	5.00	0.88	0.00	0.88
1.05	2.00	0.30	5.00	0.88	0.00	0.88
1.10	2.00	0.30	5.00	0.88	0.00	0.88
1.15	2.00	0.30	5.00	0.88	0.00	0.88
1.20	2.00	0.30	5.00	0.88	0.00	0.88
1.25	2.00	0.30	5.00	0.88	0.00	0.88
1.30	2.00	0.30	5.00	0.88	0.00	0.88
1.35	2.00	0.30	5.00	0.88	0.00	0.88
1.40	2.00	0.30	5.00	0.88	0.00	0.88
1.45	2.00	0.30	5.00	0.88	0.00	0.88
1.50	2.00	0.30	5.00	0.88	0.00	0.88
1.55	2.00	0.30	5.00	0.88	0.00	0.88
1.60	2.00	0.30	5.00	0.88	0.00	0.88
1.65	2.00	0.30	5.00	0.88	0.00	0.88
1.70	2.00	0.30	5.00	0.88	0.00	0.88
1.75	2.00	0.30	5.00	0.88	0.00	0.88
1.80	2.00	0.30	5.00	0.88	0.00	0.88
1.85	2.00	0.30	5.00	0.88	0.00	0.88
1.90	2.00	0.30	5.00	0.88	0.00	0.88
1.95	2.00	0.30	5.00	0.88	0.00	0.88
2.00	2.00	0.30	5.00	0.88	0.00	0.88
2.05	2.00	0.30	5.00	0.88	0.00	0.88
2.10	2.00	0.30	5.00	0.88	0.00	0.88
2.15	2.00	0.30	5.00	0.88	0.00	0.88
2.20	2.00	0.30	5.00	0.88	0.00	0.88
2.25	2.00	0.30	5.00	0.88	0.00	0.88
2.30	2.00	0.30	5.00	0.88	0.00	0.88
2.35	2.00	0.30	5.00	0.88	0.00	0.88
2.40	2.00	0.30	5.00	0.88	0.00	0.88
2.45	2.00	0.30	5.00	0.88	0.00	0.88
2.50	2.00	0.30	5.00	0.88	0.00	0.88
2.55	2.00	0.30	5.00	0.88	0.00	0.88

2.60	2.00	0.30	5.00	0.88	0.00	0.88
2.65	2.00	0.30	5.00	0.88	0.00	0.88
2.70	2.00	0.30	5.00	0.88	0.00	0.88
2.75	2.00	0.30	5.00	0.88	0.00	0.88
2.80	2.00	0.30	5.00	0.88	0.00	0.88
2.85	2.00	0.30	5.00	0.88	0.00	0.88
2.90	2.00	0.30	5.00	0.88	0.00	0.88
2.95	2.00	0.30	5.00	0.88	0.00	0.88
3.00	2.00	0.30	5.00	0.88	0.00	0.88
3.05	2.00	0.30	5.00	0.88	0.00	0.88
3.10	2.00	0.30	5.00	0.88	0.00	0.88
3.15	2.00	0.30	5.00	0.88	0.00	0.88
3.20	2.00	0.30	5.00	0.88	0.00	0.88
3.25	2.00	0.30	5.00	0.88	0.00	0.88
3.30	2.00	0.30	5.00	0.88	0.00	0.88
3.35	2.00	0.30	5.00	0.88	0.00	0.88
3.40	2.00	0.30	5.00	0.88	0.00	0.88
3.45	2.00	0.30	5.00	0.88	0.00	0.88
3.50	2.00	0.30	5.00	0.88	0.00	0.88
3.55	2.00	0.30	5.00	0.88	0.00	0.88
3.60	2.00	0.30	5.00	0.88	0.00	0.88
3.65	2.00	0.30	5.00	0.88	0.00	0.88
3.70	2.00	0.30	5.00	0.88	0.00	0.88
3.75	2.00	0.30	5.00	0.88	0.00	0.88
3.80	2.00	0.30	5.00	0.88	0.00	0.88
3.85	2.00	0.30	5.00	0.88	0.00	0.88
3.90	2.00	0.30	5.00	0.88	0.00	0.88
3.95	2.00	0.30	5.00	0.88	0.00	0.88
4.00	2.00	0.30	5.00	0.88	0.00	0.88
4.05	2.00	0.30	5.00	0.88	0.00	0.88
4.10	2.00	0.30	5.00	0.88	0.00	0.88
4.15	2.00	0.30	5.00	0.88	0.00	0.88
4.20	2.00	0.30	5.00	0.88	0.00	0.88
4.25	2.00	0.30	5.00	0.88	0.00	0.88
4.30	2.00	0.30	5.00	0.88	0.00	0.88
4.35	2.00	0.30	5.00	0.88	0.00	0.88
4.40	2.00	0.30	5.00	0.88	0.00	0.88
4.45	2.00	0.30	5.00	0.88	0.00	0.88
4.50	2.00	0.30	5.00	0.88	0.00	0.88
4.55	2.00	0.30	5.00	0.88	0.00	0.88
4.60	2.00	0.30	5.00	0.88	0.00	0.88
4.65	2.00	0.30	5.00	0.88	0.00	0.88
4.70	2.00	0.30	5.00	0.88	0.00	0.88
4.75	2.00	0.30	5.00	0.88	0.00	0.88
4.80	2.00	0.30	5.00	0.88	0.00	0.88
4.85	2.00	0.30	5.00	0.88	0.00	0.88
4.90	2.00	0.30	5.00	0.88	0.00	0.88
4.95	2.00	0.30	5.00	0.88	0.00	0.88
5.00	2.00	0.30	5.00	0.88	0.00	0.88
5.05	2.00	0.30	5.00	0.88	0.00	0.88
5.10	2.00	0.30	5.00	0.88	0.00	0.88
5.15	2.00	0.30	5.00	0.88	0.00	0.88
5.20	2.00	0.30	5.00	0.88	0.00	0.88
5.25	2.00	0.30	5.00	0.88	0.00	0.88
5.30	2.00	0.30	5.00	0.88	0.00	0.88
5.35	2.00	0.30	5.00	0.88	0.00	0.88
5.40	2.00	0.30	5.00	0.88	0.00	0.88
5.45	2.00	0.30	5.00	0.88	0.00	0.88
5.50	2.00	0.30	5.00	0.88	0.00	0.88
5.55	2.00	0.30	5.00	0.88	0.00	0.88
5.60	2.00	0.30	5.00	0.88	0.00	0.88
5.65	2.00	0.30	5.00	0.88	0.00	0.88
5.70	2.00	0.30	5.00	0.88	0.00	0.88

5.75	2.00	0.30	5.00	0.88	0.00	0.88
5.80	2.00	0.30	5.00	0.88	0.00	0.88
5.85	2.00	0.30	5.00	0.88	0.00	0.88
5.90	2.00	0.30	5.00	0.88	0.00	0.88
5.95	2.00	0.30	5.00	0.88	0.00	0.88
6.00	2.00	0.30	5.00	0.88	0.00	0.88
6.05	2.00	0.30	5.00	0.88	0.00	0.88
6.10	2.00	0.30	5.00	0.88	0.00	0.88
6.15	2.00	0.30	5.00	0.88	0.00	0.88
6.20	2.00	0.30	5.00	0.88	0.00	0.88
6.25	2.00	0.30	5.00	0.88	0.00	0.88
6.30	2.00	0.30	5.00	0.88	0.00	0.88
6.35	2.00	0.30	5.00	0.88	0.00	0.88
6.40	2.00	0.30	5.00	0.88	0.00	0.88
6.45	2.00	0.30	5.00	0.88	0.00	0.88
6.50	2.00	0.30	5.00	0.88	0.00	0.88
6.55	2.00	0.30	5.00	0.88	0.00	0.88
6.60	2.00	0.30	5.00	0.88	0.00	0.88
6.65	2.00	0.30	5.00	0.88	0.00	0.88
6.70	2.00	0.30	5.00	0.88	0.00	0.88
6.75	2.00	0.30	5.00	0.88	0.00	0.88
6.80	2.00	0.30	5.00	0.88	0.00	0.88
6.85	2.00	0.30	5.00	0.88	0.00	0.88
6.90	2.00	0.30	5.00	0.88	0.00	0.88
6.95	2.00	0.30	5.00	0.88	0.00	0.88
7.00	2.00	0.30	5.00	0.88	0.00	0.88
7.05	2.00	0.30	5.00	0.88	0.00	0.88
7.10	2.00	0.30	5.00	0.88	0.00	0.88
7.15	2.00	0.30	5.00	0.88	0.00	0.88
7.20	2.00	0.30	5.00	0.88	0.00	0.88
7.25	2.00	0.30	5.00	0.88	0.00	0.88
7.30	2.00	0.30	5.00	0.88	0.00	0.88
7.35	2.00	0.30	5.00	0.88	0.00	0.88
7.40	2.00	0.30	5.00	0.88	0.00	0.88
7.45	2.00	0.30	5.00	0.88	0.00	0.88
7.50	2.00	0.30	5.00	0.88	0.00	0.88
7.55	2.00	0.30	5.00	0.88	0.00	0.88
7.60	2.00	0.30	5.00	0.88	0.00	0.88
7.65	2.00	0.30	5.00	0.88	0.00	0.88
7.70	2.00	0.30	5.00	0.88	0.00	0.88
7.75	2.00	0.30	5.00	0.88	0.00	0.88
7.80	2.00	0.30	5.00	0.88	0.00	0.88
7.85	2.00	0.30	5.00	0.88	0.00	0.88
7.90	2.00	0.30	5.00	0.88	0.00	0.88
7.95	2.00	0.30	5.00	0.88	0.00	0.88
8.00	2.00	0.30	5.00	0.88	0.00	0.88
8.05	2.00	0.30	5.00	0.88	0.00	0.88
8.10	2.00	0.30	5.00	0.88	0.00	0.88
8.15	2.00	0.30	5.00	0.88	0.00	0.88
8.20	2.00	0.30	5.00	0.88	0.00	0.88
8.25	2.00	0.30	5.00	0.88	0.00	0.88
8.30	2.00	0.30	5.00	0.88	0.00	0.88
8.35	2.00	0.30	5.00	0.88	0.00	0.88
8.40	2.00	0.30	5.00	0.88	0.00	0.88
8.45	2.00	0.30	5.00	0.88	0.00	0.88
8.50	2.00	0.30	5.00	0.88	0.00	0.88
8.55	2.00	0.30	5.00	0.88	0.00	0.88
8.60	2.00	0.30	5.00	0.88	0.00	0.88
8.65	2.00	0.30	5.00	0.88	0.00	0.88
8.70	2.00	0.30	5.00	0.88	0.00	0.88
8.75	2.00	0.30	5.00	0.88	0.00	0.88
8.80	2.00	0.30	5.00	0.88	0.00	0.88
8.85	2.00	0.30	5.00	0.88	0.00	0.88

