DSA APPLICATION NO.
A - 112620

San Gabriel Unified School District

PROJECT MANUAL

Instructions to Bidders

General Conditions

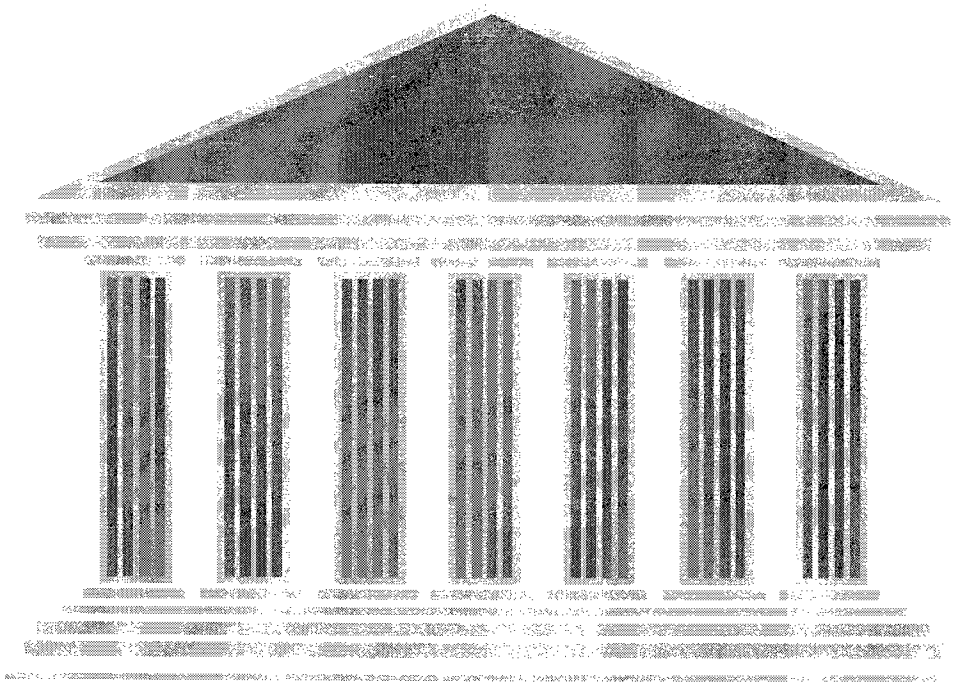
Technical Specifications
Divisions 1 through 16

Geotechnical Report

Del Mar High School CEC
Bus Depot Conversion
312 South Del Mar Avenue
San Gabriel, California 91776

February, 2009

IBI Group
18401 Von Karman Ave-Suite 110



SAN GABRIEL UNIFIED SCHOOL DISTRICT

BID NUMBER 02-09/10

Del Mar High School Modernization Project

Issue Date:	**March 3, 2010**
Mandatory Bidders Conference:	**March 3, 2010 - 10:00 AM *Sharp!***
Bid Submittal and Opening Date:	**March 17, 2010 - 2:00 PM *Sharp!***

SAN GABRIEL UNIFIED SCHOOL DISTRICT
BID PACKAGE

FOR

Del Mar High School Modernization Project
AT

Del Mar High School

BID NO. 02-09/10

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SPECIFICATIONS AND/OR DRAWINGS

NOTICE TO CONTRACTORS CALLING FOR BIDS

NOTICE IS HEREBY GIVEN that the San Gabriel Unified School District of Los Angeles County, California, acting by and through its Governing Board, hereinafter referred to as the District, will receive up to, but not later than **2:00 p.m.** on **March 17, 2010**, sealed bids for the award of a contract for:

Bid No. 02-09/10 DEL MAR HIGH SCHOOL MODERNIZATION PROJECT

All bids shall be made and presented on a form furnished by the District. Bids shall be received in the office of the Director of Purchasing and shall be opened and publicly read aloud at the above stated time and place.

Each bid must conform with and be responsive to the contract documents. Bid documents will be available on Wednesday March 3, 2010 and may be obtained at Ford Graphics, 681 South Raymond Avenue, Pasadena, California (626) 583-1122, for a non-refundable fee of $200.00. Please make checks payable to San Gabriel Unified School District. Each bid shall be accompanied by (1) the security referred to in the contract documents; (2) the list of proposed subcontractors; and (3) the Non-collusion Affidavit; and, (4) a completed Contractor's Qualifications Questionnaire. Bidders must hold a current California Contractor's License in the classification of B License or the appropriate license required by the State of California.

A mandatory bidder's conference and job-walk will be conducted on Wednesday, March 3, 2010 at 10:00 A.M., at Del Mar High School, 312 South Del Mar, San Gabriel, California 91776.

The District has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which the work is to be performed for each craft, classification, or type of work needed to execute the contract. Holiday rates shall be paid as specified in the collective bargaining agreement applicable to each particular craft, classification, or type of work employed on the project.

Copies of schedules of rates are on the Internet (http://www.dir.ca.gov/DLSR/statistics_research.html) and are on file and available at the District's principal office located at 408 Junipero Serra Drive, San Gabriel, California 91776. In accordance with Section 1773.2 of the California Labor Code, the Contractor shall post a copy of the determination of prevailing rate of wages at each jobsite. The schedule of per diem wages is based upon a working day of eight (8) hours. The rate for holiday and overtime work shall be at time and one-half. The Contractor and any subcontractor(s) shall pay not less than the specified prevailing rates of wages to all workers employed by them in the execution of the contract. In accordance with provisions of Public Contract Code Section 22300, substitution of eligible and equivalent securities for any monies withheld to ensure performance under this contract will be permitted at the request and expense of the Contractor.

No bidder may withdraw his bid for a period of sixty (60) days after the date set for the opening of bids.

The District reserves the right to reject any and all bids or to waive irregularities in any bid.

San Gabriel Unified School District is an "equal opportunity" employer.

Susan La Brada Celaya
Susan La Brada Celaya
Director of Purchasing
San Gabriel Unified School District
Los Angeles County, State of California

BID NO. 02-09/10
OPENING DATE: March 17, 2010
TIME: 2:00 P.M.

NOTICE OF MANDATORY PRE-BID
BIDDERS CONFERENCE AND JOB WALK

The San Gabriel Unified School District is scheduling a Mandatory Pre-Bid Job Walk and Bidders Conference to answer any questions and explain details regarding the specifications and scope of the work. This will give bidding contractors the opportunity to investigate and fully acquaint themselves with the conditions relating to the job so that they may fully understand the facilities, difficulties and restrictions attending the execution of the work. **Any contractor interested in bidding is required to attend this mandatory job-walk.**

PLACE:	Del Mar High School 312 South Del Mar San Gabriel, CA 91776
DATE:	March 3, 2010
TIME:	10:00 A. M. ***Sharp! No One Admitted After This Time!***

Questions may be directed to Marla Nadolney, Project Manager
Telephone (626) 285-1242 Fax (626) 285-2305

BID OVERVIEW

It is anticipated that the Board of Education will award contract(s) for this bid at its regular meeting scheduled for April 20, 2010.

The Notice to Proceed date is anticipated to be April 21, 2010. The contract period is anticipated to be ten (10) months. Construction shall be completed within 300 days of the Contract Date, with a completion date of February 28, 2011.

It is imperative that absolutely no disruption to the basic school program occur. Please note the liquidated damages provision of this bid.

Project Description:

The Del Mar High School modernization project consists of converting the existing bus garage into two classrooms, a fitness center, restrooms and storage. The parking lot will be redone with new walkways, benches, half court basketball and landscaping. A new perimeter fence and gates will be installed along Del Mar Avenue.

Thank you for your interest.

Susan La Brada Celaya
Director of Purchasing

INFORMATION FOR BIDDERS

1. **Preparation of Bid Form** The District invites bids on the form attached to be submitted at such time and place as is stated in the Notice to Contractors Calling for Bids. All blanks in the bid form must be appropriately filled in. All bids shall be submitted in sealed envelopes bearing on the outside the name of the bidder, his address, the bid number, and the name of the project for which the bid is submitted. It is the sole responsibility of the bidder to see that his bid is received in proper time. Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

2. **Bid Security** Each bid shall be accompanied by a certified or cashier's check payable to the District, or a satisfactory bid bond, in favor of the District, executed by the bidder as principal and a **legally admitted California surety insurer** as surety, in an amount not less than **TEN PERCENT (10%)** of the maximum amount of the bid. The check or bid bond shall be given as guarantee that the bidder shall execute the contract if it is awarded to him in conformity with the contract documents and shall provide the surety bond or bonds as specified therein within five (5) days after notification of the award of the contract to the bidder.

3. **Signature** The bid must be signed in the name of the bidder and must bear the signature in longhand of the person or persons duly authorized to sign the bid on behalf of the bidder.

4. **Modifications** Changes in or additions to the bid form, recapitulations of the work bid upon, alternative proposals, or any other modification of the bid form which is not specifically called for in the contract documents may result in the District's rejection of the bid as not being responsive to the invitation to bid. No oral or telephonic modifications of any bid submitted will be considered, and a telegraphic modification may be considered only if the postmark evidences that a confirmation of the telegram duly signed by the bidder was placed in the mail prior to the opening of bids.

5. **Erasures** The bid submitted must not contain any erasures, interlineations, or other corrections unless each such correction is suitably authenticated by affixing in the margin immediately opposite the correction the surname or surnames of the persons signing the bid.

6. **Examination of Site and Contract Documents** Each bidder shall visit the site of the proposed work and fully acquaint himself with the conditions relating to the construction and labor so that he may fully understand the facilities, difficulties, and restrictions attending the execution of the work under the contract. Bidders shall thoroughly examine and be familiar with the drawings and specifications. The failure or omission of any bidder to receive or examine any contract document, form, instrument, addendum, or other document, or to visit the site and acquaint himself with conditions there existing, shall in nowise relieve any bidder from any obligation with respect to his bid or to the contract. The submission of a bid shall be taken as prima facie evidence of compliance with this section.

7. **Withdrawal of Bids** Any bidder may withdraw his bid either personally by written request or by telegraphic request at any time prior to the scheduled closing time for the receipt of bids.

8. **Agreements and Bonds** The Agreement form which the successful bidder, as Contractor, will be required to execute and the forms and amounts of surety bonds, which he will be required to furnish at the time of execution of the Agreement, are included in the contract documents and should be carefully examined by the bidder. The required number of executed copies of the Agreement, the Performance Bond, and the Payment Bond (Labor and Material Bond) is as specified in the Supplementary General Conditions. Payment and Performance bonds must be executed by a **legally admitted California surety insurer**.

9. **Interpretation of Plans and Documents** If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the drawings, specifications, or other contract documents, or finds discrepancies in or omissions from the drawings and specifications, he may submit to the District a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation or correction of the contract documents will be made only by addendum duly issued and a copy of such addendum will be mailed or delivered to each person receiving a set of the contract documents. No person is authorized to make any oral interpretation of

any provision in the contract documents to any bidder, and no bidder is authorized to rely on any such unauthorized oral interpretation.

10. **Bidders Interested in More than One Bid** No person, firm, or corporation shall be allowed to make or file, or be interested in more than one bid for the same work unless alternate bids are specifically called for. A person, firm, or corporation that has submitted a sub-proposal to a bidder, or that has quoted prices of materials to bidder, is not thereby disqualified from submitting a sub-proposal or quoting prices to other bidders or making a prime proposal.

11. **Award of Contract** The District reserves the right to reject any or all bids, or to waive any irregularities or informalities in any bids or in the bidding process. The award of the contract, if made by the District, will be to the lowest responsible bidder therefor.

12. **Alternates** If alternate bids are called for the contract may be awarded at the election of the governing board to the lowest responsible bidder on the base bid, or on the base bid and any alternate or combination of alternates.

13. **Evidence of Responsibility** Upon the request of the District, a bidder whose bid is under consideration for the award of the contract shall submit promptly to the District satisfactory evidence showing the bidder's financial resources, his construction experience, and his organization and plant facilities available for the performance of the contract.

14. **Listing Subcontractors** Each bidder shall submit a list of the proposed subcontractors on this project as required by the Subletting and Subcontracting Fair Practices Act (Government Code §4100, et seq.). Forms for this purpose are furnished with the contract documents.

15. **Worker's Compensation** In accordance with the provisions of Section 3700 of the Labor Code, Contractor shall secure the payment of compensation to his employees. Contractor shall sign and file with District the following certificate prior to performing the work under this contract: "I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of the code, and I will comply with such provisions before commencing the performance of the work of this contract." The form of such certificate is included as part of the contract documents.

16. **Bid Deposit Return** Deposits of three or more low bidders, the number being at the discretion of the District, will be held for thirty (30) days or until posting by the successful bidder(s) of the bonds and certificates of insurance required and return of executed copies of the appropriate agreement form, whichever first occurs, at which time the deposits will be returned.

17. **Forfeiture for Failure to Execute Contract** In the event the bidder to whom an award is made fails or refuses to execute the contract within five calendar days from the date of receiving notification that he is the bidder to whom the contract is awarded, the District may declare the bidder's bid deposit or bond forfeited as damages caused by the failure of the bidder to enter into the contract, and may award the work to the next lowest bidder, or may call for new bids.

18. **Anti-Discrimination** It is the policy of the District that in connection with all work performed under contracts, there be no discrimination against any prospective or active employee engaged in the work because of race, color, ancestry, national origin, religious creed, sex, age, or marital status. The Contractor agrees to comply with applicable Federal and California laws including, but not limited to, the California Fair Employment and Housing Act, beginning with Government Code Section 12900, and Labor Code Section 1735. In addition, the Contractor agrees to require like compliance by any subcontractors employed on the work by him.

19. **Noncollusion Affidavit** Bidders on all public works contracts are required to submit an Affidavit of Noncollusion with their bid. This form is included with the bid package and must be signed under penalty of perjury and dated.

20. **License Requirement** Each Bidder shall possess at the time this contract is awarded a Class B License, or the appropriate license required by the State of California, current and legally issued by the Contractor's State License Board, pursuant to Public Contract Code Section 3300. The successful bidder must maintain the license throughout the duration of this Contract.

21. **Contractor's Qualification Questionnaire** All prospective Bidders are required to furnish all information on Questionnaire. Please complete Questions 1 through 27 on the Questionnaire accurately and completely. Contractors must submit the completed Questionnaire with their bid package. Please note: "Certain information may lead to a determination of non-responsibility and rejection of the bid."

21. **Fingerprinting Procedures** The successful Bidder will be required to assure that its employees, subcontractors of any tier, material suppliers, and consultants do not have direct contact with the District's students during the performance of the Contract in compliance with Education Code §45125.1 and 45125.2. To assure these provisions, the successful Bidder's supervisor shall be fingerprinted, and proof of same shall be provided to the District prior to start of on-site work. The supervisor will monitor the workers' conduct while on school grounds. In addition, the successful Bidder shall barricade the Work area to separate its workers from the students. If any Work is to be performed outside of a barricaded area where any employee of the Bidder or a Bidder's subcontractor may come into contact with students, Contractor shall comply with the fingerprinting requirements pursuant to California law, or will be ordered to stop work for cause. All costs associated with this process are the responsibility of the successful Bidder.

The Contractor's construction supervisors or their unsupervised employees who will be working outside of fenced areas during the school hours must have submitted a fingerprint identification card to the Department of Justice (DOJ) and have a proof of clearance in the form of Contractor Certification Re: Personnel provided to the District after the award of the contract but prior to commencing any Work.

CONTRACTOR'S QUALIFICATIONS QUESTIONNAIRE

TO BE SUBMITTED WITH THE BID WHEN THERE HAS BEEN NO PREQUALIFICATION PROCESS

PROJECT TITLE: BID # 02-09/10 – DEL MAR HIGH SCHOOL MODERNIZATION
OWNER: SAN GABRIEL UNIFIED SCHOOL DISTRICT

The prospective Bidder shall furnish all the following information accurately and completely. Failure to fully and completely comply with this requirement may result in rejection of any bid submitted. Additional sheets may be attached if necessary. "You" or "your" as used in this questionnaire refers to the Bidder's firm and any of its owners, officers, directors, shareholders, parties, or principals. Owner has discretion to request additional information depending on the project.

—WARNING—

Certain information may lead to a determination of non-responsibility and rejection of the bid.

(1) Firm name and address: _____
_____
_____

(2) Telephone: _____

(3) Type of firm: (check one) Individual ___ Partnership ____ Corp. ____

(4) License No. _____ Class: _____

Name of license holder: _____

(5) Have you or any of your principals ever been licensed under a different name or different license number? Response must include information pertaining to principals' association outside of the firm bidding this Project. If yes, give name and license number: _____.

(6) Names and titles of all principals of the firm:

_____ _____
_____ _____
_____ _____

(7) Number of years as contractor. Include only years in this type of construction and only the years with the current entity in its current form: _____ Years

(8) Person who inspected work site for your firm:

Name and Title: _____
Date of Inspection: _____

(9) Years of experience your firm has in public school construction work:

As general contractor: _____ As subcontractor: _____

(10) In the last five years has your firm or any of its principals defaulted so as to cause a loss to a surety? Response must include information pertaining to principals' associations outside of the firm bidding this Project. If the answer is yes, give date, name, and address of surety and details.