8.90	2.00	0.30	5.00	0.88	0.00	0.88
8.95	2.00	0.30	5.00	0.88	0.00	0.88
9.00	2.00	0.30	5.00	0.88	0.00	0.88
9.05	2.00	0.30	5.00	0.88	0.00	0.88
9.10	2.00	0.30	5.00	0.88	0.00	0.88
9.15	2.00	0.30	5.00	0.88	0.00	0.88
9.20	2.00	0.30	5.00	0.88	0.00	0.88
9.25	2.00	0.30	5.00	0.88	0.00	0.88
9.30	2.00	0.30	5.00	0.88	0.00	0.88
9.35	2.00	0.30	5.00	0.88	0.00	0.88
9.40	2.00	0.30	5.00	0.88	0.00	0.88
9.45	2.00	0.30	5.00	0.88	0.00	0.88
9.50	2.00	0.30	5.00	0.88	0.00	0.88
9.55	2.00	0.30	5.00	0.88	0.00	0.88
9.60	2.00	0.30	5.00	0.88	0.00	0.88
9.65	2.00	0.30	5.00	0.88	0.00	0.88
9.70	2.00	0.30	5.00	0.88	0.00	0.88
9.75	2.00	0.30	5.00	0.88	0.00	0.88
9.80	2.00	0.30	5.00	0.88	0.00	0.88
9.85	2.00	0.30	5.00	0.88	0.00	0.88
9.90	2.00	0.30	5.00	0.88	0.00	0.88
9.95	2.00	0.30	5.00	0.88	0.00	0.88
10.00	2.00	0.30	5.00	0.88	0.00	0.88
10.05	2.00	0.30	5.00	0.88	0.00	0.88
10.10	2.00	0.30	5.00	0.88	0.00	0.88
10.15	2.00	0.30	5.00	0.88	0.00	0.88
10.20	2.00	0.30	5.00	0.88	0.00	0.88
10.25	2.00	0.30	5.00	0.88	0.00	0.88
10.30	2.00	0.30	5.00	0.88	0.00	0.88
10.35	2.00	0.30	5.00	0.88	0.00	0.88
10.40	2.00	0.30	5.00	0.88	0.00	0.88
10.45	2.00	0.30	5.00	0.88	0.00	0.88
10.50	2.00	0.30	5.00	0.88	0.00	0.88
10.55	2.00	0.30	5.00	0.88	0.00	0.88
10.60	2.00	0.30	5.00	0.88	0.00	0.88
10.65	2.00	0.30	5.00	0.88	0.00	0.88
10.70	2.00	0.30	5.00	0.88	0.00	0.88
10.75	2.00	0.30	5.00	0.88	0.00	0.88
10.80	2.00	0.30	5.00	0.88	0.00	0.88
10.85	2.00	0.30	5.00	0.88	0.00	0.88
10.90	2.00	0.30	5.00	0.88	0.00	0.88
10.95	2.00	0.30	5.00	0.88	0.00	0.88
11.00	2.00	0.30	5.00	0.88	0.00	0.88
11.05	2.00	0.30	5.00	0.88	0.00	0.88
11.10	2.00	0.30	5.00	0.88	0.00	0.88
11.15	2.00	0.30	5.00	0.88	0.00	0.88
11.20	2.00	0.30	5.00	0.88	0.00	0.88
11.25	2.00	0.30	5.00	0.88	0.00	0.88
11.30	2.00	0.30	5.00	0.88	0.00	0.88
11.35	2.00	0.30	5.00	0.88	0.00	0.88
11.40	2.00	0.30	5.00	0.88	0.00	0.88
11.45	2.00	0.30	5.00	0.88	0.00	0.88
11.50	2.00	0.30	5.00	0.88	0.00	0.88
11.55	2.00	0.30	5.00	0.88	0.00	0.88
11.60	2.00	0.30	5.00	0.88	0.00	0.88
11.65	2.00	0.30	5.00	0.88	0.00	0.88
11.70	2.00	0.30	5.00	0.88	0.00	0.88
11.75	2.00	0.30	5.00	0.88	0.00	0.88
11.80	2.00	0.30	5.00	0.88	0.00	0.88
11.85	2.00	0.30	5.00	0.88	0.00	0.88
11.90	2.00	0.30	5.00	0.88	0.00	0.88
11.95	2.00	0.30	5.00	0.88	0.00	0.88
12.00	2.00	0.30	5.00	0.88	0.00	0.88

12.05	2.00	0.30	5.00	0.88	0.00	0.88
12.10	2.00	0.30	5.00	0.88	0.00	0.88
12.15	2.00	0.30	5.00	0.88	0.00	0.88
12.20	2.00	0.30	5.00	0.88	0.00	0.88
12.25	2.00	0.30	5.00	0.88	0.00	0.88
12.30	2.00	0.30	5.00	0.88	0.00	0.88
12.35	2.00	0.30	5.00	0.88	0.00	0.88
12.40	2.00	0.30	5.00	0.88	0.00	0.88
12.45	2.00	0.30	5.00	0.88	0.00	0.88
12.50	2.00	0.30	5.00	0.88	0.00	0.88
12.55	2.00	0.30	5.00	0.88	0.00	0.88
12.60	2.00	0.30	5.00	0.88	0.00	0.88
12.65	2.00	0.30	5.00	0.88	0.00	0.88
12.70	2.00	0.30	5.00	0.88	0.00	0.88
12.75	2.00	0.30	5.00	0.88	0.00	0.88
12.80	2.00	0.30	5.00	0.88	0.00	0.88
12.85	2.00	0.30	5.00	0.88	0.00	0.88
12.90	2.00	0.30	5.00	0.88	0.00	0.88
12.95	2.00	0.30	5.00	0.88	0.00	0.88
13.00	2.00	0.30	5.00	0.88	0.00	0.88
13.05	2.00	0.30	5.00	0.88	0.00	0.88
13.10	2.00	0.30	5.00	0.88	0.00	0.88
13.15	2.00	0.30	5.00	0.88	0.00	0.88
13.20	2.00	0.30	5.00	0.88	0.00	0.88
13.25	2.00	0.30	5.00	0.88	0.00	0.88
13.30	2.00	0.30	5.00	0.88	0.00	0.88
13.35	2.00	0.30	5.00	0.88	0.00	0.88
13.40	2.00	0.30	5.00	0.88	0.00	0.88
13.45	2.00	0.30	5.00	0.88	0.00	0.88
13.50	2.00	0.30	5.00	0.88	0.00	0.88
13.55	2.00	0.30	5.00	0.88	0.00	0.88
13.60	2.00	0.30	5.00	0.88	0.00	0.88
13.65	2.00	0.30	5.00	0.88	0.00	0.88
13.70	2.00	0.30	5.00	0.88	0.00	0.88
13.75	2.00	0.30	5.00	0.88	0.00	0.88
13.80	2.00	0.30	5.00	0.88	0.00	0.88
13.85	2.00	0.30	5.00	0.88	0.00	0.88
13.90	2.00	0.30	5.00	0.88	0.00	0.88
13.95	2.00	0.30	5.00	0.88	0.00	0.88
14.00	2.00	0.30	5.00	0.88	0.00	0.88
14.05	2.00	0.30	5.00	0.88	0.00	0.88
14.10	2.00	0.30	5.00	0.88	0.00	0.88
14.15	2.00	0.30	5.00	0.88	0.00	0.88
14.20	2.00	0.30	5.00	0.88	0.00	0.88
14.25	2.00	0.30	5.00	0.88	0.00	0.88
14.30	2.00	0.30	5.00	0.88	0.00	0.88
14.35	2.00	0.30	5.00	0.88	0.00	0.88
14.40	2.00	0.30	5.00	0.88	0.00	0.88
14.45	2.00	0.30	5.00	0.88	0.00	0.88
14.50	2.00	0.30	5.00	0.88	0.00	0.88
14.55	2.00	0.30	5.00	0.88	0.00	0.88
14.60	2.00	0.30	5.00	0.88	0.00	0.88
14.65	2.00	0.30	5.00	0.88	0.00	0.88
14.70	2.00	0.30	5.00	0.88	0.00	0.88
14.75	2.00	0.29	5.00	0.88	0.00	0.88
14.80	2.00	0.29	5.00	0.88	0.00	0.88
14.85	2.00	0.29	5.00	0.88	0.00	0.88
14.90	2.00	0.29	5.00	0.88	0.00	0.88
14.95	2.00	0.29	5.00	0.88	0.00	0.88
15.00	2.00	0.29	5.00	0.88	0.00	0.88
15.05	2.00	0.29	5.00	0.88	0.00	0.88
15.10	2.00	0.29	5.00	0.88	0.00	0.88
15.15	2.00	0.29	5.00	0.88	0.00	0.88

15.20	2.00	0.29	5.00	0.88	0.00	0.88
15.25	2.00	0.29	5.00	0.88	0.00	0.88
15.30	2.00	0.29	5.00	0.88	0.00	0.88
15.35	2.00	0.29	5.00	0.88	0.00	0.88
15.40	2.00	0.29	5.00	0.88	0.00	0.88
15.45	2.00	0.29	5.00	0.88	0.00	0.88
15.50	2.00	0.29	5.00	0.88	0.00	0.88
15.55	2.00	0.29	5.00	0.88	0.00	0.88
15.60	2.00	0.29	5.00	0.88	0.00	0.88
15.65	2.00	0.29	5.00	0.88	0.00	0.88
15.70	2.00	0.29	5.00	0.88	0.00	0.88
15.75	2.00	0.29	5.00	0.88	0.00	0.88
15.80	2.00	0.29	5.00	0.88	0.00	0.88
15.85	2.00	0.29	5.00	0.88	0.00	0.88
15.90	2.00	0.29	5.00	0.88	0.00	0.88
15.95	2.00	0.29	5.00	0.88	0.00	0.88
16.00	2.00	0.29	5.00	0.88	0.00	0.88
16.05	2.00	0.29	5.00	0.88	0.00	0.88
16.10	2.00	0.29	5.00	0.88	0.00	0.88
16.15	2.00	0.29	5.00	0.88	0.00	0.88
16.20	2.00	0.29	5.00	0.88	0.00	0.88
16.25	2.00	0.29	5.00	0.88	0.00	0.88
16.30	2.00	0.29	5.00	0.88	0.00	0.88
16.35	2.00	0.29	5.00	0.88	0.00	0.88
16.40	2.00	0.29	5.00	0.88	0.00	0.88
16.45	2.00	0.29	5.00	0.88	0.00	0.88
16.50	2.00	0.29	5.00	0.88	0.00	0.88
16.55	2.00	0.29	5.00	0.88	0.00	0.88
16.60	2.00	0.29	5.00	0.88	0.00	0.88
16.65	2.00	0.29	5.00	0.88	0.00	0.88
16.70	2.00	0.29	5.00	0.88	0.00	0.88
16.75	2.00	0.29	5.00	0.88	0.00	0.88
16.80	2.00	0.29	5.00	0.88	0.00	0.88
16.85	2.00	0.29	5.00	0.88	0.00	0.88
16.90	2.00	0.29	5.00	0.88	0.00	0.88
16.95	2.00	0.29	5.00	0.88	0.00	0.88
17.00	2.00	0.29	5.00	0.88	0.00	0.88
17.05	2.00	0.29	5.00	0.88	0.00	0.88
17.10	2.00	0.29	5.00	0.88	0.00	0.88
17.15	2.00	0.29	5.00	0.88	0.00	0.88
17.20	2.00	0.29	5.00	0.88	0.00	0.88
17.25	2.00	0.29	5.00	0.88	0.00	0.88
17.30	2.00	0.29	5.00	0.88	0.00	0.88
17.35	2.00	0.29	5.00	0.88	0.00	0.88
17.40	2.00	0.29	5.00	0.88	0.00	0.88
17.45	2.00	0.29	5.00	0.88	0.00	0.88
17.50	2.00	0.29	5.00	0.88	0.00	0.88
17.55	2.00	0.29	5.00	0.88	0.00	0.88
17.60	2.00	0.29	5.00	0.88	0.00	0.88
17.65	2.00	0.29	5.00	0.88	0.00	0.88
17.70	2.00	0.29	5.00	0.88	0.00	0.88
17.75	2.00	0.29	5.00	0.88	0.00	0.88
17.80	2.00	0.29	5.00	0.88	0.00	0.88
17.85	2.00	0.29	5.00	0.88	0.00	0.88
17.90	2.00	0.29	5.00	0.88	0.00	0.88
17.95	2.00	0.29	5.00	0.88	0.00	0.88
18.00	2.00	0.29	5.00	0.88	0.00	0.88
18.05	2.00	0.29	5.00	0.88	0.00	0.88
18.10	2.00	0.29	5.00	0.88	0.00	0.88
18.15	2.00	0.29	5.00	0.88	0.00	0.88
18.20	2.00	0.29	5.00	0.88	0.00	0.88
18.25	2.00	0.29	5.00	0.88	0.00	0.88
18.30	2.00	0.29	5.00	0.88	0.00	0.88

18.35	2.00	0.29	5.00	0.88	0.00	0.88
18.40	2.00	0.29	5.00	0.88	0.00	0.88
18.45	2.00	0.29	5.00	0.88	0.00	0.88
18.50	2.00	0.29	5.00	0.88	0.00	0.88
18.55	2.00	0.29	5.00	0.88	0.00	0.88
18.60	2.00	0.29	5.00	0.88	0.00	0.88
18.65	2.00	0.29	5.00	0.88	0.00	0.88
18.70	2.00	0.29	5.00	0.88	0.00	0.88
18.75	2.00	0.29	5.00	0.88	0.00	0.88
18.80	2.00	0.29	5.00	0.88	0.00	0.88
18.85	2.00	0.29	5.00	0.88	0.00	0.88
18.90	2.00	0.29	5.00	0.88	0.00	0.88
18.95	2.00	0.29	5.00	0.88	0.00	0.88
19.00	2.00	0.29	5.00	0.88	0.00	0.88
19.05	2.00	0.29	5.00	0.88	0.00	0.88
19.10	2.00	0.29	5.00	0.88	0.00	0.88
19.15	2.00	0.29	5.00	0.88	0.00	0.88
19.20	2.00	0.29	5.00	0.88	0.00	0.88
19.25	2.00	0.29	5.00	0.88	0.00	0.88
19.30	2.00	0.29	5.00	0.88	0.00	0.88
19.35	2.00	0.29	5.00	0.88	0.00	0.88
19.40	2.00	0.29	5.00	0.88	0.00	0.88
19.45	2.00	0.29	5.00	0.88	0.00	0.88
19.50	2.00	0.29	5.00	0.88	0.00	0.88
19.55	2.00	0.29	5.00	0.88	0.00	0.88
19.60	2.00	0.29	5.00	0.88	0.00	0.88
19.65	2.00	0.29	5.00	0.88	0.00	0.88
19.70	2.00	0.29	5.00	0.88	0.00	0.88
19.75	2.00	0.29	5.00	0.88	0.00	0.88
19.80	2.00	0.29	5.00	0.88	0.00	0.88
19.85	2.00	0.29	5.00	0.88	0.00	0.88
19.90	2.00	0.29	5.00	0.88	0.00	0.88
19.95	2.00	0.29	5.00	0.88	0.00	0.88
20.00	2.00	0.29	5.00	0.88	0.00	0.88
20.05	2.00	0.29	5.00	0.88	0.00	0.88
20.10	2.00	0.29	5.00	0.88	0.00	0.88
20.15	2.00	0.29	5.00	0.88	0.00	0.88
20.20	2.00	0.29	5.00	0.88	0.00	0.88
20.25	2.00	0.29	5.00	0.88	0.00	0.88
20.30	2.00	0.29	5.00	0.88	0.00	0.88
20.35	2.00	0.29	5.00	0.88	0.00	0.88
20.40	2.00	0.29	5.00	0.88	0.00	0.88
20.45	2.00	0.29	5.00	0.88	0.00	0.88
20.50	2.00	0.29	5.00	0.88	0.00	0.88
20.55	2.00	0.29	5.00	0.88	0.00	0.88
20.60	2.00	0.29	5.00	0.88	0.00	0.88
20.65	2.00	0.29	5.00	0.88	0.00	0.88
20.70	2.00	0.29	5.00	0.88	0.00	0.88
20.75	2.00	0.29	5.00	0.88	0.00	0.88
20.80	2.00	0.29	5.00	0.88	0.00	0.88
20.85	2.00	0.29	5.00	0.88	0.00	0.88
20.90	2.00	0.29	5.00	0.88	0.00	0.88
20.95	2.00	0.29	5.00	0.88	0.00	0.88
21.00	2.00	0.29	5.00	0.88	0.00	0.88
21.05	2.00	0.29	5.00	0.88	0.00	0.88
21.10	2.00	0.29	5.00	0.88	0.00	0.88
21.15	2.00	0.29	5.00	0.88	0.00	0.88
21.20	2.00	0.29	5.00	0.88	0.00	0.88
21.25	2.00	0.29	5.00	0.88	0.00	0.88
21.30	2.00	0.29	5.00	0.88	0.00	0.88
21.35	2.00	0.29	5.00	0.88	0.00	0.88
21.40	2.00	0.29	5.00	0.88	0.00	0.88
21.45	2.00	0.29	5.00	0.88	0.00	0.88