_____

_____

_____

(11) In the last five years have you or any of your principals been assessed liquidated damages for any project? Response must include information pertaining to principals' associations outside of the firm bidding this Project. If yes, explain:

_____

_____

_____

(12) In the last five years have you or any of your principals been in litigation or arbitration or a dispute of any kind on a question or questions relating to a public construction project? Response must include information pertaining to principals' association outside of the firm bidding this Project. If yes, provide name of public agency and details of the dispute. Attach additional pages as necessary.

_____

_____

_____

(13) In the last five years have you or any of your principals ever failed to complete a project? Response must include information pertaining to principals' association outside of the firm bidding this Project. If yes, provide owner's name and details. Attach additional pages as necessary.

_____

_____

_____

(14) In the last five years have you or any of your principals been assessed back-charges on any public works construction project? If so, explain, including the identity of the public entity, the basis for their claims, and the final result. Attach additional pages as necessary.

_____

_____

_____

(15) In the last five years have you or any of your principals ever failed to complete a project within the time frame originally set for completion, plus any extension of time granted for weather delays? An extension of time for any reason other than weather delays requires an explanation. Response must include information pertaining to principals' association outside of the firm bidding this Project. If yes, provide owner's name and details. Attach additional pages as necessary.

_____

_____

_____

(16) List names, addresses, and telephone numbers of three architects or engineers with whom you have worked on a public works project in the last five years:

Project One: _____
_____
_____
_____

Project Two: _____
_____
_____
_____

Project Three: _____
_____
_____
_____

(17) Conflicts of Interest: Do you now or have you in the last five years had any direct or indirect business, financial, or other connection with any official, employee, or consultant of the OWNER or architect? If yes, describe. Attach additional pages as necessary.

_____

_____

_____

(18) In the last five years have you or any of your principals filed a claim for additional compensation from a public entity on a construction project? If yes, explain and include the identity of the public entity, the basis for the claim, the response by the public entity, and the final result. Attach additional pages as necessary.

_____

_____

_____

(19) In the last five years have you or any of your principals ever failed to pre-qualify, or been deemed unqualified, on any public works construction project? If yes, explain and include the identity of the public entity, the basis for their claims, and the final result. Attach additional pages as necessary.

_____

_____

_____

(20) In the last five years have you or any of your principals ever been declared a "non-responsible" bidder on any public works construction project? If yes, explain and include the identity of the public entity, the basis for their claims, and the final result. Attach additional pages as necessary.

_____

_____

_____

(21) Staff/Roster Functions: List all members of your staff who will be assigned or responsible for work as a team member on this Project (except clerical) and show job titles, functions, years with firm, and projects completed for company. Include company officers, responsible managing employee (RME), project manager, and superintendent. Provide the following information for each individual (copy this page as many times as required).

Name and Title:

Function:

Years with firm:

Has the individual had prior exposure as a team member on one of your projects?
_____ Yes _____ No

List of all school projects this person has completed for you:

_____

_____

_____

_____

_____

Provide an organizational chart reflecting your proposed project team for the Project, including all persons on your project team.

(22) Surety: Indicate the names of all surety companies utilized by you in the last 10 years. Attach additional pages as necessary.

Surety Name & Address	Period Covered
Surety Name & Address	Period Covered
Surety Name & Address	Period Covered
Surety Name & Address	Period Covered

(23) Attach a notarized statement from surety company(ies) proposed to be utilized on this Project, indicating your total bonding capacity and certifying that:

A. Currently available bonding capacity exceeds the value of your contract, as estimated by the OWNER, and;

B. Surety(ies) will provide bonding of the project in the event you are awarded Project.

(24) Insurance: Provide a notarized statement from your workers' compensation carrier specifying your current "Experience Modification Rate" for workers' compensation for the State of California. Provide a list of above-referenced ratings and corresponding companies for the last five years.

_____

_____

_____

(25) Safety:

A. Does your firm have a written Safety Program?
Yes _____ No _____ (If yes, attach copy.)

B. Does your firm have personnel permanently assigned to safety?
Yes _____ No _____ (If yes, provide names and duties.)

(26) Give the public entity's name, telephone number, and the name of the contact person for the three largest public works projects performed for a public entity, other than a school/college/university, that you have completed in the last five years: Attach additional sheets as necessary.

_____

_____

_____

(27) List of References: Provide information on the three largest projects performed for a public school, college, or university in the last five years.

Contract

1. Name: _____

Address and telephone:

_____

_____

Contact person:

_____

Type of construction project:

Dates of commencement and completion of construction project:

Contract amount:

Architect:

Architect's address and telephone:

DSA or public agency inspector:

Address and telephone:

Contract 2.
Name:

Address and telephone:

Contact person:

Type of construction project:

Dates of commencement and completion of construction project:

Contract amount:

Architect:

Architect's address and telephone:

_____

_____

DSA or public agency inspector:

_____

Address and telephone:

_____

_____

Contract 3.
Name: _____

Address and telephone:

_____

_____

Contact person:

_____

Type of construction project:

_____

Dates of commencement and completion of construction project:

_____

_____

Contract amount:

_____

Architect:

_____

Architect's address and telephone:

_____

_____

DSA or public agency inspector:

_____

Address and telephone:

_____

I certify and declare under penalty of perjury under the laws of the State of California that the foregoing information is true, correct, and complete.

Executed this ____ day of _____, 20___, at _____
_____ (City, County), State of _____.

_____
Signature

_____
Print Name

_____
Title

This Questionnaire must be completed and submitted with your bid package.

BID FORM AND DESIGNATION OF SUBCONTRACTORS

FOR
Bid No. 02-09/10 – Del Mar High School Modernization Project

AT
Del Mar High School

TO

SAN GABRIEL UNIFIED SCHOOL DISTRICT
408 Junipero Serra Drive
San Gabriel, CA 91776
(626) 451-5430

Closing Date and Time – March 17, 2010 2:00 PM

TO: **SAN GABRIEL UNIFIED SCHOOL DISTRICT**, acting by and through its Governing Board, herein called "District":

1. Pursuant to and in compliance with your Notice to Contractors Calling for Bids and the other documents relating thereto, the undersigned bidder, having familiarized himself with the terms of the contract, the local conditions affecting the performance of the contract and the cost of the work at the place where the work is to be done, and with the drawings and specifications and other contract documents, hereby proposes and agrees to perform, within the time stipulated, the contract, including all of its component parts, and everything required to be performed, and to provide and furnish any and all of the labor, materials, tools, expendable equipment and all utility and transportation services necessary to perform the contract and complete in a workmanlike manner all of the work required in connection with **Bid Number 02-09/10** all in strict conformity with the drawings and specifications and other contract documents, including addenda numbers _____ , _____ , and, _____ on file at the office of the Director of Purchasing for said District **as listed on Page 9 (next page) of this document**.

2. It is understood that the District reserves the right to reject this bid and that this bid shall remain open and not be withdrawn for the period specified in the **Notice to Contractors Calling for Bids**.

3. The required bid security is hereto attached.

4. It is understood and agreed that if written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned after the opening of the bid, and within the time this bid is required to remain open, or at any time thereafter before this bid is withdrawn, the undersigned will execute and deliver to the District a contract in the form attached hereto in accordance with the bid as accepted, and that he will also furnish and deliver to the District the Performance Bond and Payment Bond as specified, all within five (5) days after receipt of notification of award, and that the work under the contract shall be commenced by the undersigned bidder, if awarded the contract, on the date to be stated in the District's Notice to the Contractor to Proceed, and shall be completed by the Contractor in the time specified in the contract documents.

All notices or other correspondence should be addressed to the undersigned at the address stated below.

ATTACHMENT A - BID FORM

BID NO.: **02-09/10 – Del Mar High School Modernization Project**
OPENING DATE: **March 17, 2010**
TIME: **2:00 PM**

Write out the total amount of your bid: _____

_____ **Dollars**

TOTAL BID $_____

In the event of a conflict between the written and numeric version of the bid, the written will prevail.

Please provide a breakdown of the cost of services for each site:

Does Not Apply to This Bid!

TOTAL _____
This total must agree with the figures listed above!

This information must be furnished or the entire bid may be rejected!

Please sign and date this page.

_____ _____
(Signature) **(Print Name)**

_____ _____
(Company) **(Date)**

This form must be completed and submitted with your bid package.

6. The names of all persons interested in the foregoing proposal as principals are as follows:

_____ _____

_____ _____

(IMPORTANT NOTICE: If Bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary treasurer, and manager thereof; if a co-partnership, state true name of firm, also names of all individual co-partners composing firm; if bidder or other interested person is an individual, state first and last names in full.)

7. The undersigned holds a license Class _____ License No._____ .

8. In the event the bidder to whom Notice of Intent to Award Contract is given fails or refuses to post the required bonds and return executed copies of the agreement form within five (5) calendar days from the date of receiving the Notice of Intent to Award Contract, the District may declare the Bidder's bid deposit or bond forfeited as damages.

9. Pursuant to Section 4552 of the Government Code, in submitting a bid to the District, the bidder offers and agrees that if the bid is accepted, it will assign to the District all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 {commencing with Section 16700} of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the District pursuant to the bid. Such assignment shall be made and become effective at the time the District tenders final payment to the bidder.

10. Designation of Subcontractors

a. In compliance with the Subletting and Subcontracting Fair Practices Act (Public Contract Code §4100 et seq.) and any amendments thereof, each bidder shall set forth below: (1) the name and the location of the place of business of each subcontractor who will perform work or labor or render services to the prime contractor in or about the construction of the work or improvement to be performed under this contract in an amount in excess of one-half of one percent of the prime Contractor's total bid and (2) the portion of the work which will be done by each subcontractor under this act. The prime contractor shall list only one subcontractor for each portion as is defined by the prime contractor in this bid.

b. If a prime contractor fails to specify a subcontractor or if a prime contractor specifies more than one subcontractor for the same portion of work to be performed under the contract in excess of one-half of one percent of the prime Contractor's total bid, he shall be deemed to have agreed that he is fully qualified to perform that portion himself, and that he shall perform that portion himself.

c. No prime contractor whose bid is accepted shall (1) substitute any subcontractor, (2) permit any subcontract to be voluntarily assigned or transferred or allow it to be performed by anyone other than the original subcontractor listed in the original bid, or (3) sublet or subcontract any portion of the work in excess of one-half of one percent of the prime Contractor's total bid as to which his original bid did not designate a subcontractor, except as authorized in the Subletting and Subcontracting Fair Practices Act. Subletting or subcontracting of any portion of the work in excess of one-half of one percent of the prime Contractor's total bid as to which no subcontractor was designated in the original bid shall only be permitted in cases of public emergency or necessity, and then only after a finding reduced to writing as public record of the authority awarding this contract, setting forth the facts constituting the emergency of necessity.

<u>This form must be completed and submitted with your bid package.</u>

SUBCONTRACTOR LISTING

Trade or Portion Of Work	Subcontractor Name	Business Location	License Number

(Use additional pages if necessary)

Contractor Name:_____ Date:_____

Signed:_____ Phone:_____

Printed Name:_____ Title:_____

Street Address: _____

City, State, Zip Code:_____

Fax Number:_____ E-Mail:_____

NOTE: If bidder is a corporation, the legal name of the corporation shall be set forth above together with the signature of authorized officers or agents and the document shall bear the corporate seal; if bidder is partnership, the true name of the firm shall be set forth above together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership, and if bidder is an individual, his signature shall be placed above.

This form must be completed and submitted with your bid package.

Bid No. 02-09/10 Del Mar High School Modernization Project

BID BOND

(10%)

KNOW ALL MEN BY THESE PRESENTS that we, the undersigned, (hereafter called "Principal"), and _____ _____ (hereafter called "Surety"), are hereby held and firmly bound unto _____ School District (hereafter called "Owner") in the sum of _____ ($_____) for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors, and assigns.

SIGNED this _____ day of _____, 20____.

The condition of the above obligation is such that whereas the Principal has submitted to the Owner a certain Bid, attached hereto and hereby made a part hereof, to enter into a contract in writing for the construction of _____.

NOW THEREFORE,

a. If said Bid is rejected, or

b. If said Bid is accepted and the Principal executes and delivers a contract or the attached Agreement form within five (5) calendar days after acceptance (properly completed in accordance with said Bid), and furnishes bonds for his faithful performance of said Contract and for payment of all persons performing labor or furnishing materials in connection therewith,

Then this obligation shall be void; otherwise, the same shall remain in force and effect.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or the call for bids, or the work to be performed thereunder, or the specifications accompanying the same, shall in anyway affect its obligation under this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of said contract or the call for bids, or to the work, or to the specifications.

In the event suit is brought upon this bond by the DISTRICT and judgment is recovered, the Surety shall pay all costs incurred by the DISTRICT in such suit, including without limitation, attorney's fees to be fixed by the court.

This form must be completed and submitted with your bid package.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by the proper officers, on the day and year first set forth above.

PRINCIPAL: _____

_____

ATTEST: (if individual, two witnesses are required)

By:_____ By:_____

Title:_____ Title:_____

ATTEST: (if corporation)

By:_____

Title:_____

(Corporate Seal)

SURETY: _____

_____

ATTEST: (if individual, two witnesses are required)

By:_____ By:_____

Title:_____ Title:_____

ATTEST: (if corporation)

By:_____

Title:_____

(Corporate Seal)

<u>This form must be completed and submitted with your bid package.</u>

IMPORTANT:

Surety companies executing bonds must possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance defined in California Insurance Code Section 105, and if the work or project is financed, in whole or in part, with federal, grant, or loan funds, it must also appear on the Treasury Department's most current list (Circular 570 as amended).

THIS IS A REQUIRED FORM

Any claims under this bond may be addressed to:

(Name and Address of Surety)

_____

_____

_____

(Name and Address of agent or representative for
Service of process in California if different from above)

_____

_____

_____

(Telephone Mumber of Surety and agent or
Representative for service of process in California).

_____

_____

_____

This form must be completed and submitted with your bid package.

DEVIATIONS FORM

Any and all deviations to this bid package including specifications of equipment and methods of installation are noted below. **Anything not here noted is to be considered as per specifications**.

Contractor Name:_____

Signed:_____

Date:_____

This form must be completed and submitted with your bid package.

NONCOLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

STATE OF CALIFORNIA

County of _____ , being first duly sworn, deposes and says that he or she is_____ _____ of _____the party making the foregoing bid; that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member of agent thereof to effectuate a collusive or sham bid.

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

_____
(Signature)

_____
(Typed Name)

SUBSCRIBED BEFORE ME on this _____ day of _____, 20____.

_____
(Notary Public)

My Commission Expires: _____
(Expiration Date)

This form must be completed and submitted with your bid package.

AGREEMENT

THIS AGREEMENT, entered into this _____ day of _____ 2010, in the County of Los Angeles, State of California, by and between **SAN GABRIEL UNIFIED SCHOOL DISTRICT**, hereinafter called the District, and _____, **hereinafter** called the Contractor,

WITNESSETH that the District and the Contractor for the considerations stated herein agree as follows:

ARTICLE 1 - SCOPE OF WORK. The Contractor shall furnish all labor, materials, equipment, tools, utility services, and transportation and perform and complete all of the work required in connection with the following:

Bid No. 02-09/10 Del Mar High School Modernization Project

It is the duty of the Contractor to complete the work covered by this contract in exact accordance with the Contract Documents as enumerated in Article 7 below. The Contractor shall be liable to the District for any damages arising as a result of a failure to fully comply with the obligation, and the Contractor shall not be excused with respect to any failure to so comply by any act or omission of the Architect, Engineer, Inspector, Office of the State Architect, or representative of any of them, unless such act or omission actually prevents the Contractor from fully complying with the requirements of the Contract Documents, and unless the Contractor protests, in accordance with the Contract Documents that the act or omission is preventing the Contractor from fully complying with the Contract Documents. Such protest shall not be effective unless reduced to writing and filed with the District office within seven days of the date of occurrence of the act or omission preventing the Contractor from fully complying with the Contract Documents.

ARTICLE 2 - TIME FOR COMPLETION. The Notice to Proceed date is anticipated to be April 21, 2010. The contract period is anticipated to be ten (10) months. Construction shall be completed within 300 days of the Contract Date, with a completion date of February 28, 2011.

In the event that District desires to postpone the giving of the notice to proceed beyond this on (1) month period, it is expressly understood that with reasonable notice to the Contractor, the giving of the date to proceed may be postponed by District. It is further expressly understood by Contractor, that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the giving of the notice to proceed.

If Contractor believes that a postponement will cause a hardship to Contractor, such Contractor may terminate the contract with written notice to District within ten (10) days after receipt by Contractor of District's notice of postponement. It is further understood by Contractor that in the event that Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Contractor for the work that Contractor had performed at the time of notification of postponement. Should Contractor terminate the contract as a result of a notice of postponement, District shall have the authority to award the contract to the next lowest bidder.

ARTICLE 3 – LIQUIDATED DAMAGES: It being impracticable and infeasible to determine the amount of actual damage, it is agreed that the Contractor will pay the District the sum of One Thousand–Five Hundred Dollars ($1,500.00) per calendar day for each and every day of delay beyond the time set forth in Article 2 of this Agreement for completing said work as Liquidated Damages and not as a penalty or forfeiture. In the event the same is not paid, the Contractor further agrees that the District may deduct that amount thereof from any money due or that may become due the Contractor under the Contract. This Article does not exclude recovery of damages under provisions of the Contract Documents.

ARTICLE 4 - CONTRACT PRICE. The District shall pay to the Contractor as full consideration for the faithful performance of the Contract, subject to any additions or deductions as provided in the Contract Documents, the sum of_____Dollars ($_____), said sum being the total amount stipulated in the Proposal. Payment shall be made as set forth in the General Conditions.

Should any change order or construction change directive result in an increase in the contract price, the cost of such change order or construction change directive shall be agreed to in advance by Contractor and District and subject to

the monetary limitations set forth in Public Contract Code Section 20118.4. In the event that Contractor proceeds with any change in work without agreeing to the cost of a change order or construction change directive, Contractor waives any claim of additional compensation for such additional work.

ARTICLE 5 - HOLD HARMLESS AGREEMENT. The Contractor agrees to and does hereby indemnify, defend and hold harmless the District, its officers, agents, and employees from every claim or demand made, and every liability, loss, damages, or expense, of any nature whatsoever, which may be incurred by reason of:

(a) Liability for damages for: (1) death or bodily injury to persons, (2) injury to, loss or theft of property, or (3) any other loss, damage or expense arising under either (1) or (2) above, sustained by the Contractor or any person, firm, or corporation employed by the Contractor upon or in connection with the work called for in this Agreement, except for liability resulting from the sole negligence or willful misconduct of the District, its officers, employees, agents or independent contractors who are directly employed by the District; and

(b) Any injury to or death of persons or damage to property caused by and act, neglect, default or omission of the Contractor, or any person, firm, or corporation employed by the Contractor, either directly or by independent contract, including all damages due to loss or theft, sustained by any person, firm or corporation, including the District, arising out of, or in any way connected with the work covered by this agreement, whether said injury of damage occurs either on or off school district property, if the liability arose from the negligence or willful misconduct of anyone employed by the Contractor, either directly or by independent contract.

(c) Any dispute between Contractor and Contractor's subcontractor/suppliers/sureties, including, but not limited to, any stop notice actions.

(d) The Contractor, at his own expense, cost, and risk, shall defend any and all actions, suits, or other proceedings that may be brought or instituted against the District, its officers, agents or employees, on any such claim, demand or liability, and shall pay or satisfy any judgment that may be rendered against the District, its officers, agents or employees in any action, suit or other proceedings as a result thereof.

ARTICLE 6 - PROVISIONS REQUIRED BY LAW. Each and every provision of law and clause required to be inserted in this Contract shall be deemed to be inserted herein and this Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted or is not inserted correctly, then upon application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

ARTICLE 7 - COMPONENT PARTS OF THE CONTRACT. The Contract entered into by this Agreement consists of the following contract documents, all of which are component parts of the contract as if herein set out in full or attached hereto:

Notice to Contractors Calling for Bids
Information for Bidders
Contractor's Qualifications Questionnaire
Information Required of Bidders
Bid Form and Designation of Bidders
Certification of Workers' Compensation
Bid Bond
Noncollusion Affidavit
Agreement
General Conditions
Supplementary General Conditions
Attachment B - Insurance Requirements
Drawings and/or Technical Specifications
Addenda Nos. ____, ____, as issued.

All of the above-named Contract Documents are intended to be complementary. Work required by one of the above-named contract documents and not by others shall be done as if required by all.

ARTICLE 8 – PREVAILING WAGES:

A. Wage rates for this Project shall be in accordance with the general prevailing rate of holiday and overtime work in the locality in which the work is to be performed for each craft, classification or type of work needed to execute the Contract as determined by the Director of the Department of Industrial Relations. Copies of schedules of rates so determined by the Director of the Department of Industrial Relations are on file at the District's principal office and are available to any interested party on request.

B. The following Labor Code sections are hereby referenced and made a part of this agreement and Contractor stipulates to the provisions contained therein:

1. Section 1775 Penalty for Failure to Comply with Prevailing Wage Rates
2. Section 1777.4 Apprenticeship Requirements
3. Section 1813 Penalty for Failure to Pay Overtime
4. Section 1810 and 1811 Working Hour Restrictions
5. Section 1775 Payroll Records
6. Section 1773.8 Travel and Subsistence Pay

ARTICLE 9 – RECORD AUDIT: In accordance with Government Code Section 8546.7, records of both the District and the Contractor shall be subject to examination and audit by the Auditor General for a period of three (3) years after final payment.

ARTICLE 10 – CONTRACTOR'S LICENSE: Contractor must possess throughout the Project a Class B License, or a license which is acceptable to the State of California for the work being accomplished under this Contract, issued by the State of California, which must be current and in good standing.

IN WITNESS WHEREOF, this Agreement has been duly executed by the above-named parties, on the day and year first above written.

DISTRICT:

San Gabriel Unified School District

BY:_____
Marc Chaldu
Assistant Superintendent,
Business Services

CONTRACTOR:

BY: _____
Authorized Officers or Agents

(CORPORATE SEAL)

PERFORMANCE BOND

(100%)

WHEREAS, the **SAN GABRIEL UNIFIED SCHOOL DISTRICT** by Board action on April 20, 2010, has awarded to_____ , hereinafter designated as the "Principal", a contract for the work described as follows:

Bid No. 02-09/10 Del Mar High School Modernization Project

WHEREAS, said Principal is required under the terms of said contract to furnish a bond for the faithful performance of said contract,

NOW THEREFORE, _____
Name of Principal
of _____
Address
City of _____, State of _____ as Principal, and _____, a corporation organized and existing under the laws of the State of _____, **legally doing business in California as an admitted surety insurer** at _____
_____
Address
City of _____, State of California, as Surety, are indebted to SAN GABRIEL UNIFIED SCHOOL DISTRICT, hereinafter called the "District", in the sum of _____ **Dollars ($_____)** for which payment Principal and Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally.

THE CONDITION OF THIS OBLIGATION is that if the Principal, his or its heirs, executors, administrators, successors or assigns, shall keep and perform the covenants, conditions and agreements in the contract and any alteration thereof on his or their part, to be kept and performed at the times and in the manner therein specified, and in all respects according to their intent and meaning, and shall indemnify and save harmless the District, its officers, agents, and employees, as therein stipulated, then this obligation shall become null and void; otherwise, it shall be and remain in full force.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder, or the specifications accompanying the same, shall in anywise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract, or to the work, or to the specifications.

In the event suit is brought upon this bond by the District and judgment is recovered, the Surety shall pay all costs incurred by the District in such suit, including reasonable attorney's fee to be fixed by the Court.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above named, on the _____ day of _____, 2010.

_____ (Corporate Seal)
Principal

BY_____
(Typed or Printed Name)

_____
(Title)

_____ (Corporate Seal)
Surety

BY_____
(Typed or Printed Name)

_____
(Title)

(Attach Attorney-in Fact Certificate)

PAYMENT BOND

(100% Labor and Material Bond)

WHEREAS, the **SAN GABRIEL UNIFIED SCHOOL DISTRICT** by Board action on April 20, 2010 has awarded to _____ hereinafter designated as the "Principal", a contract for the work described as follows:

Bid No. 02-09/10 Del Mar High School Modernization Project

WHEREAS, said Principal is required by Division 3, Part IV, Title XV, Chapter 7, (commencing at 3247 of the California Civil Code to furnish a bond in connection with said contract;

NOW THEREFORE, _____
Name of Principal
of _____
Address
City of _____, State of _____ as Principal, and _____, a corporation organized and existing under the laws of the State of _____ **legally doing business in California as an admitted surety insurer** at _____
_____
Address
City of _____, State of California, as Surety, are indebted to **SAN GABRIEL UNIFIED SCHOOL DISTRICT**, hereinafter called the "District", in the sum of _____ **Dollars ($_____)** for which payment Principal and Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally.

THE CONDITION OF THIS OBLIGATION is that if the Principal, his or its subcontractors, heirs, executors, administrators, successors, or assigns, shall fail to pay any person or persons named in Civil Code Section 3181 or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the contractor and subcontractors pursuant to 13020 of the Unemployment Insurance Code, with respect to such work and labor that the sureties will pay for the same, and also, in case suit is brought upon the bond, a reasonable attorney's fee, to be fixed by the Court.

This bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims under 3181 of the California Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract, or to the work, or to the specifications.

IN WITNESS WHEREOF this instrument has been duly executed by the Principal and Surety above named, on the _____ day of _____, 2010.

_____ (Corporate Seal)
Principal

BY _____
(Typed or Printed Name)

_____
(Title)

_____ (Corporate Seal)
Surety

BY _____
(Typed or Printed Name)

_____
(Title)

(Attach Attorney-in Fact Certificate)

CONTRACTOR'S CERTIFICATE
REGARDING WORKERS' COMPENSATION

Labor Code Section 3700:

"Every employer except the State shall secure the payment of compensation in one or more of the following ways:

(a) By being insured against liability to pay compensation in one or more insurers duly authorized to write compensation insurance in this State.

(b) By securing from the Director of Industrial Relations a certificate of consent to self-insure, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his employees.

(c) * * * * * "

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of this contract.

NAME _____

TITLE _____

SIGNATURE _____

(In accordance with Article 5 {commencing at Section 1860}, Chapter 1, Part 7, Division 2 of the Labor Code, the above certificate must be signed and filed with the awarding body prior to performing any work under this contract.)

This form must be completed and submitted with your bid package.

Bid No. 02-09/10 Del Mar High School Modernization Project

SUPPLEMENTARY GENERAL CONDITIONS

A. The Notice to Proceed date is anticipated to be April 21, 2010. The contract period is anticipated to be ten (10) months. Construction shall be completed within 300 days of the Contract Date, with a completion date of February 28, 2010.

B. The agreed liquidated damages provision established in Article 6 of the General Conditions is One-Thousand – Five Hundred Dollars ($1,500.00) per calendar day for each calendar day that the project completion exceeds the completion date set forth above, or a later date approved by the District as an extension of allowable time for completion.

The term "completion" as used in this section shall be construed to mean Substantial Completion.

C. The number of copies of drawings and specifications to be furnished to the Contractor free of charge is five (5) per job.

D. Insurance - As provided in the General Conditions, Contractor shall take out and maintain and require all subcontractors, if any, whether primary or secondary, to take out and maintain coverage as noted below and per **Attachment B - Insurance Requirements**:

Public Liability Insurance for injuries, including accidental death, to any one person in an amount not less than $1,000,000, and, Subject to the same limit for each person on account of one accident, in an amount not less than $1,000,000.

Property Damage Insurance in an amount not less than $1,000,000.

Insurance Covering Special Hazards: The following special hazards shall be covered by rider or riders to above mentioned public liability insurance, or property damage insurance policy or policies of insurance, or by special policies of insurance, in amounts as follows:

Automotive and truck, where operated, in amounts as above.

Material Hoist, where used, in amounts as above.

Fire Insurance: Where work is on existing sites, District will maintain fire insurance on existing structures; Contractor shall take out and maintain coverage on all new structures and new work in existing structures.

Contractor shall name District in all policies, all of which shall be open to inspection by all parties in interest. A minimum 30-day notice of cancellation is required. The Insurance Certificate/Additional Insured section is usually project specific. **The Contractor cannot commence without such proof of insurance**. If the District is damaged by failure of the Contractor to maintain such insurance, it may recover as stipulated elsewhere in the Contract Documents for recovery of damages. District may insure its own interest if Contractor fails to effect or maintain insurance.

E. The number of executed copies of the Agreement, the Performance Bond, and the Labor and Materials Bond required is three (3).

ATTACHMENT B

INSURANCE REQUIREMENTS

PRODUCT VENDOR: _____
(CONTRACTOR, LESSEE, ETC.)

Bid No. 02-09/10 Del Mar High School Modernization Project

The following coverage noted on the left with an "X" are required (Certificate or Endorsement) with the Combined Single Limits (CSL) as noted on the right. Comparable split limits may be accepted.

CERTIFICATE/ENDORSEMENT		MINIMUM COMBINED SINGLE LIMITS
___X___/_____	Workers' Compensation	Insured - Statutory
		Self-Insured - $5,000,000
___X___/_____	Employer's Liability	$1,000,000
( )	Broad Form All States Endorsement	
( )	Longshoremen's and Harbor Workers' Compensation Act Endorsement	
( )	_____	
___X___/___X___	Comprehensive General Liability	$1,000,000
(X)	Premises and Operations	( ) Explosion Hazard
(X)	Contractual Liability	( ) Collapse Hazard
(X)	Independent Contractors	( ) Underground Hazard
(X)	Products/Completed Operations	( ) Garage keepers Legal Liab.
(X)	Broad Form Property Damage	( ) Hangar keepers Legal Liab.
(X)	Personal Injury	(X) Owned Automobiles
(X)	Broad Form Liability Endorsement	(X) Non owned Automobiles
( )	Fire Legal Liability	(X) Hired Automobiles
( )	Water craft Liability	
( )	Incidental Medical Malpractice	( ) _____
___X___/___X___	Automobile Liability (if not included in General Liability coverage checked above)	$1,000,000
_____/_____	Aviation/Airport Liability (including appropriate General Liability coverage checked above)	$_____
_____/_____	Professional Liability	$_____
_____/_____	Property Insurance	$_____
( )	Extended Coverage	( ) Debris Removal
( )	Vandalism & Malicious Mischief	( ) Sprinkler Leakage
( )	Flood	( ) All Risk
( )	Earthquake $_____	( ) Other

0200.5 Attachment B

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GENERAL TERMS AND CONDITIONS

1. DEFINITIONS

a. "**Acceptance of Completion**" shall mean the date upon which the District's Board, based on its consultation with District staff, the Architect and the Inspector, formally accepts Substantial Completion or final completion of the Project, whichever occurs first, and authorizes the execution and recordation of a Notice of Completion for the Project.

b. "**Acts of God**" shall mean only the following occurrences or conditions or effects: earthquakes that measure in excess of a magnitude of 3.5 on the Richter Scale within a five (5) mile radius of the Project Premises.

c. "**Architect**" shall mean the architect or engineer, if any, retained or employed on the Work and specifically identified in the General Contract. In the event there is no architect or engineer on the Work, then the term "Architect" shall be construed to mean the District.

d. "**Architect/Engineer Field Directive**" shall mean a clarification of the Drawings and/or Specifications that does not produce a time delay or additional costs, that is directive in nature and issued to the Contractor by the Architect or an engineer working on the Project.

e. "**Board**" shall mean the San Gabriel Unified School District Board of Education.

f. "**Certificate for Payment**" shall mean the certificate of the Architect given from time to time in accordance with the terms and provisions of Section 6 hereof to fully or partially review any progress payments requested in a Contractor Payment Request.

g. "**Change Order**" shall mean a written statement executed by the District and the Contractor, in accordance with the terms and provisions of Sections 9 and 10 hereof, ordering a change in the Work or the Drawings or Specifications or other Contract Documents, and/or confirming a change in the Contract Price (whether an increase or decrease thereto) and/or Contract Time (whether an extension or reduction thereof). A Change Order may in the alternative constitute the decision of an arbitrator, if applicable, in accordance with and pursuant to Section 9d hereof.

h. "**Construction Claims**" is defined in Section 56a hereof.

i. "**Contract**" shall mean the contract for the construction and completion of the Project and the performance of all Work by the Contractor, which consists of all of the Contract Documents as a whole.

j. "**Contract Documents**" is defined in Section 10 of the General Contract.

k. "**Contract Price**" shall mean the lump sum price payable to the Contractor for all of the Work, as specifically set forth in the General Contract. The Contract Price may not be changed, altered or otherwise modified except by a Change Order in accordance with the terms and provisions of Sections 9 and 10 hereof.

l. "**Contract Time**" shall mean the number of consecutive calendar days from and after the Starting Date within which the Project and all Work must be completed, which number of calendar days are specifically set forth in the General Contract. The Contract Time may not be changed, altered or otherwise modified except by a Change Order in accordance with the terms and provisions of Sections 9 and 10 hereof.

m. "**Contractor Payment Request**" shall mean a progress payment request, on a standard AIA form, to be submitted by the Contractor to the District monthly during the progress of the Work in accordance with the terms and provisions of Section 6 hereof.

n. "**Cost of the Work**" is defined in Section 9b hereof.

o. "**Drawings**" shall mean the drawings attached hereto as the same may be amended, modified or otherwise revised from time to time by Change Order and any revisions or modifications thereto promulgated by the Architect or an Architect/Engineer Field Directive, a response to a Request for Information (RFI) or a Submittal Response returned to the Contractor by the Architect, an engineer or any other District representative working on the Project.

p. "**Default**" is defined in Section 54a hereof.

q. "**District**" shall mean the San Gabriel Unified School District, and its authorized representative(s).

r. "**General Contract**" shall mean the General Contract executed by the District and the Contractor and attached hereto.

s. "**General Terms and Conditions**" shall mean these General Terms and Conditions.

t. "**Inspector**" shall mean the inspector, if any, retained or employed on the Work and specifically identified in the General Contract.

u. "**Maintenance Bond**" is defined in Section 45 hereof.

v. "**Materialmen**" shall mean those organizations or individuals who furnish material or equipment that is incorporated into or used in connection with the Project or the Work. The term "Materialmen" shall include, without limitation, vendors, suppliers and manufacturers. The term "Materialmen" shall also include all materialmen of any tier.

w. "**Notice of Completion**" shall mean the Notice of Completion executed by the District and recorded in the County Records of Los Angeles County, California, promptly after the District's Acceptance of Completion in accordance with Section 52 hereof.

x. "**Payment Bond**" shall mean that certain Payment Bond for the Work and the Project in the form attached hereto, issued by a surety that has been approved by the District, in its reasonable discretion, in favor of the District, as obligee.