21.50	2.00	0.29	5.00	0.88	0.00	0.88
21.55	2.00	0.29	5.00	0.88	0.00	0.88
21.60	2.00	0.29	5.00	0.88	0.00	0.88
21.65	2.00	0.29	5.00	0.88	0.00	0.88
21.70	2.00	0.29	5.00	0.88	0.00	0.88
21.75	2.00	0.29	5.00	0.88	0.00	0.88
21.80	2.00	0.29	5.00	0.88	0.00	0.88
21.85	2.00	0.29	5.00	0.88	0.00	0.88
21.90	2.00	0.29	5.00	0.88	0.00	0.88
21.95	2.00	0.29	5.00	0.88	0.00	0.88
22.00	2.00	0.29	5.00	0.88	0.00	0.88
22.05	2.00	0.29	5.00	0.88	0.00	0.88
22.10	2.00	0.29	5.00	0.88	0.00	0.88
22.15	2.00	0.29	5.00	0.88	0.00	0.88
22.20	2.00	0.29	5.00	0.88	0.00	0.88
22.25	2.00	0.29	5.00	0.88	0.00	0.88
22.30	2.00	0.29	5.00	0.88	0.00	0.88
22.35	2.00	0.29	5.00	0.88	0.00	0.88
22.40	2.00	0.29	5.00	0.88	0.00	0.88
22.45	2.00	0.29	5.00	0.88	0.00	0.88
22.50	2.00	0.29	5.00	0.88	0.00	0.88
22.55	2.00	0.29	5.00	0.88	0.00	0.88
22.60	2.00	0.29	5.00	0.88	0.00	0.88
22.65	2.00	0.29	5.00	0.88	0.00	0.88
22.70	2.00	0.29	5.00	0.88	0.00	0.88
22.75	2.00	0.29	5.00	0.88	0.00	0.88
22.80	2.00	0.29	5.00	0.88	0.00	0.88
22.85	2.00	0.29	5.00	0.88	0.00	0.88
22.90	2.00	0.29	5.00	0.88	0.00	0.88
22.95	2.00	0.29	5.00	0.88	0.00	0.88
23.00	2.00	0.29	5.00	0.88	0.00	0.88
23.05	2.00	0.29	5.00	0.88	0.00	0.88
23.10	2.00	0.29	5.00	0.88	0.00	0.88
23.15	2.00	0.29	5.00	0.88	0.00	0.88
23.20	2.00	0.29	5.00	0.88	0.00	0.88
23.25	2.00	0.29	5.00	0.88	0.00	0.88
23.30	2.00	0.29	5.00	0.88	0.00	0.88
23.35	2.00	0.29	5.00	0.88	0.00	0.88
23.40	2.00	0.29	5.00	0.88	0.00	0.88
23.45	2.00	0.29	5.00	0.88	0.00	0.88
23.50	2.00	0.29	5.00	0.88	0.00	0.88
23.55	2.00	0.29	5.00	0.88	0.00	0.88
23.60	2.00	0.29	5.00	0.88	0.00	0.88
23.65	2.00	0.29	5.00	0.88	0.00	0.88
23.70	2.00	0.29	5.00	0.88	0.00	0.88
23.75	2.00	0.29	5.00	0.88	0.00	0.88
23.80	2.00	0.29	5.00	0.88	0.00	0.88
23.85	2.00	0.29	5.00	0.88	0.00	0.88
23.90	2.00	0.29	5.00	0.88	0.00	0.88
23.95	2.00	0.29	5.00	0.88	0.00	0.88
24.00	2.00	0.29	5.00	0.88	0.00	0.88
24.05	2.00	0.29	5.00	0.88	0.00	0.88
24.10	2.00	0.29	5.00	0.88	0.00	0.88
24.15	2.00	0.29	5.00	0.88	0.00	0.88
24.20	2.00	0.29	5.00	0.88	0.00	0.88
24.25	2.00	0.29	5.00	0.88	0.00	0.88
24.30	2.00	0.29	5.00	0.88	0.00	0.88
24.35	2.00	0.29	5.00	0.88	0.00	0.88
24.40	2.00	0.29	5.00	0.88	0.00	0.88
24.45	2.00	0.29	5.00	0.88	0.00	0.88
24.50	2.00	0.29	5.00	0.88	0.00	0.88
24.55	2.00	0.29	5.00	0.88	0.00	0.88
24.60	2.00	0.29	5.00	0.88	0.00	0.88

24.65	2.00	0.29	5.00	0.88	0.00	0.88
24.70	2.00	0.29	5.00	0.88	0.00	0.88
24.75	2.00	0.29	5.00	0.88	0.00	0.88
24.80	2.00	0.29	5.00	0.88	0.00	0.88
24.85	2.00	0.29	5.00	0.88	0.00	0.88
24.90	2.00	0.29	5.00	0.88	0.00	0.88
24.95	2.00	0.29	5.00	0.88	0.00	0.88
25.00	2.00	0.29	5.00	0.88	0.00	0.88
25.05	0.47	0.29	1.64	0.88	0.00	0.88
25.10	0.47	0.29	1.63	0.88	0.00	0.88
25.15	0.47	0.29	1.62	0.88	0.00	0.88
25.20	0.46	0.29	1.61	0.88	0.00	0.88
25.25	0.46	0.29	1.60	0.88	0.00	0.88
25.30	0.46	0.29	1.59	0.88	0.00	0.88
25.35	0.46	0.29	1.59	0.88	0.00	0.88
25.40	0.46	0.29	1.58	0.88	0.00	0.88
25.45	0.46	0.29	1.57	0.88	0.00	0.88
25.50	0.45	0.29	1.56	0.87	0.00	0.87
25.55	0.45	0.29	1.56	0.87	0.00	0.87
25.60	0.45	0.29	1.55	0.87	0.00	0.87
25.65	0.45	0.29	1.54	0.87	0.00	0.87
25.70	0.45	0.29	1.54	0.87	0.00	0.87
25.75	0.45	0.29	1.53	0.87	0.00	0.87
25.80	0.45	0.29	1.52	0.87	0.00	0.87
25.85	0.44	0.29	1.52	0.87	0.00	0.87
25.90	0.44	0.29	1.51	0.87	0.00	0.87
25.95	0.44	0.29	1.51	0.87	0.00	0.87
26.00	0.44	0.29	1.50	0.87	0.00	0.87
26.05	0.44	0.29	1.50	0.87	0.00	0.87
26.10	0.44	0.29	1.49	0.86	0.00	0.86
26.15	0.44	0.29	1.48	0.86	0.00	0.86
26.20	0.44	0.29	1.48	0.86	0.00	0.86
26.25	0.43	0.29	1.47	0.86	0.00	0.86
26.30	0.43	0.30	1.47	0.86	0.00	0.86
26.35	0.43	0.30	1.46	0.86	0.00	0.86
26.40	0.43	0.30	1.46	0.86	0.00	0.86
26.45	0.43	0.30	1.45	0.86	0.00	0.86
26.50	0.43	0.30	1.45	0.86	0.00	0.86
26.55	0.43	0.30	1.44	0.86	0.00	0.86
26.60	0.43	0.30	1.44	0.85	0.00	0.85
26.65	0.43	0.30	1.44	0.85	0.00	0.85
26.70	0.43	0.30	1.43	0.85	0.00	0.85
26.75	0.42	0.30	1.43	0.85	0.00	0.85
26.80	0.42	0.30	1.42	0.85	0.00	0.85
26.85	0.42	0.30	1.42	0.85	0.00	0.85
26.90	0.42	0.30	1.41	0.85	0.00	0.85
26.95	0.42	0.30	1.41	0.85	0.00	0.85
27.00	0.42	0.30	1.40	0.85	0.00	0.85
27.05	0.42	0.30	1.40	0.84	0.00	0.84
27.10	0.42	0.30	1.40	0.84	0.00	0.84
27.15	0.42	0.30	1.39	0.84	0.00	0.84
27.20	0.42	0.30	1.39	0.84	0.00	0.84
27.25	0.42	0.30	1.38	0.84	0.00	0.84
27.30	0.42	0.30	1.38	0.84	0.00	0.84
27.35	0.41	0.30	1.38	0.84	0.00	0.84
27.40	0.41	0.30	1.37	0.84	0.00	0.84
27.45	0.41	0.30	1.37	0.83	0.00	0.83
27.50	0.41	0.30	1.37	0.83	0.00	0.83
27.55	0.41	0.30	1.36	0.83	0.00	0.83
27.60	0.41	0.30	1.36	0.83	0.00	0.83
27.65	0.41	0.30	1.35	0.83	0.00	0.83
27.70	0.41	0.30	1.35	0.83	0.00	0.83
27.75	0.41	0.30	1.35	0.83	0.00	0.83