y. "**Performance Bond**" shall mean that certain Performance Bond for the Work and the Project in the form attached hereto, issued by a surety that has been approved by the District, in its reasonable discretion, in favor of the District, as obligee.

z. "**Project**" shall mean the project described in the General Contract.

aa. "**Project Premises**" shall mean the parcel of real property upon which the Project shall be constructed.

bb. "**Project Schedule**" is defined in Section 3 hereof.

cc. **"Provide"** Purchase, deliver, furnish and install.

dd. **"Rain Day"** A day in which work proceeds for four hours or less due to rain at the project site. Or, a day on which the site is too muddy to access, by no fault of the contractor.

ee. "**Record Drawings**" is defined in Section 24g hereof.

ff. "**Retention**" is defined in Section 6a hereof.

gg. **"Request for Information"** shall mean a written request for additional information or clarification of the Contract Documents on a form reviewed and accepted by the District, delivered by the Contractor to the District and Architect.

hh. **"Review"** Read and provide written acceptance. A review does not acknowledge accuracy or reviewed material.

ii. "**Schedule of Values**" is defined in Section 2 hereof.

jj. **"Similar (SIM)"** When noted at a detail, the detail is similar to the condition noted on the detail but not identical. Contractor is responsible for determining differences in similar details.

kk. "**Specifications**" shall mean the specifications attached hereto (as the same may be amended, modified or otherwise revised from time to time by Change Order or as otherwise provided hereunder).

ll. "**Starting Date**" shall mean the date specified as such in the Notice to Proceed from the District to the Contractor, being the date from which the Contract Time will commence and be calculated.

mm. "**Subcontractor**" shall mean those organizations or individuals who furnish labor and/or materials in connection with the Work or the Project and who do not have a direct written contract with the District, the Architect or any organization or individual (other than Contractor) who has a direct written contract with the District or Architect. The term "Subcontractor" shall include, without limitation, all engineers hired by Contractor or any other Subcontractor. The term "Subcontractor" shall also include all subcontractors of any tier.

nn. "**Submittal Response**" shall mean the District's response to any Contractor submittal that proposes the use of certain materials and/or methods in connection with the completion of the Project.

oo. "**Substantial Completion**" shall mean the stage in the progress of the Work when the Work is complete in accordance with the Contract Documents, except for certain minor corrective items commonly referred to in the construction industry as "punch list" items, such that the District can occupy or utilize the Project for its intended use; provided that, as a condition precedent to Substantial Completion, the Architect and Inspector shall have each agreed that the Work and Project have reached a stage of substantial completion and the District shall have received all permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial use of the Project. A project is not "substantially complete" if life safety items are incomplete.

pp. "**Substitution Request**" is defined in Section 11 hereof.

qq. **"Supplementary General Terms and Conditions"** shall mean the supplementary general terms and conditions attached hereto (as the same may be amended, modified or otherwise revised from time to time by Change Order or as otherwise provided hereunder).

rr. "**Surety**" shall mean the person, firm, corporation or other entity that executes as surety the Payment Bond and/or Performance Bond. The surety must be an admitted surety insurer pursuant to California Code of Civil Procedure Section 995.120, must have procured from the State Insurance

Commissioner a valid Certificate of Authenticity and is subject to the prior approval of the District, which the District shall grant or withhold in its reasonable discretion.

ss. **"Typical (TYP)"** when indicated with a detail means the detail applies to all similar conditions that occur on the project, whether shown or not shown, unless noted otherwise.

tt. "**Work**" shall mean the construction and services required by the Contract Documents or reasonably inferable by the Contractor as necessary to produce the results intended by the Contract Documents, whether completed or partially completed, and includes all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's construction obligations and complete the Project. The term "Work" includes labor and materials, or both, incorporated in, or to be incorporated in the construction covered by the Contract Documents or reasonably inferable from the Contract Documents. Unless otherwise specified, the terms "approved", "directed", "satisfactory", "accepted", "acceptable", "proper", "required", "necessary", and "equal", as used in connection with the Work, shall mean as approved, directed, satisfactory, accepted, proper, required, necessary and equal, in the opinion of the Architect.

This set of General Terms and Conditions and the definitions above are an integral part of the Contract Documents. In addition to signing the General Contract, Contractor shall initial this paragraph immediately below acknowledging that these General Terms and Conditions and the definitions have been read, understood and accepted by Contractor. Contractor shall not disclaim knowledge of the meaning and effect of any term or provision of these General Terms and Conditions and agrees to strictly abide by their meaning and intent. In the event that Contractor fails to initial below, the District shall have the right to declare the Contract unexecuted and hold Contractor non-responsive in accordance with California Public Contract Code Section 5106.

CONTRACTOR'S
INITIALS _____

2. SCHEDULE OF VALUES

Within seven (7) days after award of the Contract, the Contractor shall submit to the Architect and the District, for their reasonable approval, a schedule of values (the **"Schedule of Values"**) allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect or the District may require. Such values shall include the amount of overhead and profit applicable to each item of the Work (not including Contractor's General Conditions) and shall include a breakdown between rough and finish Work for the basic trades as well as individual dollar figures for large dollar equipment and materials installed or furnished in connection with the Project. Prior to the processing of any Contractor Payment Request (including a Contractor Payment Request for mobilization), the Schedule of Values must have been reviewed by the District and the Architect. The reviewed Schedule of Values shall be used as a basis for reviewing the Contractor Payment Requests that are submitted for payment from time to time. If the District or the Architect objects to any Schedule of Values submitted by the Contractor, the Contractor shall work and cooperate with the party objecting to the same in order to revise the Schedule of Values in a manner that addresses such objecting party's objections. The Schedule of Values will be updated from time to time as may be necessary during the course of construction. Updates to the Schedule of Values shall also be subject to the prior approval of the District and the Architect.

In preparing the Schedule of Values, the Contractor shall carefully list the true cost of each activity or item for which payment will be requested. The Contractor shall not "front-load" the Schedule of Values with false dollar amounts for activities required to be performed in the early stages of the Project Schedule. The District may, in its sole discretion, utilize the costs listed in the Schedule of Values as the true costs of items to be deducted from the Contract Price through credit or deductive Change Order.

3. PROJECT SCHEDULE

Within fourteen (14) days after award of the Contract and prior to the processing of any Contractor Payment Request (including a Contractor Payment Request for mobilization), the Contractor shall submit the following to the District and the Architect for their review and approval (in their sole discretion):

a. A project schedule setting forth the milestone dates for the Project and stating the start and completion dates of the various stages of the Work (the **"Project Schedule"**); and

b. A preliminary schedule of submittals.

The Project Schedule and schedule of submittals must each be reviewed by the District and the Architect (in their sole discretion). The Project Schedule shall provide for an orderly progression of the Work to completion within the specified milestones and the Contract Time. Review of the Project Schedule by the District and/or the Architect shall neither impose on the District or the Architect responsibility for the progress or scheduling of the Work nor relieve the Contractor from full responsibility therefor. The Project Schedule shall be prepared in a critical path network format such that no activity has a duration of more than twenty (20) days, shall have the critical path clearly indicated and shall have the total Contract Price allocated among the scheduled activities such that progress payments may be computed accurately from the updates of the critical path schedule. The critical path must be a single task (concurrent tasks cannot both be critical) and must be continuous from the start to end of the schedule. Each of the Contractor's activities shall be allocated a price, and the sum of the prices of all activities listed on the Project Schedule shall equal the total Contract Price.

The Project Schedule shall be prepared on a PC-based program. For purposes of bidding, the Contractor shall assume that the District will request preparation of a Cost-Loaded Primavera Scheduling Program utilizing the Primavera, Project or Suretrak Scheduling Software Packages. However, following bid award, the District fully reserves the right to require an alternate software system without any additional cost to the District. Before preparing the first base line schedule, Contractor shall recommend a software scheduling program for the District's approval.

In addition to being in a "critical path network format", as provided above, the Contractor agrees that the Project Schedule shall plot and incorporate certain milestone activities and dates deemed "critical" or "constraining factors" by the District and furnished by the District. Should the District not provide the Contractor with such milestone activities or dates, then the start and finish dates shall be considered the main constraining elements; however, the District reserves the full right to reject or approve intermediate schedule development.

The completed Project Schedule and all required periodic updates (as required below) shall include, at a minimum, the following items of data:

a. Critical path;
b. Earliest and latest dates of completion;
c. Float for each activity and total Project float;
d. Manufacturing dates and delivery dates of critical equipment or special equipment designated by the District as essential;
e. District-designated milestone activities;
f. Submission dates for all submittals, deferred approval items and shop drawings (which may be provided on a separate schedule of submittals);
g. Incorporation of weather related time as further addressed in Section 8 and
h. All underground Work.

The District and the Architect shall provide the Contractor with their review of the Project Schedule promptly after receipt of the same. If the Project Schedule is not acceptable, the Contractor shall revise the Project Schedule as necessary based on the District's and the Architect's comments and resubmit to the District and the Architect a revised Project Schedule. No progress payments shall be processed or paid until the Contractor's Project Schedule has been properly prepared and submitted by the Contractor and approved by the District and the Architect.

The Contractor shall submit with each Contractor Payment Request monthly schedule reports to the District and the Architect indicating the current status of the Work and incorporating into such monthly schedule all Change Orders. The reports may include proposed adjustments in the Contractor's Project Schedule, and, additionally shall indicate any revised sequence of the Work as may be necessary to meet specified milestone and final completion dates. No changes in any activity or price allocations shall be permitted except by, and in accordance with, the Change Order provisions set forth in Sections 9 and 10 hereof. Acceptance of the proposed adjustments shall be at the sole discretion of the District and the Architect. If the proposed adjustments are accepted, the Contractor shall, within ten

(10) days, submit to the District and the Architect for approval (in their sole discretion) a revised Contractor's Project Schedule indicating the accepted adjustments.

In bidding this Project, Contractor expressly agrees and understands that the following principles will be controlling and shall govern the District's evaluation and interpretation of the Project Schedule and, together with the terms and provisions of Sections 8, 9 and 10 hereof, shall be applied when determining the potential impact of, and monetary costs (if any) resulting from, Project delays:

1.No extended overhead, general conditions money, impact costs, out-of-sequence money or any other type of compensation, by any name or characterization, shall be paid to the Contractor for any delay to any activity not designated as a critical path item on the latest approved Project Schedule, and if any delay occurs to any critical path item, such compensation shall only be payable to the Contractor in accordance with the terms and provisions of Sections 8, 9 and 10 below.

2. There shall be only one (1) critical path for the Project.

3. In lieu of payment of extended general conditions or overhead or any other cost as specified in subsection 1 above, the District reserves the right to first direct "work orients" to the Contractor's Project Schedule in order to recover the lost time whenever a District-caused delay (as defined in Section 8) occurs; provided that, the District's exercise of this right shall neither impose upon the District the responsibility for the progress of the Work or the completion thereof within the Contract Time nor relieve the Contractor from full responsibility therefor or from the responsibility to perform all Work and complete the Project in accordance with the terms and provisions of the Contract Documents.

4. Neither the District nor the Contractor has a right to the float. If the Contractor's construction progress is ahead of the agreed-upon baseline time schedule and a delay is encountered (even if such delay is a District-caused delay), no compensation of any type will be due the Contractor and the District may claim float days equal to the delay until such float days are exhausted.

4. THE WORK

a. The Work. The Contractor shall perform, diligently prosecute and complete the Work in a good and workmanlike manner within the Contract Time, and in strict conformity with all Contract Documents. All utilities, tools, equipment, apparatus, facilities, transportation, labor and materials necessary for the performance and completion of the Work shall be furnished by the Contractor, at its cost, except for material expressly agreed to be furnished by the District (at its cost) in a writing signed by the District. During the term of this Contract, Contractor shall send proper notices, make all necessary arrangements and perform all other services required for the care and maintenance of all public utilities used in connection with the Project. Contractor shall assume all responsibility concerning the same for which the District may otherwise be liable. By executing the General Contract, the Contractor represents that it has (a) examined the Contract Documents thoroughly, (b) visited the Project Premises to become familiar with local conditions that may in any manner affect the cost, progress or performance of the Work, (c) become familiar with federal, state and local laws, ordinances, rules and regulations that may in any manner affect the cost, progress or performance of the Work, (d) become familiar with the anticipated labor supply and costs, (e) become familiar with local utility company standards and policies, and (f) studied and carefully correlated the Contractor's observations with the Contract Documents.

b. Interpretation of Contract Documents. The Contract Documents are intended to be complementary, and what is called for by one Contract Document shall be as binding as if called for by all. The intention of the Contract Documents is to include all labor and materials, equipment, transportation and other things necessary for the proper execution of the Work. When the word "provide" (including derivatives thereof) is used, it shall mean "provide complete in place", "furnish and install" and deliver materials and equipment F.O.B. destination to the Project Premises, and to properly fabricate, complete, transport, deliver, install, erect, construct, test and furnish all labor, materials, equipment, apparatus, appurtenances, and all other items necessary to properly complete in place, ready for operation or use in accordance with the Drawings and Specifications. Materials or Work described in words which so applied have a well known technical or trade meaning shall be deemed to refer to such recognized standards.

Work that is not particularly shown or specified on the Drawings or Specifications shall be the same as similar parts or Work that are shown or specified. Specifications shall govern as to materials, workmanship, and installation procedures. Drawings and Specifications are intended to be fully cooperative and to agree. If the Contractor or any Subcontractor observes that the Drawings and Specifications are in conflict, or that there is a conflict or inconsistency between Drawings, he or she shall promptly notify the Architect in writing (via a Request for Information) before commencing any Work or layout or making any submittals and before ordering any materials, and any necessary changes shall be adjusted by a written response to the Request for Information and Change Order, if required.

Should any question arise concerning the true meaning of the Drawings and/or Specifications, the point in question shall be resolved by the Architect, subject to the approval of the District. Should the Contractor disagree with such interpretation, the Contractor shall proceed without delay with the Work under question as resolved by the Architect and may initiate the dispute resolution proceedings set forth in Section 56 hereof to resolve its dispute.

Standards, Rules and Regulations referred to are recognized printed standards and shall be considered as one and a part of the Contract Documents within any limits specified. Specifications and accompanying Drawings are intended to delineate and describe the Project and its component parts to such a degree as will enable skilled and competent contractors to intelligently bid upon the Work and to carry said Work to a successful conclusion. In preparing the bid for this Project, any Work called for on the Drawings and not by the Specifications, or vice versa, or called for on one Drawing sheet but not on others, shall be priced and fully included in the bid. For bidding purposes, the Contractor shall bid the more stringent requirement or the more complete and comprehensive process in the event of conflicts or discrepancies in the Drawings or Specifications. Should the District desire, during the construction phase of the Project after bid, to direct the use of the simpler or less comprehensive process of the Work or processes in conflict, the Contractor will be issued an Architect/Engineer Field Directive to this effect and a credit Change Order will be issued for the dollar difference between the District-directed Work or method and the more elaborate or comprehensive Work or method that was used in bidding.

It is not the intention of the Contract Documents to go into detailed descriptions of any materials and/or methods commonly known to the trade under "trade name" or "trade term". The mere mention or notation of such "trade name" or "trade term" shall be considered a sufficient notice to Contractor that the Work so named must be completed with all its appurtenances according to the best practices of the trade. The naming of any material and/or equipment shall mean the furnishing and installing of the same, including all incidental and accessory items thereto and/or labor, as per best practices of the trade(s) involved, unless specifically noted otherwise. Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

c. Compliance with Laws. Drawings and Specifications (and all other Contract Documents) are intended to comply with all laws, ordinances, rules and regulations of constituted authorities having jurisdiction, and where referred to in the Contract Documents, said laws, ordinances, rules and regulations shall be considered as a part of said Contract Documents within the limits specified therein. If the Contractor observes that portions of the Contract Documents are at variance with any laws, ordinances, rules or regulations applicable to the Project Premises, the Work or the Project, the Contractor shall promptly notify the Architect and the District in writing, and any necessary changes shall be made by Change Order in accordance with Sections 9 and 10 hereof or as otherwise provided in the Contract Documents. The Contractor shall bear all expenses of correcting Work that is done contrary to, or in violation of, said laws, ordinances, rules and regulations if the Contractor knew or should have known that the Work as performed is contrary to, or violates, said laws, ordinances, rules and regulations and if the Contractor performed the same (1) without first consulting the Architect and the District for further instructions regarding said Work or (2) disregarded the Architect's or the District's instructions regarding said Work.

5. CONTRACT PRICE

The District shall pay, and the Contractor shall accept in full payment for the Work, the Contract Price, subject to additions and deductions provided for in Change Orders, if any, as hereinafter allowed. Whenever Contractor arranges to work at night or at any time when work is not usually in progress, such work shall be accomplished without extra cost to the District, unless the acceleration in the schedule has been directed by the District after bid

award and the delay is not caused by the Contractor. If the District directs the acceleration, the Contract Price shall be equitably adjusted by Change Order.

A reduction in the Contract Price will be made, dollar for dollar, for each overtime or per diem dollar spent by the District in connection with required State Inspections when such per diem or overtime payments are caused by the following:

a. Voluntary acceleration of the Project Schedule by the Contractor which involves weekend Work, Work in excess of forty (40) hours per week, or Work in excess of eight (8) hours in a single day, performed by the Contractor or any Subcontractors or Materialmen (of any tier), for which on-site inspection of the accelerated Work is required to be furnished by the District; or

b. Fabrication of materials outside a geographical radius of one hundred (100) air miles from the Project Premises in each direction, when said fabrication requires the presence of a District or State inspector (i.e., steel fabrication or concrete batch mixing).