27.80	0.41	0.30	1.34	0.83	0.00	0.83
27.85	0.41	0.30	1.34	0.82	0.00	0.82
27.90	0.47	0.30	1.54	0.82	0.00	0.82
27.95	0.47	0.30	1.54	0.82	0.00	0.82
28.00	0.47	0.30	1.53	0.82	0.00	0.82
28.05	0.46	0.31	1.52	0.82	0.00	0.82
28.10	0.46	0.31	1.51	0.82	0.00	0.82
28.15	0.46	0.31	1.51	0.82	0.00	0.82
28.20	0.46	0.31	1.50	0.82	0.00	0.82
28.25	0.46	0.31	1.49	0.82	0.00	0.82
28.30	0.46	0.31	1.49	0.82	0.00	0.82
28.35	0.45	0.31	1.48	0.82	0.00	0.82
28.40	0.45	0.31	1.48	0.81	0.00	0.81
28.45	0.45	0.31	1.47	0.81	0.00	0.81
28.50	0.45	0.31	1.46	0.81	0.00	0.81
28.55	0.45	0.31	1.46	0.81	0.00	0.81
28.60	0.45	0.31	1.45	0.81	0.00	0.81
28.65	0.45	0.31	1.45	0.81	0.00	0.81
28.70	0.45	0.31	1.44	0.81	0.00	0.81
28.75	0.44	0.31	1.44	0.81	0.00	0.81
28.80	0.44	0.31	1.43	0.81	0.00	0.81
28.85	0.44	0.31	1.43	0.80	0.00	0.80
28.90	0.44	0.31	1.42	0.80	0.00	0.80
28.95	0.44	0.31	1.42	0.80	0.00	0.80
29.00	0.44	0.31	1.41	0.80	0.00	0.80
29.05	0.44	0.31	1.41	0.80	0.00	0.80
29.10	0.44	0.31	1.41	0.80	0.00	0.80
29.15	0.44	0.31	1.40	0.80	0.00	0.80
29.20	0.43	0.31	1.40	0.80	0.00	0.80
29.25	0.43	0.31	1.39	0.80	0.00	0.80
29.30	0.43	0.31	1.39	0.79	0.00	0.79
29.35	0.43	0.31	1.38	0.79	0.00	0.79
29.40	0.43	0.31	1.38	0.79	0.00	0.79
29.45	0.43	0.31	1.38	0.79	0.00	0.79
29.50	0.43	0.31	1.37	0.79	0.00	0.79
29.55	0.43	0.31	1.37	0.79	0.00	0.79
29.60	0.43	0.31	1.36	0.79	0.00	0.79
29.65	0.43	0.31	1.36	0.79	0.00	0.79
29.70	0.43	0.31	1.36	0.79	0.00	0.79
29.75	0.43	0.31	1.36	0.78	0.00	0.78
29.80	0.43	0.31	1.36	0.78	0.00	0.78
29.85	0.43	0.31	1.35	0.78	0.00	0.78
29.90	0.42	0.31	1.35	0.78	0.00	0.78
29.95	0.42	0.32	1.34	0.78	0.00	0.78
30.00	0.42	0.32	1.34	0.78	0.00	0.78
30.05	0.42	0.32	1.33	0.78	0.00	0.78
30.10	0.42	0.32	1.33	0.78	0.00	0.78
30.15	0.42	0.32	1.32	0.77	0.00	0.77
30.20	0.41	0.32	1.31	0.77	0.00	0.77
30.25	0.41	0.32	1.31	0.77	0.00	0.77
30.30	0.41	0.32	1.30	0.77	0.00	0.77
30.35	0.41	0.32	1.29	0.77	0.00	0.77
30.40	0.41	0.32	1.29	0.77	0.00	0.77
30.45	0.41	0.32	1.28	0.77	0.00	0.77
30.50	0.40	0.32	1.27	0.76	0.00	0.76
30.55	0.40	0.32	1.27	0.76	0.00	0.76
30.60	0.40	0.32	1.26	0.76	0.00	0.76
30.65	0.40	0.32	1.26	0.76	0.00	0.76
30.70	0.40	0.32	1.25	0.76	0.00	0.76
30.75	0.40	0.32	1.24	0.76	0.00	0.76
30.80	0.39	0.32	1.24	0.75	0.00	0.75
30.85	0.39	0.32	1.23	0.75	0.00	0.75
30.90	0.39	0.32	1.23	0.75	0.00	0.75

30.95	0.39	0.32	1.22	0.75	0.00	0.75
31.00	0.39	0.32	1.22	0.75	0.00	0.75
31.05	0.39	0.32	1.21	0.75	0.00	0.75
31.10	0.38	0.32	1.21	0.74	0.00	0.74
31.15	0.38	0.32	1.20	0.74	0.00	0.74
31.20	0.38	0.32	1.19	0.74	0.00	0.74
31.25	0.38	0.32	1.19	0.74	0.00	0.74
31.30	0.38	0.32	1.18	0.74	0.00	0.74
31.35	0.38	0.32	1.18	0.74	0.00	0.74
31.40	0.38	0.32	1.17	0.73	0.00	0.73
31.45	0.37	0.32	1.17	0.73	0.00	0.73
31.50	0.37	0.32	1.16	0.73	0.00	0.73
31.55	0.37	0.32	1.16	0.73	0.00	0.73
31.60	0.37	0.32	1.15	0.72	0.00	0.72
31.65	0.37	0.32	1.15	0.72	0.00	0.72
31.70	0.37	0.32	1.14	0.72	0.00	0.72
31.75	0.37	0.32	1.14	0.72	0.00	0.72
31.80	0.36	0.32	1.13	0.72	0.00	0.72
31.85	0.36	0.32	1.13	0.71	0.00	0.71
31.90	0.36	0.32	1.12	0.71	0.00	0.71
31.95	0.36	0.32	1.12	0.71	0.00	0.71
32.00	0.36	0.32	1.12	0.71	0.00	0.71
32.05	0.36	0.32	1.11	0.70	0.00	0.70
32.10	0.36	0.32	1.11	0.70	0.00	0.70
32.15	0.35	0.32	1.10	0.70	0.00	0.70
32.20	0.35	0.32	1.10	0.70	0.00	0.70
32.25	0.35	0.32	1.09	0.69	0.00	0.69
32.30	0.35	0.32	1.09	0.69	0.00	0.69
32.35	0.35	0.32	1.08	0.69	0.00	0.69
32.40	0.35	0.32	1.08	0.68	0.00	0.68
32.45	0.35	0.32	1.07	0.68	0.00	0.68
32.50	0.34	0.32	1.07	0.68	0.00	0.68
32.55	0.34	0.32	1.06	0.68	0.00	0.68
32.60	0.34	0.32	1.06	0.67	0.00	0.67
32.65	0.34	0.32	1.05	0.67	0.00	0.67
32.70	0.34	0.32	1.05	0.67	0.00	0.67
32.75	0.34	0.32	1.05	0.66	0.00	0.66
32.80	0.34	0.32	1.04	0.66	0.00	0.66
32.85	0.33	0.32	1.04	0.66	0.00	0.66
32.90	0.33	0.32	1.03	0.65	0.00	0.65
32.95	0.33	0.32	1.03	0.65	0.00	0.65
33.00	0.33	0.32	1.02	0.65	0.00	0.65
33.05	0.33	0.32	1.02	0.64	0.00	0.64
33.10	0.33	0.32	1.01	0.64	0.00	0.64
33.15	0.33	0.32	1.01	0.63	0.00	0.63
33.20	0.33	0.32	1.01	0.63	0.00	0.63
33.25	0.32	0.32	1.00	0.63	0.00	0.63
33.30	0.32	0.32	1.00*	0.62	0.00	0.62
33.35	0.32	0.32	0.99*	0.62	0.00	0.62
33.40	0.32	0.32	0.99*	0.62	0.00	0.62
33.45	0.32	0.32	0.99*	0.61	0.00	0.61
33.50	0.32	0.32	0.98*	0.61	0.00	0.61
33.55	0.32	0.32	0.98*	0.60	0.00	0.60
33.60	0.32	0.32	0.97*	0.60	0.00	0.60
33.65	0.32	0.33	0.97*	0.59	0.00	0.59
33.70	0.31	0.33	0.97*	0.59	0.00	0.59
33.75	0.31	0.33	0.96*	0.58	0.00	0.58
33.80	0.31	0.33	0.96*	0.58	0.00	0.58
33.85	0.31	0.33	0.95*	0.58	0.00	0.58
33.90	0.31	0.33	0.95*	0.57	0.00	0.57
33.95	0.31	0.33	0.95*	0.57	0.00	0.57
34.00	0.31	0.33	0.94*	0.56	0.00	0.56
34.05	0.31	0.33	0.94*	0.56	0.00	0.56