6. PAYMENT SCHEDULE

a. Progress Payments. On or about the last day of each month during the progress of the Work, the Contractor shall submit to the Inspector of record for preliminary approval a completed Contractor Payment Request form, which will include Contractor's periodic estimate for partial payment, on account of the portion of the Contract Price in proportion to Work completed from the commencement of the Work through the last day of the month and not included and paid pursuant to any previous Contractor Payment Requests. Each Contractor Payment Request shall show the Contractor's reasonable estimate of the percentage of completion of the Work based upon the most updated Schedule of Values and Contractor's reasonable estimate of the portion of the Contract Price allocable to (1) labor, materials and equipment incorporated into the Work during the period commencing on the date of the preceding Contractor Payment Request (or the date of the General Contract if no payments have been made) and ending on the last day of the month, and (2) materials and equipment properly purchased and stored for use in the Project as of the last day of the month; provided that, except as otherwise provided in the next paragraph, the District shall not be obligated to make payment for (and shall not pay for) materials or equipment stored off-site (i.e., not on the Project Premises). The Contractor Payment Request shall also include a request for a pro rata share (based upon the Contract Time) of the general conditions previously approved in the Schedule of Values. Contractor's estimate of percentage of completion shall be subject to final review and approval by the Inspector of record and the Architect, in each such person's reasonable discretion.

Notwithstanding anything to the contrary stated above, the Contractor may include in a Contractor Payment Request (and the District shall pay for) the value of any structural steel, mail order materials, G.F.R.C. panels and other such custom-made materials prepared specifically for the Project and unique to the Project, so long as the following requirements are satisfied:

(1) The aggregate cost of materials stored off-site shall not exceed Fifty Thousand Dollars ($50,000) at any time without the written approval of the District to be given or withheld in its sole discretion;

(2) Title to such materials shall be vested in the District, as evidenced by documentation satisfactory in form and substance to the District, including, without limitation, recorded financing statements, UCC filings and UCC searches;

(3) With each Contractor Payment Request, the Contractor shall submit to the District a written list identifying each location where materials are stored off-site (which must be a bonded warehouse) and the value of the materials at each location. The Contractor shall procure insurance satisfactory to the District (in its reasonable discretion) for materials stored off-site in an amount not less than the total value thereof;

(4) The consent of any Surety shall be obtained to the extent required prior to payment for any materials stored off-site;

(5) Representatives of the District shall have the right to make inspections of the storage areas at any time;

(6) Such materials shall be (a) protected from diversion, destruction, theft and damage to the reasonable satisfaction of the District, (b) specifically marked for use on the Project, and (c) segregated from other materials at the storage facility;

(7) Stored items shall be scheduled for installation within six months of the store date, unless allowed by the District in writing, and;

(8) Items commonly used and readily available will not be considered as stored items.

In addition to other required items, each Contractor Payment Request shall be accompanied by (i) a duly executed and acknowledged sworn statement showing all Subcontractors and Materialmen with whom the Contractor has entered into contracts, the amount of each such contract, the amount requested for any Subcontractors or Materialmen in the Contractor Payment Request, together with similar sworn statements from all such Subcontractors and Materialmen, (ii) duly executed conditional lien releases and waivers (in the form provided in California Civil Code Section 3262) from Contractor, and all Subcontractors and Materialmen providing labor, services, materials or equipment in connection with the Work, whereby such persons conditionally waive all lien and stop notice rights against the District, the Project and the Project Premises with respect to all payments to be made pursuant to the Contractor Payment Request being submitted, (iii) duly executed unconditional lien releases and waivers (in the form provided in California Civil Code Section 3262) from Contractor, and all Subcontractors and Materialmen providing labor, services, materials or equipment in connection with the Work, whereby such persons unconditionally and irrevocably waive all lien and stop notice rights against the District, the Project and the Project Premises with respect to all payments made pursuant to all previous Contractor Payment Requests, (iv) copies of all recently issued permits or other governmental licenses and approvals with respect to the Work or the Project, (v) the monthly schedule report and any updates made to the Project Schedule during the current payment period, (vi) a record drawing review log form as required by Section 24g. pertaining to the current payment period and (vii) all other information and materials required to comply with the requirements of the Contract Documents or reasonably requested by the District or the Architect. Each Contractor Payment Request shall be based upon the most updated Schedule of Values submitted by the Contractor in accordance with Section 2 hereof.

Upon approval of the Contractor Payment Request (or any portion thereof), the Inspector shall sign the same and deliver it to the Architect for approval. The Architect shall review each Contractor Payment Request, the supporting documentation and the progress of the Work and shall submit to the District a Certificate for Payment form certifying the amounts owed Contractor based on the percentage of completion of the Work as of the date of the Contractor Payment Request, and/or a statement that the Contractor Payment Request, or any portion thereof, is rejected and the reasons for rejecting the same, within three (3) days after receipt of the Contractor Payment Request and all supporting documentation. Notwithstanding anything to the contrary stated herein, in accordance with California Public Contract Code Section 20104.50, any Contractor Payment Request (or portion thereof) that is rejected by the Architect or the District shall be returned to the Contractor, together with a document setting forth the reasons why the Contractor Payment Request (or portion thereof) is rejected, as soon as practicable, but not later than seven (7) days after the District's receipt of the Contractor Payment Request. The issuance of a Certificate for Payment will not be a representation that the Inspector or the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and Materialmen and other data requested by the District to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Price.

If the Contractor Payment Request is undisputed and in accordance with the Contract Documents and the Architect issues a Certificate for Payment, payment shall be made to the Contractor within thirty (30) days after receipt of the Certificate for Payment by the District as required by California Public Contract Code Section 20104.50(b). The amount paid pursuant to each Contractor Payment Request shall be ninety percent (90%) of the amount certified by the Architect in the applicable Certificate for Payment. The District shall be entitled to retain ten percent (10%) of the value of the Work completed as certified by the Architect to assure the faithful performance of the Contract by the Contractor (collectively, the **"Retention"**), plus any other amounts that may be retained by the District pursuant to Section 6d below. Any Retention (less any other amounts that the District is otherwise entitled to withhold pursuant to Section 6d below) shall be paid to the Contractor, if at all, at the time of final payment. Notwithstanding the foregoing, the District shall have the option, but not the obligation, in its sole and absolute discretion, to reduce

from time to time or at any time the Retention or release any portion of the Retention or any other amounts withheld hereunder prior to the date hereinbefore specified so long as the District does not allow the Retention to fall below the percentages required by California Public Contract Code Section 9203. Any exercise of this option shall not be a waiver of (i) any of the District's rights respecting the Retention or future Retention or the right to withhold other amounts under the Contract Documents or (ii) any other right or remedy that the District has under the Contract Documents, at law or in equity. Contractor shall not be entitled to have any Contractor Payment Requests processed or be entitled to have any payment made for Work performed so long as any lawful or proper direction concerning the Work, or any portion thereof, given by the District, Architect or Inspector shall remain uncomplied with. Pursuant to California Public Contract Code Section 20104.50, if the District fails to make a progress payment (or any acceptable portion thereof) within thirty (30) days after the District's receipt of a properly submitted Certificate for Payment therefor (as provided above), the progress payment (or such acceptable portion thereof) shall accrue interest for each day from and after the expiration of the said thirty (30) day period until it is paid to the Contractor at the legal rate set forth in subdivision (a) of Section 685.010 of the California Code of Civil Procedure.

A Certificate for Payment or a progress payment shall not constitute acceptance of Work that is not in accordance with the Contract Documents.

The Contractor shall promptly pay each Subcontractor and Materialman, upon receipt of payment from the District, and in any event no later than ten (10) days after such receipt in accordance with California Public Contract Code Section 10262.5, out of the amount paid to the Contractor on account of such Subcontractor's or Materialman's portion of the Work, the amount to which such Subcontractor or Materialman is entitled, less percentages (amounts) actually retained from payments to the Contractor on account of such Subcontractor's or Materialman's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor and Materialman, require each Subcontractor and Materialman to make payments to its sub-Subcontractors and sub-Materialmen in a similar manner. In no event shall Contractor be permitted to withhold any sums (other than retention as provided hereinabove) due any Subcontractor or Materialman hereunder on the basis of any claims, retention rights or other rights that Contractor may have against such Subcontractor or Materialman at law, in equity or under contract pertaining to or arising out of any other project other than the Project.

b. Final Payment. If no stop notices or other claims relating to the Work have been served or filed against the District, the Contractor, the Work, the Project or the Project Premises, the final payment, or any part thereof that is not subject to a stop notice or other claim, less any other amounts that may be withheld or retained by the District pursuant to Section 6d below, shall be processed following the thirty-fifth (35th) day after recordation of a Notice of Completion for the Work, but no later than the sixtieth (60th) day after the recordation of the Notice of Completion or final completion of the Project, whichever occurs first, as prescribed by California Public Contract Code Section 7107. The final payment shall be processed in accordance with the submission of a final Contractor Payment Request. Before final payment is due and will be paid under the Contract, the Contractor shall deliver certain items to the District (as reasonably requested by the District prior to final payment), including, but not limited, (1) all maintenance and operating manuals, spare parts, extra stock and special tools required by the Specifications, (2) the marked sets of Record Drawings, (3) reproducible mylar drawings reflecting the location of any concealed utilities, mechanical or electrical systems and components, (4) any special guaranties and warranties required by the Contract Documents, (5) assignments of all guaranties and warranties from Subcontractors and Materialmen, (6) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the District or the District's property might be responsible or encumbered (less amounts withheld by the District) have been paid or otherwise satisfied, (7) duly executed conditional lien releases and waivers (in the form provided in California Civil Code Section 3262) from Contractor, and all Subcontractors and Materialmen providing labor, services, materials or equipment in connection with the Work, whereby such persons conditionally waive all lien and stop notice rights against the District, the Project and the Project Premises with respect to all payments to be made to them from the final payment, (8) duly executed unconditional lien releases and waivers (in the form provided in California Civil Code Section 3262) from Contractor, and all Subcontractors and Materialmen providing labor, services, materials or equipment in connection with the Work, whereby such persons unconditionally and irrevocably waive all lien and stop notice rights against the District, the Project and the Project Premises with respect to all payments made pursuant to all previous Contractor Payment Requests, (9) a record drawing review log form for the current payment period and (10) copies of all recently issued or final permits or other governmental licenses and approvals with respect to the Work or the Project. As a condition precedent to final payment, Contractor shall also have satisfied all close-out requirements set forth in Sections 48, 49, 50 and 51 hereof. Within ten (10) days following final payment, the Contractor shall deliver to the District duly executed unconditional lien releases and waivers (in the form provided in California Civil Code Section 3262) from Contractor, and all Subcontractors and

Materialmen providing labor, services, materials or equipment in connection with the Work or the Project, executed by such persons, whereby such persons unconditionally and irrevocably waive all lien and stop notice rights against the District, the Work, the Project and the Project Premises arising out of this Contract, the Work or the Project in general.

c. Changes. Payment for additional work or extra work shall be authorized by Change Order in accordance with the terms and provisions of Sections 9 and 10 hereof.

d. Payments Reduced or Withheld. The District may at any time decline to pay the Contractor, or reduce or withhold any portion of a payment otherwise due the Contractor under the Contract (including, without limitation, the final payment), if:

(i) Any of the Work is defective and such defects are not remedied;

(ii) Any third party claims are filed with respect to the Work or the construction or there is reasonable evidence indicating the probable filing of such claims;

(iii) The Contractor fails to make any payments properly to Subcontractors or Materialmen for labor, materials or equipment;

(iv) In the District's opinion, the Work cannot be completed for the unpaid balance of the Contract Price;

(v) In the District's opinion, the Work will not be completed within the Contract Time and the unpaid balance of the Contract Price would not be adequate to cover liquidated damages and/or actual delay damages resulting from the anticipated delay;

(vi) Any damage has occurred to the District or any Subcontractor, Materialman or another contractor, and the Contractor may be liable for such damage;

(vii) The Contractor fails to comply with the Project Schedule;

(viii) The Contractor fails to perform any portion of the Work in accordance with the Contract Documents or otherwise violates any provision of the Contract Documents or fails to discharge any Contractor obligation thereunder;

(ix) Any claims, liens or stop notices are filed in connection with the Work or asserted against the District, the Project or the Project Premises or the District has reason to believe it is probable a claim, lien or stop notice will be filed or asserted in connection with any portion of the Work;

(x) The Contractor fails to reimburse the District for any costs or expenses incurred by the District, or amounts advanced by the District, on behalf of the Contractor as may be provided or permitted in this Contract;

(xi) Notification has been given that a penalty will be assessed by any State, local or municipal agency or by the District for violations of any applicable laws, including, without limitation, labor laws and/or fair employment laws; or

(xii) Any testing/inspection costs or payments that become due to the District for failed tests or inspections.

If the District elects to withhold payment from the Contractor pursuant to this Section 6d, then the District will be permitted to withhold such amounts as the District may, in its reasonable discretion, deem necessary to (A) protect the District against any and all liabilities to Subcontractors, Materialmen or any other persons as a result of the Work or any of the Contractor's acts or omissions, (B) correct any defective Work or remedy any breach of the Contract Documents, (C) recover and collect liquidated damages and actual delay damages in the event completion of the Project is delayed, (D) recover and collect any costs or expenses paid by, or amounts advanced by, the District on behalf of Contractor, (E) collect any penalty that may be assessed against the Contractor for violations of any applicable laws, including, without limitation, labor laws and/or fair employment laws, and/or (F) recover any testing/inspections costs incurred by the District in connection with failed tests or inspections. The District may

apply any such withheld amount or amounts to the payment and satisfaction of such claims or obligations at its discretion. In so doing, the District shall be deemed the agent of Contractor and any payment so made by the District shall be considered as a payment made under the Contract by the District to the Contractor and shall be so deducted from the Contract Price due the Contractor. The District shall not be liable to Contractor for any such payments made in good faith. Such payments may be made without prior judicial determination of the claim or the obligation to make such payment. The District will render the Contractor a proper accounting of any such amounts retained or disbursed by the District on behalf of the Contractor.

The Contractor shall promptly pay each Subcontractor or Materialman, upon receipt of payment from the District, and in any event no later than ten (10) days after such receipt in accordance with California Public Contract Code Section 7107, out of the amount paid to the Contractor on account of such Subcontractor's or Materialman's portion of the Work, the balance of the portion of the Retention to which said Subcontractor or Materialman is entitled, reflecting amounts actually retained from previous payments to the Contractor on account of such Subcontractor's or Materialman's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor and Materialman, require each Subcontractor and Materialman to make payments to sub-Subcontractors and sub-Materialmen in a similar manner. In no event shall Contractor be permitted to withhold any sums (other than retention as provided hereinabove) due any Subcontractor or Materialman hereunder on the basis of any claims, retention rights or other rights that Contractor may have against such Subcontractor or Materialman at law, in equity or under contract pertaining to or arising out of any other project other than the Project.

e. Substitution of Securities. Substitution of securities for any monies withheld under this Section 6 will be permitted at the request and expense of the Contractor, but only in accordance with the provisions of California Public Contract Code Section 22300. Upon satisfactory completion of the Contract, the securities shall be returned to the Contractor.

Securities eligible for investment under this Section 6e shall include those listed in California Government Code Section 16430, bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters or credit, or any other security mutually agreed to by the Contractor and the District.

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

The escrow agreement used for the purposes of this Section 6e shall be substantially similar to the form set forth in California Public Contract Code Section 22300(f).

7. TIME PERIOD FOR COMPLETION OF THE WORK

The time period for completion of the Work shall be the number of consecutive calendar days stated in the General Contract and shall commence from the Starting Date. By executing the General Contract, the Contractor confirms that the Contract Time is a reasonable period for performing the Work. Any extension thereto shall be authorized under Change Order only in accordance with Sections 8, 9 and 10 below. Time is of the essence in the performance of the Contract.

IT IS AGREED BY THE CONTRACTOR AND THE DISTRICT THAT, IT WOULD BE IMPRACTICABLE AND EXTREMELY DIFFICULT TO FIX THE ACTUAL DAMAGE TO THE DISTRICT SHOULD THE ENTIRE WORK AND PROJECT NOT BE COMPLETED WITHIN THE TIME PERIOD SPECIFIED ABOVE PLUS ANY AUTHORIZED EXTENSIONS OF TIME HEREUNDER, THERE SHALL BE ASSESSED AS LIQUIDATED DAMAGES, BUT NOT AS A PENALTY, THE AMOUNT STATED IN THIS CONTRACT FOR EACH DAY THEREAFTER UNTIL THE DATE THAT PHYSICAL COMPLETION OF THE WORK AND THE PROJECT HAS REACHED SUBSTANTIAL COMPLETION.

CONTRACTOR'S INITIALS: _____	DISTRICT'S INITIALS: _____

The District may deduct liquidated described in this Section 7 from any unpaid amounts then or thereafter due the Contractor under this Agreement in accordance with Section 6d hereof. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the District at the demand of the District, together

with interest thereon from the date of demand until paid at a rate equal to the rate of interest set forth in Section 54d hereof.