34.10	0.30	0.33	0.93*	0.55	0.00	0.55
34.15	0.30	0.33	0.93*	0.54	0.00	0.54
34.20	0.30	0.33	0.93*	0.54	0.00	0.54
34.25	0.30	0.33	0.92*	0.53	0.00	0.53
34.30	0.30	0.33	0.92*	0.53	0.00	0.53
34.35	0.30	0.33	0.91*	0.52	0.00	0.52
34.40	0.30	0.33	0.91*	0.52	0.00	0.52
34.45	0.30	0.33	0.90*	0.51	0.00	0.51
34.50	0.29	0.33	0.90*	0.50	0.00	0.50
34.55	0.29	0.33	0.89*	0.50	0.00	0.50
34.60	0.29	0.33	0.89*	0.49	0.00	0.49
34.65	0.29	0.33	0.89*	0.48	0.00	0.48
34.70	0.29	0.33	0.88*	0.48	0.00	0.48
34.75	0.29	0.33	0.88*	0.47	0.00	0.47
34.80	0.29	0.33	0.87*	0.46	0.00	0.46
34.85	0.28	0.33	0.87*	0.46	0.00	0.46
34.90	0.28	0.33	0.86*	0.45	0.00	0.45
34.95	0.28	0.33	0.86*	0.44	0.00	0.44
35.00	0.28	0.33	0.86*	0.44	0.00	0.44
35.05	0.28	0.33	0.86*	0.43	0.00	0.43
35.10	0.28	0.33	0.87*	0.42	0.00	0.42
35.15	0.29	0.33	0.88*	0.41	0.00	0.41
35.20	0.29	0.33	0.88*	0.41	0.00	0.41
35.25	0.29	0.33	0.89*	0.40	0.00	0.40
35.30	0.29	0.33	0.90*	0.39	0.00	0.39
35.35	0.30	0.33	0.90*	0.39	0.00	0.39
35.40	0.30	0.33	0.91*	0.38	0.00	0.38
35.45	0.30	0.33	0.92*	0.38	0.00	0.38
35.50	0.30	0.33	0.93*	0.37	0.00	0.37
35.55	0.31	0.33	0.93*	0.36	0.00	0.36
35.60	0.31	0.33	0.94*	0.36	0.00	0.36
35.65	0.31	0.33	0.95*	0.35	0.00	0.35
35.70	0.31	0.33	0.96*	0.35	0.00	0.35
35.75	0.32	0.33	0.97*	0.34	0.00	0.34
35.80	0.32	0.33	0.97*	0.34	0.00	0.34
35.85	0.32	0.33	0.98*	0.34	0.00	0.34
35.90	0.33	0.33	0.99*	0.33	0.00	0.33
35.95	0.33	0.33	1.00*	0.33	0.00	0.33
36.00	0.33	0.33	1.01	0.32	0.00	0.32
36.05	0.34	0.33	1.02	0.32	0.00	0.32
36.10	0.34	0.33	1.03	0.32	0.00	0.32
36.15	0.34	0.33	1.04	0.31	0.00	0.31
36.20	0.34	0.33	1.05	0.31	0.00	0.31
36.25	0.35	0.33	1.06	0.31	0.00	0.31
36.30	0.35	0.33	1.07	0.30	0.00	0.30
36.35	0.35	0.33	1.08	0.30	0.00	0.30
36.40	0.36	0.33	1.09	0.30	0.00	0.30
36.45	0.36	0.33	1.10	0.29	0.00	0.29
36.50	0.37	0.33	1.11	0.29	0.00	0.29
36.55	0.37	0.33	1.12	0.29	0.00	0.29
36.60	0.37	0.33	1.13	0.29	0.00	0.29
36.65	0.38	0.33	1.14	0.28	0.00	0.28
36.70	0.38	0.33	1.16	0.28	0.00	0.28
36.75	0.39	0.33	1.17	0.28	0.00	0.28
36.80	0.39	0.33	1.18	0.28	0.00	0.28
36.85	0.40	0.33	1.20	0.28	0.00	0.28
36.90	0.40	0.33	1.21	0.27	0.00	0.27
36.95	0.41	0.33	1.23	0.27	0.00	0.27
37.00	0.41	0.33	1.25	0.27	0.00	0.27
37.05	0.42	0.33	1.26	0.27	0.00	0.27
37.10	0.42	0.33	1.28	0.27	0.00	0.27
37.15	0.43	0.33	1.31	0.27	0.00	0.27
37.20	0.44	0.33	1.33	0.27	0.00	0.27

37.25	0.45	0.33	1.36	0.26	0.00	0.26
37.30	0.46	0.33	1.40	0.26	0.00	0.26
37.35	0.48	0.33	1.45	0.26	0.00	0.26
37.40	0.51	0.33	1.53	0.26	0.00	0.26
37.45	0.56	0.33	1.68	0.26	0.00	0.26
37.50	2.25	0.33	5.00	0.26	0.00	0.26
37.55	2.25	0.33	5.00	0.26	0.00	0.26
37.60	2.25	0.33	5.00	0.26	0.00	0.26
37.65	2.25	0.33	5.00	0.26	0.00	0.26
37.70	2.25	0.33	5.00	0.26	0.00	0.26
37.75	2.25	0.33	5.00	0.26	0.00	0.26
37.80	2.25	0.33	5.00	0.26	0.00	0.26
37.85	2.25	0.33	5.00	0.26	0.00	0.26
37.90	2.25	0.33	5.00	0.26	0.00	0.26
37.95	2.25	0.33	5.00	0.26	0.00	0.26
38.00	2.25	0.33	5.00	0.26	0.00	0.26
38.05	2.25	0.33	5.00	0.26	0.00	0.26
38.10	2.25	0.33	5.00	0.26	0.00	0.26
38.15	2.25	0.33	5.00	0.26	0.00	0.26
38.20	2.25	0.33	5.00	0.26	0.00	0.26
38.25	2.25	0.33	5.00	0.26	0.00	0.26
38.30	2.25	0.33	5.00	0.26	0.00	0.26
38.35	2.25	0.33	5.00	0.26	0.00	0.26
38.40	2.25	0.33	5.00	0.26	0.00	0.26
38.45	2.25	0.33	5.00	0.26	0.00	0.26
38.50	2.25	0.33	5.00	0.26	0.00	0.26
38.55	2.24	0.33	5.00	0.26	0.00	0.26
38.60	2.24	0.33	5.00	0.26	0.00	0.26
38.65	2.24	0.33	5.00	0.26	0.00	0.26
38.70	2.24	0.33	5.00	0.26	0.00	0.26
38.75	2.24	0.33	5.00	0.26	0.00	0.26
38.80	2.24	0.33	5.00	0.26	0.00	0.26
38.85	2.24	0.33	5.00	0.26	0.00	0.26
38.90	2.24	0.33	5.00	0.26	0.00	0.26
38.95	2.24	0.33	5.00	0.26	0.00	0.26
39.00	2.24	0.33	5.00	0.26	0.00	0.26
39.05	2.24	0.33	5.00	0.26	0.00	0.26
39.10	2.24	0.33	5.00	0.26	0.00	0.26
39.15	2.24	0.33	5.00	0.26	0.00	0.26
39.20	2.24	0.33	5.00	0.26	0.00	0.26
39.25	2.24	0.33	5.00	0.26	0.00	0.26
39.30	2.24	0.33	5.00	0.26	0.00	0.26
39.35	2.24	0.33	5.00	0.26	0.00	0.26
39.40	2.24	0.33	5.00	0.26	0.00	0.26
39.45	2.24	0.33	5.00	0.26	0.00	0.26
39.50	2.24	0.33	5.00	0.26	0.00	0.26
39.55	2.24	0.33	5.00	0.26	0.00	0.26
39.60	2.24	0.33	5.00	0.26	0.00	0.26
39.65	2.24	0.33	5.00	0.26	0.00	0.26
39.70	2.24	0.33	5.00	0.26	0.00	0.26
39.75	2.24	0.33	5.00	0.26	0.00	0.26
39.80	2.24	0.33	5.00	0.26	0.00	0.26
39.85	2.24	0.33	5.00	0.26	0.00	0.26
39.90	2.24	0.33	5.00	0.26	0.00	0.26
39.95	2.24	0.33	5.00	0.26	0.00	0.26
40.00	2.24	0.33	5.00	0.26	0.00	0.26
40.05	2.24	0.33	5.00	0.26	0.00	0.26
40.10	2.24	0.33	5.00	0.26	0.00	0.26
40.15	2.24	0.33	5.00	0.26	0.00	0.26
40.20	2.24	0.33	5.00	0.26	0.00	0.26
40.25	2.24	0.33	5.00	0.26	0.00	0.26
40.30	2.24	0.33	5.00	0.26	0.00	0.26
40.35	2.24	0.33	5.00	0.26	0.00	0.26

40.40	2.24	0.33	5.00	0.26	0.00	0.26
40.45	2.23	0.33	5.00	0.26	0.00	0.26
40.50	2.23	0.33	5.00	0.26	0.00	0.26
40.55	2.23	0.33	5.00	0.26	0.00	0.26
40.60	2.23	0.33	5.00	0.26	0.00	0.26
40.65	2.23	0.33	5.00	0.26	0.00	0.26
40.70	2.23	0.33	5.00	0.26	0.00	0.26
40.75	2.23	0.33	5.00	0.26	0.00	0.26
40.80	2.23	0.33	5.00	0.26	0.00	0.26
40.85	2.23	0.33	5.00	0.26	0.00	0.26
40.90	2.23	0.33	5.00	0.26	0.00	0.26
40.95	2.23	0.33	5.00	0.26	0.00	0.26
41.00	2.23	0.33	5.00	0.26	0.00	0.26
41.05	2.23	0.33	5.00	0.26	0.00	0.26
41.10	2.23	0.33	5.00	0.26	0.00	0.26
41.15	2.23	0.33	5.00	0.26	0.00	0.26
41.20	2.23	0.33	5.00	0.26	0.00	0.26
41.25	2.23	0.33	5.00	0.26	0.00	0.26
41.30	2.23	0.33	5.00	0.26	0.00	0.26
41.35	2.23	0.33	5.00	0.26	0.00	0.26
41.40	2.23	0.33	5.00	0.26	0.00	0.26
41.45	2.23	0.33	5.00	0.26	0.00	0.26
41.50	2.23	0.33	5.00	0.26	0.00	0.26
41.55	2.23	0.33	5.00	0.26	0.00	0.26
41.60	2.23	0.33	5.00	0.26	0.00	0.26
41.65	2.23	0.33	5.00	0.26	0.00	0.26
41.70	2.23	0.33	5.00	0.26	0.00	0.26
41.75	2.23	0.33	5.00	0.26	0.00	0.26
41.80	2.23	0.33	5.00	0.26	0.00	0.26
41.85	2.23	0.33	5.00	0.26	0.00	0.26
41.90	2.23	0.33	5.00	0.26	0.00	0.26
41.95	2.23	0.33	5.00	0.26	0.00	0.26
42.00	2.23	0.33	5.00	0.26	0.00	0.26
42.05	2.23	0.33	5.00	0.26	0.00	0.26
42.10	2.23	0.33	5.00	0.26	0.00	0.26
42.15	2.23	0.33	5.00	0.26	0.00	0.26
42.20	2.23	0.33	5.00	0.26	0.00	0.26
42.25	2.23	0.33	5.00	0.26	0.00	0.26
42.30	0.53	0.33	1.58	0.26	0.00	0.26
42.35	0.49	0.33	1.46	0.26	0.00	0.26
42.40	0.47	0.34	1.39	0.26	0.00	0.26
42.45	0.45	0.34	1.35	0.26	0.00	0.26
42.50	0.44	0.34	1.31	0.26	0.00	0.26
42.55	0.43	0.34	1.28	0.25	0.00	0.25
42.60	0.42	0.34	1.26	0.25	0.00	0.25
42.65	0.41	0.34	1.23	0.25	0.00	0.25
42.70	0.41	0.34	1.21	0.25	0.00	0.25
42.75	0.40	0.34	1.20	0.25	0.00	0.25
42.80	0.40	0.34	1.18	0.25	0.00	0.25
42.85	0.39	0.34	1.16	0.24	0.00	0.24
42.90	0.38	0.34	1.15	0.24	0.00	0.24
42.95	0.38	0.34	1.13	0.24	0.00	0.24
43.00	0.38	0.34	1.12	0.24	0.00	0.24
43.05	0.37	0.34	1.11	0.24	0.00	0.24
43.10	0.37	0.34	1.09	0.23	0.00	0.23
43.15	0.36	0.34	1.08	0.23	0.00	0.23
43.20	0.36	0.34	1.07	0.23	0.00	0.23
43.25	0.35	0.34	1.06	0.23	0.00	0.23
43.30	0.35	0.34	1.05	0.22	0.00	0.22
43.35	0.35	0.34	1.03	0.22	0.00	0.22
43.40	0.34	0.34	1.02	0.22	0.00	0.22
43.45	0.34	0.34	1.01	0.21	0.00	0.21
43.50	0.34	0.34	1.00	0.21	0.00	0.21

43.55	0.33	0.34	0.99*	0.21	0.00	0.21
43.60	0.33	0.34	0.98*	0.20	0.00	0.20
43.65	0.33	0.34	0.97*	0.20	0.00	0.20
43.70	0.32	0.34	0.96*	0.19	0.00	0.19
43.75	0.32	0.34	0.96*	0.19	0.00	0.19
43.80	0.32	0.34	0.95*	0.18	0.00	0.18
43.85	0.31	0.34	0.94*	0.18	0.00	0.18
43.90	0.31	0.34	0.93*	0.17	0.00	0.17
43.95	0.31	0.34	0.92*	0.17	0.00	0.17
44.00	0.31	0.34	0.91*	0.16	0.00	0.16
44.05	0.30	0.34	0.90*	0.16	0.00	0.16
44.10	0.30	0.34	0.90*	0.15	0.00	0.15
44.15	0.30	0.34	0.89*	0.15	0.00	0.15
44.20	0.30	0.34	0.88*	0.14	0.00	0.14
44.25	0.29	0.34	0.87*	0.13	0.00	0.13
44.30	0.29	0.34	0.86*	0.13	0.00	0.13
44.35	0.29	0.34	0.86*	0.12	0.00	0.12
44.40	0.29	0.34	0.85*	0.11	0.00	0.11
44.45	0.28	0.34	0.84*	0.11	0.00	0.11
44.50	0.28	0.34	0.83*	0.10	0.00	0.10
44.55	0.28	0.34	0.83*	0.09	0.00	0.09
44.60	0.28	0.34	0.82*	0.08	0.00	0.08
44.65	0.27	0.34	0.81*	0.08	0.00	0.08
44.70	0.27	0.34	0.81*	0.07	0.00	0.07
44.75	0.27	0.34	0.80*	0.06	0.00	0.06
44.80	0.27	0.34	0.79*	0.05	0.00	0.05
44.85	0.26	0.34	0.79*	0.04	0.00	0.04
44.90	0.26	0.34	0.78*	0.03	0.00	0.03
44.95	0.26	0.34	0.77*	0.02	0.00	0.02
45.00	0.26	0.34	0.77*	0.01	0.00	0.01
45.05	2.00	0.34	5.00	0.00	0.00	0.00
45.10	2.00	0.34	5.00	0.00	0.00	0.00
45.15	2.00	0.34	5.00	0.00	0.00	0.00
45.20	2.00	0.34	5.00	0.00	0.00	0.00
45.25	2.00	0.34	5.00	0.00	0.00	0.00
45.30	2.00	0.34	5.00	0.00	0.00	0.00
45.35	2.00	0.34	5.00	0.00	0.00	0.00
45.40	2.00	0.34	5.00	0.00	0.00	0.00
45.45	2.00	0.34	5.00	0.00	0.00	0.00
45.50	2.00	0.34	5.00	0.00	0.00	0.00
45.55	2.00	0.34	5.00	0.00	0.00	0.00
45.60	2.00	0.34	5.00	0.00	0.00	0.00
45.65	2.00	0.34	5.00	0.00	0.00	0.00
45.70	2.00	0.34	5.00	0.00	0.00	0.00
45.75	2.00	0.34	5.00	0.00	0.00	0.00
45.80	2.00	0.34	5.00	0.00	0.00	0.00
45.85	2.00	0.34	5.00	0.00	0.00	0.00
45.90	2.00	0.34	5.00	0.00	0.00	0.00
45.95	2.00	0.34	5.00	0.00	0.00	0.00
46.00	2.00	0.34	5.00	0.00	0.00	0.00
46.05	2.00	0.34	5.00	0.00	0.00	0.00
46.10	2.00	0.34	5.00	0.00	0.00	0.00
46.15	2.00	0.34	5.00	0.00	0.00	0.00
46.20	2.00	0.34	5.00	0.00	0.00	0.00
46.25	2.00	0.34	5.00	0.00	0.00	0.00
46.30	2.00	0.34	5.00	0.00	0.00	0.00
46.35	2.00	0.34	5.00	0.00	0.00	0.00
46.40	2.00	0.34	5.00	0.00	0.00	0.00
46.45	2.00	0.34	5.00	0.00	0.00	0.00
46.50	2.00	0.34	5.00	0.00	0.00	0.00
46.55	2.00	0.34	5.00	0.00	0.00	0.00
46.60	2.00	0.34	5.00	0.00	0.00	0.00
46.65	2.00	0.34	5.00	0.00	0.00	0.00

46.70	2.00	0.34	5.00	0.00	0.00	0.00
46.75	2.00	0.34	5.00	0.00	0.00	0.00
46.80	2.00	0.34	5.00	0.00	0.00	0.00
46.85	2.00	0.34	5.00	0.00	0.00	0.00
46.90	2.00	0.34	5.00	0.00	0.00	0.00
46.95	2.00	0.34	5.00	0.00	0.00	0.00
47.00	2.00	0.34	5.00	0.00	0.00	0.00
47.05	2.00	0.34	5.00	0.00	0.00	0.00
47.10	2.00	0.34	5.00	0.00	0.00	0.00
47.15	2.00	0.34	5.00	0.00	0.00	0.00
47.20	2.00	0.34	5.00	0.00	0.00	0.00
47.25	2.00	0.34	5.00	0.00	0.00	0.00
47.30	2.00	0.34	5.00	0.00	0.00	0.00
47.35	2.00	0.34	5.00	0.00	0.00	0.00
47.40	2.00	0.34	5.00	0.00	0.00	0.00
47.45	2.00	0.34	5.00	0.00	0.00	0.00
47.50	2.00	0.34	5.00	0.00	0.00	0.00
47.55	2.00	0.34	5.00	0.00	0.00	0.00
47.60	2.00	0.34	5.00	0.00	0.00	0.00
47.65	2.00	0.34	5.00	0.00	0.00	0.00
47.70	2.00	0.34	5.00	0.00	0.00	0.00
47.75	2.00	0.34	5.00	0.00	0.00	0.00
47.80	2.00	0.34	5.00	0.00	0.00	0.00
47.85	2.00	0.34	5.00	0.00	0.00	0.00
47.90	2.00	0.34	5.00	0.00	0.00	0.00
47.95	2.00	0.34	5.00	0.00	0.00	0.00
48.00	2.00	0.34	5.00	0.00	0.00	0.00
48.05	2.00	0.34	5.00	0.00	0.00	0.00
48.10	2.00	0.34	5.00	0.00	0.00	0.00
48.15	2.00	0.34	5.00	0.00	0.00	0.00
48.20	2.00	0.34	5.00	0.00	0.00	0.00
48.25	2.00	0.34	5.00	0.00	0.00	0.00
48.30	2.00	0.34	5.00	0.00	0.00	0.00
48.35	2.00	0.34	5.00	0.00	0.00	0.00
48.40	2.00	0.34	5.00	0.00	0.00	0.00
48.45	2.00	0.34	5.00	0.00	0.00	0.00
48.50	2.00	0.34	5.00	0.00	0.00	0.00
48.55	2.00	0.34	5.00	0.00	0.00	0.00
48.60	2.00	0.34	5.00	0.00	0.00	0.00
48.65	2.00	0.34	5.00	0.00	0.00	0.00
48.70	2.00	0.34	5.00	0.00	0.00	0.00
48.75	2.00	0.34	5.00	0.00	0.00	0.00
48.80	2.00	0.34	5.00	0.00	0.00	0.00
48.85	2.00	0.34	5.00	0.00	0.00	0.00
48.90	2.00	0.34	5.00	0.00	0.00	0.00
48.95	2.00	0.34	5.00	0.00	0.00	0.00
49.00	2.00	0.34	5.00	0.00	0.00	0.00
49.05	2.00	0.34	5.00	0.00	0.00	0.00
49.10	2.00	0.34	5.00	0.00	0.00	0.00
49.15	2.00	0.34	5.00	0.00	0.00	0.00
49.20	2.00	0.34	5.00	0.00	0.00	0.00
49.25	2.00	0.34	5.00	0.00	0.00	0.00
49.30	2.00	0.34	5.00	0.00	0.00	0.00
49.35	2.00	0.34	5.00	0.00	0.00	0.00
49.40	2.00	0.34	5.00	0.00	0.00	0.00
49.45	2.00	0.34	5.00	0.00	0.00	0.00
49.50	2.00	0.34	5.00	0.00	0.00	0.00
49.55	2.00	0.34	5.00	0.00	0.00	0.00
49.60	2.00	0.34	5.00	0.00	0.00	0.00
49.65	2.00	0.34	5.00	0.00	0.00	0.00
49.70	2.00	0.34	5.00	0.00	0.00	0.00
49.75	2.00	0.34	5.00	0.00	0.00	0.00
49.80	2.00	0.34	5.00	0.00	0.00	0.00