8. DELAY IN THE WORK

a. Extension of Contract Time. The District shall extend the time period for completion of the Work by the number of calendar days the Contractor is delayed only when satisfactory evidence is presented to the District, within fifteen (15) calendar days after the commencement of the matter or condition causing the delay, that such delay could not be anticipated at the time of entering into the Contract and is neither caused nor continued by fault or negligence on the part of the Contractor, its Subcontractors, Materialmen or others reasonably and customarily under the Contractor's control and is not otherwise caused by the Contractor or within its control. The following shall constitute matters or conditions that may justify an extension to the Contract Time hereunder: an act of God or of a public enemy, act of government, act of any quasi-governmental or publicly-regulated entity including a public utility, labor disputes, fire, abnormal adverse weather, flood, epidemic, quarantine restrictions, riot, strike, freight embargo, unavoidable casualties, and other such causes beyond the Contractor's control. If abnormal adverse weather conditions are the basis of a claim for an extension to the Contract Time, such claim shall be documented by data substantiating that weather conditions were abnormal for the period of time claimed and could not have been reasonably anticipated at the time of contracting, and that such weather conditions had an adverse effect on the scheduled construction. The District shall ascertain the facts and the extent of the delay, and its findings shall be conclusive. A time extension granted for Work at one site shall not apply to any other site. Any extension of time, if allowed by the District pursuant to this Section 8, shall be authorized under written Change Order.

b. District Liability for Delays. Except as otherwise provided in this Section 8, the District and those acting on its behalf shall not be liable for any damages because of any delay in furnishing the Project Premises or otherwise resulting from any cause beyond the control and without the fault of the District, including, but not restricted to: an act of God or of a public enemy, act of government, act of any quasi-governmental or publicly-regulated entity including a public utility, labor disputes, act of the Contractor or the Contractor's employees, Subcontractors, Materialmen or agents, act of any other contractor on the Project, abnormal adverse weather conditions, fire, flood, epidemic, quarantine restrictions, riot, strike, freight embargo, unavoidable casualties, or act of any third person or entity not subject to the direct control of the District. The sole remedy of the Contractor for any such delay shall be limited to an extension of the Contract Time in accordance with Section 8(a) above. Notwithstanding anything to the contrary stated above, the District may, in its sole and absolute discretion and without obligation to do so, elect to increase the Contract Price for significant delays that are not caused by the Contractor or any person under the Contractor's control (based on actual incurred costs which can be substantiated through documentary evidence) where the circumstances warrant such a change in the Contract Price pursuant to a Change Order in accordance with Sections 9 and 10 hereof.

In compliance with, the provisions of California Public Contract Code Section 7102, if the Contractor is delayed in completing the Work due solely to the fault of the District, and where such delay is unreasonable under the circumstances and was not contemplated by the parties at the time of contracting, the Contractor shall be entitled to an appropriate time extension to account for the delay, to be authorized by Change Order, and the District shall pay to Contractor the actual and verifiable damages and costs incurred by Contractor as a direct result of such delay. This extension of the Contract Time and payment of direct verifiable damages shall be the Contractor's sole remedy (and the Contractor shall have no right to actual or liquidated damages) for any delay, hindrance in the performance of the Work, loss in productivity, impact damages or similar claims unless the delay (i) is caused solely by the acts of the District, (ii) is unreasonable under the circumstances, and (iii) was not contemplated by the parties at the time of contracting. If any such District-caused delay occurs, the Contractor expressly agrees to be limited solely to the actual, direct, and verifiable damages provided for in this Section 8b.

Notwithstanding anything to the contrary stated above, Contractor hereby acknowledges and agrees that Contractor shall not be entitled to any compensation, under any theory of recovery, for extended overhead, project general conditions, acceleration costs or other costs or expenses, arising or resulting from delays of up to one-hundred twenty (120) days from the date of bid opening in the District's obtaining bid approval from its Board and the State of California (if required). In bidding this Project, Contractor fully agrees and understands that a considerable delay may result from the date of the bid opening until the issuance of the Notice to Proceed and that no compensation shall be due to Contractor for such delay unless such delay exceeds one-hundred twenty (120) days, in which event the Contractor shall be appropriately compensated only for the portion of such delay that exceeds one-hundred twenty (120) days.

c. Change Order Work. The Contractor expressly acknowledges and agrees that any change in the Work performed pursuant to Sections 9 or 10 below shall not be deemed to constitute a delay or other basis for claiming

additional compensation based on theories including, but not limited to, acceleration, suspension or disruption to the Project, and further acknowledges that a complete system of compensation for said change in the Work is provided exclusively under said Sections 9 and 10.

9. CHANGES

a. Changes in the Work. The District may, at any time prior to Acceptance of Completion, by delivery of a written Bulletin make changes in the Work or the Contract Documents by alteration, addition, deduction, deviation, or omission, without making the Contract void. The Contractor when so notified by the District shall proceed without delay with the changes described in the written directive. The details, workmanship and materials involved in any change in the Work shall conform to the original Drawings and Specifications unless specifically instructed otherwise by the District. All such Work shall be executed under conditions of the original Contract, except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

In giving instructions, the Architect, any engineer or any other District representative working on the Project shall have authority to make minor changes in the Work, not involving a change in Contract Price or Contract Time, and not inconsistent with the purposes of the building, via an Architect/Engineer Field Directive. Otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order from the District, and no claim for addition to the Contract Price or extension to the Contract Time shall be valid unless so ordered by the District.

Request for changes shall be made by the architect or District in the form of a proposal request. The Contractor shall have fourteen days to respond to the initial request and five days to respond to the District's evaluation of the response. Should the Contractor fail to respond in the aforementioned time, the Contractor becomes responsible for the work. Work installed after the time periods noted, that has to be altered or removed to accommodate the change, shall be performed at no cost to the District.

Request for changes shall be priced based on the Specifications and similar work on the Drawings, even if not explicitly stated.

b. Changes in the Contract Price. The charge or credit to the District resulting from any changes ordered or authorized by the District in writing shall be mutually agreed upon by the District and the Contractor as provided in this Section 9b, or, at the District's option, shall be performed on a time and materials basis in accordance with Section 10 below. In no event shall the Contractor be permitted to cease Work during the negotiation of any Change Order or Architect/Engineer Field Directive and shall proceed with the ordered change in the Work in a timely manner. Contractor shall increase the amounts of each of the Payment Bond and Performance Bond in proportion to any increase in the Contract Price.

If the District elects to fix the charge or credit resulting from any such change by agreement with the Contractor prior to commencement of the change in the Work, then the District shall so notify the Contractor in the written directive whereby it requests the change and the Contractor shall submit its estimate for the change within fourteen (14) calendar days after the change is requested or more quickly upon specific written request by District or agent of District. The Contractor shall submit estimates in sufficient detail to permit verification of all costs comprising the Cost of the Work (as defined below). Such estimates shall be based on either unit prices or detailed labor and material estimates, as required by the District in its sole and absolute discretion.

For changes in the Work performed by the Contractor, only the following shall be used in computing the total **"Cost of the Work"**:

(i) Amount of wages (including employer payment for fringe benefits required by custom) paid (A) laborers, apprentices, journeymen and others who are dedicated exclusively to the Project and working on the Project on a full-time basis to the extent such wages are incurred in connection with such Change Order Work and (B) lead person retained on a full-time basis to supervise the Project to the extent such wages are incurred while such persons are directly supervising Change Order Work;

(ii) A portion of the wages (including employer payment for fringe benefits required by custom) for project directors, assistant project directors, project managers, assistant project managers, project engineers and other such employees equal to the product of such employee's wages multiplied by the number of hours that such employee actually worked on the Project Premises in connection with the Change Order Work (it being acknowledged and agreed by the parties that hours worked by such employees off-site (e.g., not on the Project Premises) on or in connection with the Change Order Work shall be considered Contractor overhead and compensated via the overhead and profit percentages set forth below and not as a part of the Cost of the Work). Work related to preparing and processing the paper work for a change order, or updating a schedule, is considered overhead and is not chargeable;

(iii) Cost of services, materials, supplies and equipment, including transportation, directly and actually consumed in connection with the change in the Work; provided that, the rental cost for any hand tool with a replacement value that is less than $500 shall be excluded from the "Cost of the Work" and all materials credits, cash or bulk discounts given to the Contractor or any Subcontractor or Materialman shall be passed on to the District in full. Wearable parts such as saw blades and drill bits are not chargeable. Phone, fax and copy charges are considered overhead and are not chargeable;

(iv) Cost of the rental or use of special machinery and equipment (except as otherwise excluded above) necessary to perform the actual change in the Work (including, without limitation, the additional rental costs for Contractor's field office, temporary fencing and other such rented items and materials, but only to the extent that such rental costs are incurred as a result of the critical path being affected by the change in the Work);

(v) Cleaning costs are not chargeable unless the debris generated is on a surface previously cleaned by the contractor; and

(vi) Cost of applicable taxes, insurance and surety bonds that become due and payable solely because of the change in the Work. Surety bond increases shall be the actual cost to the contractor, but shall not exceed 1% of the Change Order cost.

No other amounts shall be included in the calculation of the Cost of the Work.

For Change Order Work performed solely by the Contractor and/or its employees, the Contractor shall add fifteen percent (15%) of the total Cost of the Work for the Contractor's profit, overhead, supervision, and any and all other costs or expenses which are incurred by the Contractor because of the change in the Work.

For Change Order Work performed by a direct Subcontractor of the Contractor, the Subcontractor shall be paid the Cost of the Work actually performed by such Subcontractor plus fifteen percent (15%) of the Cost of the Work performed by such Subcontractor as the Subcontractor's profit, overhead, supervision and any and all other such costs or expenses as described in "Cost of Work" above which are incurred by the Subcontractor because of the change in the Work, and the Contractor may add six percent (6%) of the Subcontractor's Cost of the Work as the Contractor's profit, overhead, supervision, and any and all other costs or expenses as described in "Cost of Work" above which are incurred by the Contractor because of the change in the Work.

For Change Order Work performed by a sub-Subcontractor, the sub-Subcontractor shall be paid the Cost of the Work actually performed by such sub-Subcontractor, plus fifteen percent (15%) of the Cost of the Work performed by such sub-Subcontractor as the sub-Subcontractor's profit, overhead, supervision and any and all other such costs or expenses as described in "Cost of Work" above which are incurred by the sub-Subcontractor because of the change in the Work, to which the Subcontractor may add five percent (5%) of the sub-Subcontractor's total Cost of the Work and the Contractor may add six percent (6%) of the sub-Subcontractor's total Cost of the Work. No increases above the Cost of the Work, as described in items (i) through (vi) listed above, other than the overhead, profit and supervision percentages specifically referenced hereinbefore, shall be allowed regardless of the number of layers or tiers of Subcontractors involved.

When the change involves a deletion of Work, the credit to the District shall be computed as set forth in this Section 9b above, including overhead and profit.

If the District and Contractor agree on the amount of any such charge or credit to the District, both parties shall execute a Change Order memorializing the same. If the District and the Contractor are unable to agree on the amount of any charge or credit to the District resulting from a change in the Work, the Contractor shall, at the District's direction, promptly proceed with and diligently prosecute such change in the Work and the charge or credit to the District resulting there fromshall be determined on a time and materials basis, and if, after completion of the change in the Work, the Contractor or the District disputes the other party's determination of the labor and materials cost incurred in connection with the change in the Work, then the party disputing the same may initiate the dispute resolution procedures pursuant to and otherwise proceed in accordance with Section 9d below.

c. Extension of Time. If the District determines that additional time will be required to complete the Work by reason of a change made pursuant to this Section, or a justified delay has occurred in accordance with Section 8 above, the time for completion of the Work shall be extended by a Change Order for a period commensurate with the number of days by which the entire Project has been extended because of that change or delay, as determined by the District in its reasonable discretion. The parties understand and expressly agree that insofar as the provision of California Public Contract Code Section 7102 may apply to changes in the Work or delays under this Contract, the actual delay damages set forth in Section 8b above, in conjunction with the time extensions provided herein, are

intended to, and shall provide, the exclusive and full method of compensation for changes in the Work performed under this Contract and construction delays. If the Contractor disputes the District's proposed time extension or any increase in the Contract Price resulting there from the Contractor may proceed in accordance with Section 9d below.

d. Dispute over Estimate of Changes to the Contract Price and/or Contract Time. Should the Contractor and the District fail to agree on the estimate of any charge or credit to the District and/or additional or reduced time required for proposed changes in the Work or any justified delay under Section 8 hereof, the Contractor when notified by the District shall proceed without delay with the changes or extra Work and shall file a written request for mediation and then arbitration (if necessary), as provided in Section 56 hereof, and, if the matter is not resolved by mediation and goes to arbitration, the decision of the arbitrator on the matter shall constitute the Change Order for such change in the Work or delay, as applicable.

e. Unknown or Concealed Conditions or Mistakes/Omissions in Drawings or Specifications. The Contractor hereby reconfirms that it has intensively reviewed the Drawings and Specifications and the Project Premises and is familiar with all laws, rules and regulations that may be imposed upon the Project or the Work by any governmental entity. The Contractor shall not be entitled to any adjustment in the Contract Price or Contract Time for any concealed or unknown condition encountered in the performance of the Work, or for correcting any mistakes or omissions in the Drawings or Specifications, if the Contractor knew of or should have recognized (given the Contractor's investigation of the Drawings and Specifications, the Project Premises and the proposed Work) the condition or mistake/omission prior to commencement of the Work. Notwithstanding the foregoing, however, if the Contractor makes a proper claim for an adjustment to the Contract Time or Contract Price regarding special or concealed conditions or mistakes/omissions in the Drawings or Specifications which do not fall into the categories set forth above, the Architect will promptly investigate such conditions or mistakes/omissions. If such conditions or mistakes/omissions differ materially and cause an increase or decrease in the Contractor's cost or time required for performance of any part of the Work, and the Contractor has timely and properly made its claim, the Architect will recommend an equitable adjustment to the Contract Time or Contract Price, or both. If the Architect determines that the conditions at the Project Premises are not materially different from those indicated in the Contract Documents or that the conditions or mistakes or omissions in the Drawings or Specifications should have been recognized by the Contractor prior to the commencement of the Work and that no change in either or both of the Contract Time or the Contract Price is justified, then the Architect shall so notify the District and the Contractor in writing stating the reasons. For any claim for any adjustment to the Contract Time or Contract Price to be made properly, such claim must be made by the Contractor in writing with specific detail as to the special or concealed condition or mistakes or omissions (as applicable) and such notice shall be given to the District and the Architect promptly before conditions are disturbed and in no event later than fifteen (15) calendar days after first observance of such conditions, mistakes or omissions. If the Contractor is entitled to an adjustment in the Contract Time and/or Contract Price, the Contractor shall make such claim within the fifteen (15) calendar day period. If such claim is not timely and properly made, it shall be considered waived. In no event shall the existence of any concealed or unknown conditions, or any mistakes or omissions in the Drawings or Specifications, qualify or limit any of the Contractor's obligations under the Contract Documents.

10. TIME AND MATERIALS PRACTICES

If, in the opinion of the Architect and the District, it is not feasible to estimate the charge or credit to the District or additional time required in connection with a proposed change in the Work before such change is performed, or if the District and the Contractor are unable to agree upon the charge, credit or additional time required in connection with a proposed change by agreement in accordance with Section 9b above, then the Contractor shall, upon the authorization of the District (to be given or withheld in its sole and absolute discretion), proceed with the change in the Work on a TIME AND MATERIALS BASIS not to exceed the amounts authorized by California Public Contract Code Section 20118.4 for changes or alterations to contracts. The time and materials costs shall be based upon the Cost of the Work, shall include profit, overhead and supervision percentage fees for the Contractor, Subcontractors and sub-Subcontractors, and shall otherwise be calculated in accordance with the applicable provisions of Section 9b above. The Contractor shall submit to the District and the Architect daily time and material tickets signed by the Inspector of record that include the identification number assigned to the change in the Work, the location and description of the change in the Work, the classification of labor employed (and names and social security numbers), the materials used, the equipment rented (not small or expendable tools), and such other evidence of cost or credit as the District may require in its sole discretion. The Contractor shall submit time and materials tickets for such authorized Work on a daily basis. Should the Contractor fail to submit such tickets as specified on a daily basis, the evaluation of the amount of materials used and labor expended will be made by the District, in its

sole and absolute discretion. The District shall not be liable to Contractor for time and materials costs which arise or are incurred because of the negligence of or defective or nonconforming work or materials of Contractor or any Subcontractor, Materialman or other person within Contractor's control; because of Contractor's failure to properly supervise the Work or to properly schedule or coordinate the Work; or because of Contractor's failure to comply with any requirements of the Contract Documents.

Upon completion of the change in the Work, a Change Order shall be issued and signed by the District and Contractor based upon the aforesaid records; provided that, if the District disputes the amounts claimed in such records of the Contractor, the District may initiate mediation and/or arbitration proceedings (if necessary) pursuant to Section 56 hereof, and, if the matter is not resolved by mediation and an arbitration hearing is required, then the arbitrator's decision on the matter will constitute the Change Order for the change in the Work. No work shall proceed on a time and materials basis except in the presence of the Inspector or an assigned District representative. All daily time and material tickets must be signed by the Inspector.

11. SUBSTITUTIONS

In accordance with California Public Contract Code Section 3400, whenever in the Specifications any material, process or article is indicated or specified by grade, patent or proprietary name or by name of manufacture, the District is unaware of any material, process or article which is equal to the product or item specified. However, such specification shall be deemed to be used for the purpose of facilitating description of material, process or article desired and shall be deemed to be followed by the words "or equal", and Contractor may, unless otherwise stated, offer any material, process or article which shall be substantially equal or better in every respect to that so indicated or specified by delivering to the District and Architect a completed better in every respect to that specified, then the Contractor shall furnish any material, process or article substitution request in the form that addresses each of these items, (a **"Substitution Request"**). If the material, process or article offered by the Contractor in the Substitution Request is not, in the opinion of the Architect and the District, substantially equal or better in every respect to that specified, then the Contractor shall furnish any material, process or article specified. Burden of proof as to quality of any material, process or article proposed in a Substitution Request shall rest with the Contractor. The Contractor shall submit the Substitution Request together with substantiating data for substitution of any "or equal" items within thirty-five (35) days after award of the contract, and no substitutions (or Substitution Requests) shall be considered or permitted after such 35 day period unless expressly ordered by the District or pursuant to an Architect/Engineer Field Directive. The Substitution Request shall include proof of the State Fire Marshal's approval, if required, all necessary information, specifications, data and the difference in cost. Provision authorizing submission of "or equal" justification data shall not in any way authorize an extension to the Contract Time.

If requested by the Architect or the District, the Contractor shall, at the Contractor's sole cost and expense, have the proposed substitute material, apparatus, equipment or process tested under the direction of the Architect or the Inspector or other District representative in accordance with the terms and provisions of Section 35 hereof. Quality and strength, physical, chemical or other characteristics, durability finish, or efficiency shall be tested by a testing laboratory selected by the District. It shall be the responsibility of the Contractor to provide all necessary evidence for the Architect and the District to evaluate a proposed substitute. If the Architect and the District accept the proposed substitute, the Contractor agrees to pay for all engineering and design services, including, without limitation, compensation to the Architect and affected engineers for their required time to process such substitution through the Division of the State Architect (DSA), if required, and to make all changes and adjustments in materials or Work of all trades directly or indirectly affected by the substituted item or items at no cost to the District. If the furnished material, process or article is more expensive than that specified, the difference in cost of such material, process or article so furnished shall be borne entirely by the Contractor.

12. SUPERVISION OF THE WORK

a. District. The tools, equipment, apparatus, facilities, transportation, labor and materials shall be furnished, and the Work shall be performed and completed, under the general supervision of and subject to the approval of the Architect, the Inspector and the District. Assigned and designated District representatives, including, without limitation, construction managers or project managers, shall have full access to the Work at all times while Work is underway and being performed.

b. Architect. The Architect shall have the right to accept or reject materials or workmanship and determine when the Contractor has complied with the conditions of the Contract. The Architect shall be the District's

representative during the construction period and shall observe the progress and quality of the Work on behalf of the District. The Architect will visit the Project Premises at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. The Architect shall have the authority to act on behalf of the District only to the extent expressly provided in the Contract Documents. The Architect shall have the authority to stop Work whenever such stoppage may be necessary, in the Architect's reasonable opinion, to ensure the proper execution of the Contract. The Architect shall be in the first instance the judge of the performance of this Contract. The Architect shall side neither with the District nor with the Contractor, but shall use its powers under the Contract to enforce its faithful performance by both. The Architect shall, within a reasonable time, make decisions on all claims of the District or the Contractor and on all other matters relating to the execution and progress of the Work, and shall generally have all responsibility and power established by law, including Title 24 of the California Code of Regulations. If the District elects, in its sole discretion, to utilize a project manager or a construction manager, the powers delineated above for the Architect may be shared, in whole or in part, with the project manager or construction manager, as the District may determine in its reasonable discretion.

c. Inspector. One or more inspectors employed by the District (including the Inspector) will be assigned to the Work. The inspectors employed by the District shall represent the Architect and the District on the Work. All Work shall be done under the observation or with the knowledge of the Inspector and/or any specialty trade inspector representing the District as may be applicable. The Inspector and such specialty inspectors shall have free access to any or all parts of the Work at any time. Work done or covered up in the absence of specified or prescribed inspection may be required to be removed and replaced under proper inspection. Contractor shall bear the entire cost of performing all the Work and furnishing all the material necessary for the removal and its subsequent replacement irrespective of whether or not the Work is found to be defective. Whenever Contractor arranges to work at night, or at any time when the Work is not usually in progress, or to vary the period during which the Work is carried on each day, Contractor shall give the District twenty-four (24) hours prior notice so that proper inspection may be provided. Contractor shall furnish the Inspector with reasonable facilities (including, without limitation, the field office described in Section 13 below) for obtaining such information as may be necessary to keep the Inspector fully informed respecting the progress and manner of the Work and character of materials and equipment. Inspection of the Work shall not relieve the Contractor from any obligation to fulfill the Contract. The Inspector shall have the authority to stop Work whenever provisions of the Contract Documents are not being complied with, and Contractor shall instruct its subcontractors and employees accordingly.

d. Contractor. Unless personally present on the Project Premises where Work is being done, the Contractor shall keep on the Work at all times during its progress a competent construction superintendent satisfactory to the District. The superintendent shall be present on a full-time basis, shall be dedicated exclusively to the Project and shall not share superintendence duties with another project or job. The construction superintendent shall not be replaced except with written consent of the District. The construction superintendent shall represent the Contractor in its absence and shall be fully authorized to receive and fulfill any instructions from the Architect, the Inspector, the District or any other District representative. All Requests for Information shall be originated by the superintendent and responses thereto shall be given to the superintendent. No Work shall begin in any day by any Subcontractor or other person on the Project Premises until the superintendent has arrived, nor shall Work continue during any day after the superintendent has departed from the Project Premises. Any authorized replacement of the superintendent must be completed through a smooth transition of duties lasting at least ten (10) working days' duration, with such transition being at no expense to the District. The Contractor shall give efficient supervision over the Work using the best skill and attention. The Contractor and all Subcontractors and Materialmen shall at all times enforce strict discipline and good order among the Contractor's, such Subcontractor's or Materialman's (as applicable) employees and shall not employ on the Work any unfit person or anyone not skilled in the portion of the Work assigned. Any person in the employ of the Contractor or any Subcontractor or Materialman whom the District may deem incompetent or unfit, shall be dismissed from the Work and shall not again be employed on it except with the written consent of the District. Prior to the District deeming an employee of the Contractor, Subcontractor or Materialman incompetent or unfit, the District shall serve written notice upon the Contractor setting forth the reasons for its determination, and if it relates to a Subcontractor or Materialman, Contractor shall forward a copy of such notice to the affected Subcontractor or Materialman. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

e. Subcontractors and Materialmen. The Contractor shall be fully responsible for the acts and omissions of all Subcontractors and Materialmen on the Work of every tier. In the event of any dispute or controversy between the Contractor and any Subcontractor or Materialman over any matter whatsoever, performance of the Work

required under this Contract shall not be delayed or stopped. The District will deal with Subcontractors, Materialmen and others employed in connection with the Work, only through the Contractor, who shall be responsible for the proper execution of all the Work.

h. Conflicts. In case of conflicts among the parties listed above, the decision of the District shall be final.

13. INSPECTOR'S FIELD OFFICE

The Contractor shall provide for the use of the Inspector and other District representatives on the Project Premises a temporary office of not less than ninety-six (96) square feet of floor area to be located as directed by the Inspector and to be maintained until removal is ordered or authorized by the District. The Inspector's office shall be separate from the Contractor's office area. The office shall be of substantial waterproof construction with adequate natural light and ventilation by means of stock design windows. Doors shall have a key-type lock or padlock hasp. Windows shall be barred. The office shall also be air conditioned. At no cost to the District, Contractor shall also install and provide, for Inspector's and other District representatives' exclusive use, a facsimile machine and a dedicated phone line for such fax service as well as a recent model computer, with modem and licensed software and a dedicated phone line for the computer.

A table satisfactory for study of the Drawings and other plans and two chairs shall be provided by the Contractor. The Contractor shall, at its sole cost and expense, provide and pay for adequate electric lights, free telephone service within the Southern California area, not a payphone, and adequate heat for the field office until removal of such field office is ordered or authorized by the District. Contractor shall also grant to Inspector access to a copy machine located on the Project Premises free of charge.

14. ACCESS TO WORK

The District, the Architect, the Inspector and their representatives shall at all times have access to the Project and the Work wherever it is in preparation or progress. The Contractor shall provide safe and proper facilities for such access so that the District, the Architect, the Inspector and their representatives may perform their functions in connection with the Work or under this Contract. The Contractor, at its sole cost and expense, shall provide sufficient, safe and proper facilities and the labor necessary to move, take and prepare samples for testing of materials and shall move the same for purposes of inspection when ordered to do so by any of the above-named persons.

15. SUBCONTRACTING

a. Subcontracting Generally. The Contractor agrees to bind every Subcontractor and Materialman to the terms of this Contract as far as such terms are applicable to such Subcontractor's or Materialman's Work or services. If the Contractor shall subcontract any part of this Contract, Contractor shall be as fully responsible to the District for acts and omissions of all Subcontractors (of every tier) and of persons either directly or indirectly employed by such Subcontractors, as the Contractor is for acts and omissions of persons employed directly by the Contractor. The Contractor shall also be so responsible for the acts and omissions of all Subcontractors and Materialmen of every tier. Nothing contained in the Contract Documents shall create any contractual relations between any Subcontractor or Materialman and the District; provided that, each subcontract or other contract with a Subcontractor or Materialman shall specifically provide that the District is an intended third party beneficiary thereof. Each such subcontract or other contract shall further specifically provide that the District shall only be responsible for those obligations of the Contractor that accrue subsequent to the District's exercise of any rights under the contingent assignment set forth in subsection d below. The Contractor shall not contract with any Subcontractor or Materialman to whom the District or the Architect has made reasonable objection. The District shall have no obligation to pay or to see to the payment of money to a Subcontractor or Materialman except as may be otherwise required by law.

Contractor is responsible for coordinating the work of Contractor's, Subcontractors, and Material Suppliers. Contractor shall not delegate responsibility to coordinate between Subcontractors and Material Suppliers to the Subcontractor's and Material Suppliers.

b. District Consent. The District's consent to or approval of any Subcontractor or Materialman under this Contract shall not in any way relieve the Contractor of its obligations under this Contract with respect to such persons and no such consent or approval shall be deemed to waive any such provisions of this Contract.

c. Subletting and Subcontracting Fair Practices Act. In performance of the Work, the Contractor is required to comply with the "Subletting and Subcontracting Fair Practices Act" (California Public Contract Code Sections 4100, et seq.), and for violation of any provision of said Act, shall be subject to the penalties prescribed in the Act. Failure to comply with the Act shall also constitute a "Default" under this Contract. Should performance or completion of the Work be assumed and undertaken by a guarantor or Surety pursuant to a performance guaranty or bond (including, without limitation, the Performance Bond), such party shall, to the same extent as the Contractor, be obligated to use the same subcontractors which the Contractor would have been required to use under the provisions of the "Subletting and Subcontracting Fair Practices Act". Requests for substitution must be made timely and Contractor acknowledges that subcontractor substitutions are a time consuming and arduous process. As a result, any delays for substitution of subcontractors are Contractor's sole responsibility.

d. Contingent Assignment of Subcontracts and Other Contracts. Each subcontract and other contract or agreement for any portion of the Work is hereby assigned by the Contractor to the District provided that:

(i) such assignment is effective only after termination of this Contract by the District as provided herein and only for those subcontracts and other contracts and agreements which the District accepts by notifying the Subcontractor or Materialman (as may be applicable) in writing; and

(ii) such assignment is subject to the prior rights of the Surety(ies) obligated under the Payment Bond and Performance Bond.

The Contractor shall include adequate provisions for this contingent assignment of subcontracts and other contracts and agreements in each such document.

16. DRUG-FREE WORKPLACE

The Contractor shall remove any worker from the Project Premises when directed to do so by the District or any representative of the District. The District and all of the District's projects are "drug-free" and "tobacco-free" workplaces and, as such, require that the Contractor be subject to the requirements mandated by California Government Code Sections 8350, et seq. The Drug-Free Workplace Act of 1990 requires that every person or entity awarded a contract or grant for the procurement of any property or service from a State agency certify that it will provide a drug-free workplace and, in that respect, comply with certain obligations set forth in that Act. In addition, the Drug-Free Workplace Act provides that each contract or grant awarded by the State agency may be subject to suspension of payments or termination for failure to comply with such Act. It is the sole responsibility of the Contractor to police and oversee any and all personnel used in connection with the Work and the Project, whether employed directly or indirectly by Contractor. If Contractor fails to maintain a drug-free workplace as required by the Drug-Free Workplace Act and a tobacco-free workplace, the District may enforce its lawful rights to suspend pending or subsequent payments and to terminate the Contract and may pursue all other rights and remedies in may have against the Contractor at law and/or in equity. The Contractor shall also submit to the District the drug-free workplace certificate required by law within seven (7) days after award of the Contract.

17. TAXES

It is understood and agreed that all taxes applicable to or that may be levied in connection with the Work or the Project will be paid by the Contractor and are included in the Contract Price. If, under federal excise tax law, any transaction hereunder constitutes a sale on which a federal excise tax is imposed, and the sale is exempt from such excise tax because it is a sale to a state or local government for its exclusive use, the District, upon request, will execute a certificate of exemption which will certify (1) that the District is a political subdivision of the state for the purpose of such exemption; and (2) that the sale is for the exclusive use of the District. No excise tax for such materials shall be included in the calculation of any bid price.

18. UTILITIES AND SANITARY FACILITIES

All utilities, including, but not limited to, electricity, water, gas, and telephone, used on or in connection with the Work, or, with respect to projects providing for the construction of new buildings, the building under construction, shall be furnished and paid for by the Contractor. For projects involving the construction of new buildings, the District shall be responsible for all utilities charges and fees for the building under construction only upon and after

the earlier to occur of Acceptance of Completion and early occupancy of the building by the District as provided in Section 46 hereof. The Contractor shall furnish and install all necessary temporary distribution systems, including meters, if necessary, from distribution points to points on the Project Premises where utility is necessary to carry on the Work. The Contractor shall protect all public utilities equipment by enclosing or boxing in, and upon the completion of the Work, remove all enclosures or protective coverings and leave the Work in a finished condition. Upon completion of the Work, the Contractor shall remove all temporary distribution systems.

If this Contract is for an addition to an existing facility (or otherwise for Work on an existing building or facility), the Contractor may, with the written permission of the District, use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors and Materialmen and others employed on the Project.

The Contractor shall provide sanitary temporary toilet building(s) as directed by the District or any District representative for the use of all workmen; provided that, in any event, the ratio of such toilet buildings to workers on the Project Premises shall be at least equal to the ratio required by OSHA regulations. The building(s) shall be maintained in a sanitary condition at all times and shall be left at the Project Premises until removal is directed by the approval of the District or any District representative. Use of toilet facilities at the Project Premises shall not be permitted except by approval of the District or any District representative.

19. FEES, PERMITS, LICENSES, PATENTS AND ROYALTIES; AND PAYMENT THEREFOR

The Contractor and all its employees, Subcontractors, Materialmen or agents shall secure and maintain in force for the duration of the Contract and the warranty period such licenses and permits as are required by law and shall conform to all Federal and State of California laws and regulations and County of Los Angeles, City of San Gabriel and other applicable laws, ordinances and regulations covering the Project or the Work
The Contractor shall obtain and pay for all permits and licenses required for the performance of, or in connection with, the Work, and shall give all necessary notices and shall deliver necessary certificates to the District when required except when provided otherwise in the Specifications, and shall pay all royalties and license fees arising from the use of any material, machine, method or process used in performing the Work. All charges, assessments and fees payable in connection therewith are included in the Contract Price and shall be the Contractor's sole responsibility.

20. EASEMENTS

Easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the District unless otherwise specified in the Contract Documents.

21. SURVEYS

Surveys to determine the location of property lines and corners, and legal limitations and utility locations, will be supplied by the Contractor, at its sole cost and expense. Surveys to determine the location of construction, grading and site work, and all building layout Work and layout for utility lines and connections, required in connection with the Project or the Work shall be provided by Contractor, at its sole cost and expense.

22. LAWS AND REGULATIONS

Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations bearing on conduct of the Work as indicated and specified.

23. MATERIAL SAFETY DATA SHEETS AND COMPLIANCE WITH PROPOSITION 65

a. Contractor is required to insure that material safety data sheets for any material requiring a material safety data sheet pursuant to the federal "hazard communication" standard or employee's right-to-know law are available in a readily accessible place on the Project Premises. The Contractor is also required to insure (i) the proper labeling of any substance brought onto the Project Premises, and (ii) that the person(s) working with the material, or within the

general area of the material, is/are informed about the hazards of the substance and follow(s) proper handling and protection procedures.

b. Contractor is required to comply with the provisions of California Health and Safety Code Section 25249.5, et seq., which requires the posting and giving of notice to persons who may be exposed to any chemical known to the State of California to cause cancer. The Contractor agrees to familiarize itself with such statutory provisions and to fully comply with the requirements therein set forth.