49.85	2.00	0.34	5.00	0.00	0.00	0.00
49.90	2.00	0.34	5.00	0.00	0.00	0.00
49.95	2.00	0.34	5.00	0.00	0.00	0.00
50.00	2.00	0.34	5.00	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units Depth = ft, Stress or Pressure = tsf (atm), Unit Weight = pcf, Settlement = in.

CRRm Cyclic resistance ratio from soils
CSRfs Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRfs
S_sat Settlement from saturated sands
S_dry Settlement from dry sands
S_all Total settlement from saturated and dry sands
NoLiq No-Liquefy Soils

APPENDIX D

EARTHWORK SPECIFICATIONS

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EARTHWORK SPECIFICATIONS

D1.1 Scope of Work

The work includes all labor, supplies and construction equipment required to construct the building pads in a good workmanlike manner, as shown on the drawings and herein specified. The major items of work covered in this section include the following:

- Site Inspection
- Authority of Geotechnical Engineer
- Site Clearing
- Excavations
- Preparation of Fill Areas
- Placement and Compaction of Fills
- Observation and Testing

D1.2 Site Inspection

1. The Contractor shall carefully examine the site and make all inspections necessary in order to determine the full extent of the work required to make the completed work conform to the drawings and specifications. The Contractor shall satisfy himself as to the nature and location of the work, ground surface and the characteristics of equipment and facilities needed prior to and during prosecution of the work. The Contractor shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the drawings, or between the drawings and specifications must be brought to the Owner's attention in order to clarify the exact nature of the work to be performed.

2. The *Geotechnical Study Report* by Converse Consultants may be used as a reference to the surface and subsurface conditions on this project. The information presented in this above referenced report is intended for use in design and is subject to confirmation of the conditions encountered during construction. The exploration logs and related information depict subsurface conditions only at the particular time and location designated on the boring logs. Subsurface conditions at other locations may differ from conditions encountered at the exploration locations. In addition, the passage of time may result in a change in subsurface conditions at the exploration locations. Any review of this information shall not relieve the Contractor from performing such independent investigation and evaluation to satisfy himself as to the nature of the surface and

subsurface conditions to be encountered and the procedures to be used in performing his work.

D1.3 Authority of the Geotechnical Engineer

1. The Geotechnical Engineer will observe the placement of compacted fill and will take sufficient tests to determine the uniformity and degree of compaction of filled ground.

2. As the Owner's representative, the Geotechnical Engineer will (a) have the authority to cause the removal and replacement of loose, soft, disturbed and other unsatisfactory soils and uncontrolled fills; (b) have the authority to approve the preparation of native ground to receive fill material; and (c) have the authority to approve or reject soils proposed for use in building areas.

3. The Civil Engineer and/or Owner will decide all questions regarding (a) the interpretation of the drawings and specifications, (b) the acceptable fulfillment of the contract on the part of the Contractor and (c) the matters of compensation.

D1.4 Site Clearing

1. Clearing and grubbing shall consist of the removal of all existing pavement, foundation, utilities, and vegetation from building areas to be graded.

2. Organic and inorganic materials resulting from the clearing and grubbing operations shall be hauled away from the areas to be graded.

D1.5 Excavations

1. Based on observations made during our field explorations, the surficial soils can be excavated with conventional earthwork equipment.

D1.6 Preparation of Fill Areas

1. Organic material, organic soils, incompetent alluvium, all undocumented fill and debris shall be removed from the proposed building/structures areas as outlined in the referenced Converse Consultants report

2. After the required removals have been made, the exposed native earth materials shall be excavated to provide a zone of structural fill for the support of footings, slabs-on-grade, exterior flatwork. All loose, soft or disturbed earth materials should be removed from the bottom of excavations before placing structural fill.

3. The subgrade, in all areas to receive fill, shall be scarified to a minimum depth of six (6) inches. On-site materials should be compacted with the water content at, or within two (2) percent of the optimum as determined from ASTM Test Method D1557. Scarification may be terminated on moderately hard to hard cemented earth materials with the approval of the Geotechnical Engineer.

4. Compacted fill may be placed on native soils that have been properly scarified and recompacted as discussed above.

5. All areas to receive compacted fill will be observed and evaluated by the Geotechnical Engineer before the placement of fill.

D1.7 Placement and Compaction of Fills

1. Compacted fill placed for the support of footings, slabs-on-grade, exterior concrete flatwork, and driveways shall be considered structural fill. Structural fill may consist of approved onsite soils or imported fill that meets the criteria indicated below.

2. Fill consisting of selected on-site earth materials or imported soils approved by the Geotechnical Engineer shall be placed in layers on approved earth materials. Soils used as compacted structural fill shall have the following characteristics:

    a. All fill soil particles should not exceed three (3) inches in nominal size, and should be free of organic matter and miscellaneous inorganic debris and inert rubble.

    b. In order to limit moisture penetration to foundation earth materials, imported fill materials should be similar to on-site earth materials with at least 30 percent passing the No. 200 sieve. As an alternative to 30 percent passing the No. 200 sieve, import materials with a remolded permeability of $1 \times 10^{(-6)}$ cm/sec or less would be acceptable.

    c. Fill materials within the proposed structure areas and to five (5) feet beyond the building limits shall have an Expansion Index (EI) less than 20. All imported fill should be compacted to at least 90 percent of maximum dry density (ASTM D1557-00) at about two (2) percent above optimum moisture for fine grained soils, and within two (2) percent of optimum for granular soils.

    d. Imported fill materials should have less than 0.1 percent sulfate salts, if possible. If laboratory test results indicate import fill materials contain

more than 0.1 percent sulfate salts, a concrete mix shall be designed to resist the sulfate levels indicated by the laboratory test results.

3. Fill soils shall be evenly spread in maximum eight-inch lifts, watered or dried as necessary, mixed and compacted to at least the density specified below. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer.

4. All fill placed at the site shall be compacted to at least 90 percent of the maximum laboratory density as determined by ASTM D1557. Granular soils shall be moisture conditioned to within two (2) percent, and fine-grained soils to at least three (3) percent above optimum moisture content.

5. Fill exceeding five (5) feet in height shall not be placed on native slopes that are steeper than 5 to 1 (horizontal to vertical). Where native slopes are steeper than 5 to 1, and the height of the fill is greater than five (5) feet, the fill shall be benched into competent materials. The height and width of the benches shall be at least two (2) feet.

6. Representative samples of materials being used as compacted fill will be analyzed in the laboratory by the Geotechnical Engineer to obtain information on their physical properties. Maximum laboratory density of each soil type used in the compacted fill will be determined by the ASTM D1557 compaction method.

7. Fill materials shall not be placed, spread or compacted during unfavorable weather conditions. When site grading is interrupted by heavy rain, filling operations shall not resume until the Geotechnical Engineer approves the moisture and density conditions of the previously placed fill.

8. It shall be the Grading Contractor's obligation to take all measures deemed necessary during grading to provide erosion control devices in order to protect slope areas and adjacent properties from storm damage and flood hazard originating on this project. It shall be the Contractor's responsibility to maintain slopes in their as-graded form until all slopes are in satisfactory compliance with job specifications, all berms have been properly constructed, and all associated drainage devices meet the requirements of the Civil Engineer.

D1.8 Observation and Testing

1. During the progress of grading, the Geotechnical Engineer will provide observation of the fill placement operations.

2. Field density tests will be made during grading to provide an opinion on the degree of compaction being obtained by the Contractor. Where compaction of less than specified herein is indicated, additional compactive effort with adjustment of the moisture content shall be made as necessary until the required degree of compaction is obtained.

3. A sufficient number of field density tests will be performed to provide an opinion to the degree of compaction achieved. In general, density tests will be performed on each one-foot lift of fill, but not less than one for each 500 cubic yards of fill placed.