24. DETAIL DRAWINGS AND INSTRUCTIONS

a. In case of any ambiguity, conflict or lack of information in the Drawings or Specifications, the Architect shall furnish with reasonable promptness, additional instructions by means of additional drawings or specifications, an Architect/Engineer Field Directive or otherwise as may be necessary for the proper execution of the Work. All such drawings, specifications, Architect/Engineer Field Directives and instruments shall be consistent with the Contract Documents or with true developments thereof and/or reasonable inferences there from.

b. The Work shall be executed in conformity with all Contract Documents, and the Contractor shall do no Work without proper drawings, specifications and instructions.

c. The Architect will furnish all additional details needed to more fully explain the Work, which details shall be considered as part of the Contract Documents.

d. Should any details be more elaborate, in the reasonable opinion of the Contractor, than scale drawings and specifications warrant, written notice thereof shall be given to the Architect within five (5) days of receipt of the details. In case no such written notice is given to the Architect within such five (5) day period, it will be assumed that the details are reasonable developments of the scale drawings. If such notice is given, then the claim will be considered by the District and the Architect, and if found justified, the Architect will either modify the Drawings or recommend to the District a Change Order for any extra work involved.

e. All parts of the described and shown construction shall be of the best quality of their respective kinds, and the Contractor is hereby advised to use all diligence to understand fully the required construction and finish, and in no case to proceed with the different parts of the Work without obtaining first from the Architect such directions and/or drawings as may be necessary for the proper performance of the Work.

f. If it is found that the Contractor has varied from the Drawings and/or Specifications in materials, quality, form or finish, or in the amount or value of the materials and labor used, the Architect shall be at liberty, at any time either before or after completion of the Work, to order such improper work removed, remade and replaced, and all Work disturbed by these changes shall be made good at the Contractor's expense, or the Architect shall receive from the Contractor for the District a sum of money (or the District shall deduct from amounts otherwise due the Contractor in accordance with Section 6d hereof a sum of money) equal to the difference in value between the work actually performed and the Work that is called for by the Drawings and Specifications, it being within the Architect's and the District's sole discretion to pursue either course of action.

g. The Contractor shall maintain at the Project Premises, and shall make available to the District, the Architect, the Inspector and other District representatives, one record copy of the Drawings (the **"Record Drawings"**) in good order. The Record Drawings shall be prepared and updated during the prosecution of the Work. The prints for Record Drawing use will be a set of blackline prints provided by the Architect to the Contractor at the start of construction. The Contractor shall maintain the said set in good condition and shall use colored pencils to mark up said set with "record information" in a legible manner to show (i) deviations from the Drawings made during construction; (ii) details in the Work not previously shown; (iii) changes to existing conditions or existing conditions found to differ from those shown on any existing Drawings; (iv) the actual installed position of equipment, piping, conduits, light switches, electric fixtures, circuiting, ducts, dampers, access panels, control valves, drains, openings and stub-outs; and (v) such other information as the District, Architect, Inspector or other District representative may reasonably request from time to time. Contractor shall submit a completed record drawing review log form in the form of Exhibit I attached hereto and incorporated herein by this reference together with each Contractor Payment Request in accordance with Section 6 hereof. Final payment and any Retention hereunder shall not be made or paid to the Contractor until the final Record Drawings marked by the Contractor as required herein are delivered to the District.

25. COPIES OF DRAWINGS AND SPECIFICATIONS FURNISHED

The Contractor will be furnished, free of charge, a maximum of 10 copies of the Drawings and Specifications, plus 1 set of the Drawings for use as the Record Drawings. Additional copies may be obtained by the Contractor at the cost of reproduction and delivery.

26. CONTRACT DOCUMENTS ON PROJECT PREMISES

Contractor shall keep one copy of all Contract Documents, including, without limitation, addenda, Change Orders, Title 24 of the California Code of Regulations, the California Building Code, most recent edition or addition that corresponds with the DSA approved documents, and the prevailing wage rate tables, which are all part of the Contract Documents, on the Project Premises at all times during the progress of the Work. Contractor shall also retain the most recent issue of the Uniform Building Code on the Project Premises. Said documents shall be kept in good order and will be available for review by the Architect, its representatives and the District and its representatives. Contractor shall be acquainted with and comply with the provisions of Title 24 of the California Code of Regulations as they relate to this Project.

27. OWNERSHIP OF DRAWINGS

All drawings, specifications, and copies thereof furnished by the District are its property. They are not to be used on other work and with exception of signed contract sets are to be returned to District on request at completion of the Work.

28. SHOP DRAWINGS, DIAGRAMS AND DEFERRED APPROVALS

a. Submittal of Drawings. The Contractor shall check and verify all field measurements and shall submit, with such promptness so as not to cause delay to the Contractor's Work or in the work of any other contractor on the Project Premises, six (6) copies checked and approved by the Contractor of all shop or setting drawings, schedules and materials lists required for the Work of various trades. One set of reproducible drawings is required for shop drawings on paper larger than 11 by 17 inches. The Contractor shall further submit, for the Architect's approval, shop and diagram drawings as required by the Specifications or requested by the Architect, of any material and equipment proposed to be used by the Contractor. The Contractor covenants that all shop drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the shop drawing is prepared and, if required by the Architect or applicable law, by a licensed engineer. Drawings shall be submitted with a letter of transmittal addressed to the Architect and listing the numbers of the drawings submitted. Drawings must identify the Project and the Contractor and be complete in every respect. If the drawings have variations from the requirements of the Contract Documents, Contractor shall make specific mention and request approval of such variations in the Contractor's letter of transmittal in order that, if acceptable, suitable action may be taken for acceptance and proper adjustment of the Contract Documents by Change Order. Otherwise, Contractor will not be relieved of the responsibility for executing the Work in accordance with the Contract Documents, even though the drawings have been approved. By approving and submitting shop drawings, samples (as provided by Section 34 below) and other similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. All shop drawings shall be reviewed by the Contractor for coordination of each submittal with the Work of other Subcontractors performing Work on the Project. The Contractor's endorsement shall state that such coordination has taken place and that no conflict exists between the information contained in the submitted shop drawings and any other trade or process used in connection with the Project. Review by District and Architect shall not relieve the Contractor or any Subcontractor from its responsibility in preparing and submitting proper shop drawings in accordance with the Contract Documents. Any submission, which in Architect's opinion is incomplete, contains errors, or has been checked superficially, will be returned unreviewed by the Architect for resubmission by the Contractor. Contractor shall stamp, sign, and date each submittal indicating its representation that the submittal meets all of the requirements of the Contract Documents and evidence Contractor's review through execution of the following stamp to be placed on each shop drawings:

> "The contractor has reviewed and approved the field dimensions and the construction criteria, and has also made written notation regarding any information in the shop drawings that does not conform to the contract documents. This shop drawing has

been coordinated with all other shop drawings received to date by contractor and this duty of coordination has not been delegated to subcontractors, material suppliers, the Architect, or the engineers on this project.

_____

Signature of Contractor and date"

b. Architect Review of Drawings. In reviewing shop drawings, the Architect will not verify dimensions and field conditions. Architect shall check and review the drawings only for conformance with design concept of the Project and compliance with information given in the Contract Documents only, and shall indicate corrections, if any, and shall return such drawings to the Contractor within fourteen (14) working days after the Architect's receipt thereof. Two copies of the submittal will be returned to the contractor, provided the required six sets were received. The Architect may return a single shop drawing submittal in a reproducible format. The Contractor shall make copies from the reproducible as required. If the drawings have not been given final approval, the Contractor shall make any corrections required by the Architect, re-submit to the Architect corrected copies of the drawings in the same number as the original submittal in accordance with the procedure outlined above and obtain final approval before beginning the Work involved. Upon final approval of the drawings, the Contractor shall furnish such other copies thereof as may be needed for construction. The Architect's approval of such drawings or schedules shall not relieve the Contractor from the responsibility for errors in shop drawings or schedules, or for fitting and construction of the Work, or for deviations from the Drawings or Specifications, or from furnishing materials and Work required by the Contract Documents, which may not be indicated on the approved drawings, unless the Contractor has in writing called the Architect's attention to any such deviation.

c. Deferred Approvals. Contract Documents which require deferred approval items are meant to be for illustration purposes only. Contractor is responsible for all deferred approval requirements set forth in the Contract Documents. Contractor is responsible to comply with all laws, building codes, and regulations necessary to obtain all necessary approvals, including those required from the Division of the State Architect ("DSA") and the State Fire Marshall. Contractor shall not be granted an extension of time for failure to obtain necessary approvals due to failure to comply with laws, building codes, and other regulations (including Title 24 of the California Code of Regulations). Contractor shall schedule all deferred approval items in its progress schedule pursuant to Section 3. If Contractor fails to include deferred-approval items in its schedule which results in a critical path delay, then Contractor shall be subject to the assessment of liquidated damages.

29. LAYOUT AND FIELD ENGINEERING

It shall be the Contractor's sole and absolute responsibility to check, verify and determine the accuracy of all measurements and locations contained in the Drawings and Specifications, including, without limitation, the verification of quantities and general information. Any field engineering required for laying out the Work and establishing grades shall be furnished by the Contractor at its sole cost and expense.

Whenever the documentation or Drawings provided by the District, as prepared by various consultants or others, provide or indicate quantities or related dimensioning, these quantities or information in general shall not be construed as specific requirements for the basis of fabrication, preparation or pricing or installation until verified as accurate by the Contractor and/or its Subcontractors. Contractor shall, at its sole cost and expense, procure, calculate, confirm and obtain accurate reports for quantities and dimensioning. The District shall not be liable (to any degree or in any manner) for any cost, expense or liability resulting from or arising out of Contractor's failure to obtain and verify information. Any information furnished by the District, the Architect, any record engineer, the project manager, the Inspector or any other District representative shall be considered to be "good will" information provided on a courtesy basis without the assumption of any liability or responsibility on the part of the District or such other persons, and all responsibility for checking, verifying and determining the accuracy of all measurements and locations, and for all field engineering required for laying out the Work and establishing grades, shall remain with the Contractor.

30. SOILS INVESTIGATION REPORT

The Contractor has examined the Project Premises and satisfied itself as to site conditions and the character, quality and quantity of surface and subsurface materials that will be encountered in connection with the Work.

When a soils investigation report obtained from test holes at the Project Premises is available, such report shall not be a part of this Contract. Any information obtained from such report, or any information given on any drawings as to subsurface soil conditions or to elevations of existing grades or elevations of underlying rock, is approximate only, is not guaranteed, and does not form a part of the Contract. The Contractor is required to make a visual examination of the Project Premises and must (and is permitted to) make whatever tests the Contractor deems appropriate to determine and assess the underground condition of soil. No claims for allowances or damages because of the Contractor's negligence or failure in acquainting itself with the conditions of the Project Premises as described herein will be recognized by the District.

WARNING: DISTRICT DOES NOT WARRANT THE SOILS AT THE PROJECT SITE. SOILS INVESTIGATION REPORT IS PROVIDED FOR CONTRACTORS INFORMATION ONLY. CONTRACTOR HAS CONDUCTED AN INDEPENDENT INVESTIGATION OF THE PROJECT SITE AND THE SOILS CONDITIONS OF THE SITE. DISTRICT DOES NOT WARRANT THE SOILS CONDITIONS OF THE SITE AND CONTRACTOR IS FULLY RESPONSIBLE TO ASCERTAIN SITE CONDITIONS FOR THE PURPOSES OF DETERMINING CONSTRUCTION MEANS AND METHODS PRIOR TO COMMENCING CONSTRUCTION. THE SOILS INVESTIGATION REPORT IS NOT A CONTRACT DOCUMENT.

The following constitute the only exceptions to the Contractor's responsibility stated above:

a. The Contractor shall promptly notify the Architect if foundations, utility installations or facilities or other man-made obstacles are encountered which are not shown or indicated on the Drawings or Specifications, or which are found in a location substantially different from that shown, indicated or specified, and such obstacles were not reasonably apparent from a personal on-site examination of the Project Premises. Any delay to the Project caused as a result of any failure by the District or any utility company to provide for the removal or relocation of any such utility facilities shall justify a corresponding extension to the Contract Time. Contractor shall be compensated for the cost of locating and repairing damage to any existing main or trunkline utility facilities located on the Project Premises and shall be otherwise compensated as required by California Government Code Section 4215, provided that, (i) any such damage was not caused by the negligence or willful misconduct of Contractor or its Subcontractors or Materialmen and (ii) such main and/or trunkline were not indicated in the Contract Documents with reasonable accuracy. Additional work that may be required because of the obstacles referenced above shall be handled by a Change Order in accordance with Sections 9 and 10 hereof and in accordance with California Government Code Section 4215.

b. If the Contract Documents require excavation or other Work to a stated elevation and the Architect orders a change of depth or dimension of such subsurface Work, then an adjustment in Contract Price for such change will be made in accordance with Sections 9 and 10 hereof.

31. EXCAVATIONS; SUBSURFACE CONDITIONS

a. For all excavations in excess of five (5) feet involving an estimated expenditure in excess of $25,000, the Contractor shall submit to the District and the District's Architect and/or civil or structural engineer, for acceptance a detailed drawing showing the design of shoring, bracing, sloping or other provisions to be made for the protection of workmen from the hazard of caving ground. If such design varies from the standards established by the Construction Safety Orders of the California Division of Industrial Safety, the drawing shall be prepared by a registered civil or structural engineer. None of the aforementioned trenching shall be started before the Contractor receives notification of acceptance from the District or its civil or structural engineer, as applicable. Contractor shall comply with all other applicable requirements of California Labor Code Section 6705, and, as therein provided, no provisions of that Section or this Section 31 shall be construed to impose tort liability upon the District. In any event, the Contractor shall not commence any excavation work until it has secured all necessary permits including the required CAL OSHA excavation/shoring permit. Any permits shall be prominently displayed on the Project Premises prior to the commencement of any excavation.

b. In accordance with Section 7104 of the California Public Contract Code, if the Work under this Contract involves digging trenches or other excavations that extend deeper than four feet below the surface, the Contractor shall promptly, and before the following conditions are disturbed, notify the District in writing of any:

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

(ii) Subsurface or latent physical conditions at the Project Premises differing from those indicated; or

(iii) Unknown physical conditions at the Project Premises of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in the Work of the character provided for in this Contract.

The District will promptly investigate the conditions, and if it finds that the conditions do materially differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work, the District will issue a Change Order under the procedures described in Sections 9 and 10 hereof.

In the event that a dispute arises between the District and the Contractor as to whether the conditions materially differ or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, then the Contractor shall not be excused from the scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. The Contractor shall retain any and all rights either by contract or by law and may initiate the dispute resolution proceedings of this Contract in accordance with Section 56 hereof to resolve its dispute.

In addition, the District reserves the right to terminate this Contract should the District determine not to proceed with the Project because of any condition described in this subsection b. In the event of any such termination, the Contractor shall receive payment for all Work actually performed to the effective date of termination.

32. MATERIALS AND WORK

Except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary constructions of every nature, and all other services and facilities of every nature whatsoever necessary to execute and complete this Contract and the Work within the Contract Time. Unless otherwise specified, all materials used in connection with the Work shall be new and the best of their respective kinds and grades as noted and/or specified, and workmanship shall be of good quality and done in full compliance with applicable laws and to industry standards or better, if specified.

Materials shall be furnished in ample quantities and at such times as to ensure uninterrupted progress of the Work and shall be stored properly and protected as required. Contractor shall be entirely responsible for damage or loss to materials or the Work under this Contract by weather or other causes, except as otherwise expressly provided in this Contract with respect to Acts of God.

Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project Premises by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project Premises. Protection of construction materials and equipment stored on the Project Premises is solely the responsibility of the Contractor.

Contractor shall, after signing the General Contract with the District and receiving approval by the Architect of the submittals and samples, place orders for materials and/or equipment as specified so that delivery of the same may be made without delays to the performance of the Work. Contractor shall, upon demand from the Architect, furnish to the Architect documentary evidence showing that the orders have been placed. When delivered, materials and equipment shall be completely identified with manufacturer's name, model number, type and other required data stamped thereon or on a tag or label attached thereto; or the materials or equipment shall be delivered in the manufacturer's original containers bearing such identification and other pertinent data as required for complete identification. If materials or equipment are not so identified, an invoice or certificate providing complete identification shall at time of delivery be furnished to the District's Inspector.

The District reserves the right, for any neglect in not complying with the above instructions, to place orders for such materials and/or equipment as it may deem advisable in order to ensure that the Work may be completed within the

Contract Time, and all expenses incidental to the procuring of said materials and/or equipment shall be paid for by the Contractor upon demand. Any amounts expended by the District pursuant to this paragraph shall accrue interest from the date expended until repaid at the rate set forth in Section 54d hereof.

Materials shall be stored on the Project Premises in such manner so as not to interfere with the Work and as prescribed by all applicable laws, rules, regulations, orders or permits applicable to the Project and so that no portion of the structure shall be overloaded. If Contractor shall cause, permit or allow any part of the building(s) to be overloaded by storing, piling or setting thereon any material or equipment, or by performing thereon any of the Work, Contractor shall do so at its own risk and shall be solely responsible for any and all loss, damage and injury arising or resulting therefrom. Any load on any area in excess of that fixed by the Architect as a safe load within the limits allowed by the applicable building code or other laws, rules or regulations, or any load placed or distributed so as to exceed such safe load, shall be deemed to be overloaded. The Architect may require load tests to be made on any part of the building(s) so overloaded. Said portion of the Work shall support a test load of two times the design load without excessive deflection. These tests shall be made by a testing laboratory selected by the District, and the cost of such tests shall be borne by the Contractor.

Should the Architect, the Inspector or any other District representative consider that the place, manner or form of storage by the Contractor of any materials, or the placing or storage by the Contractor of any equipment, temporary structures or other facilities on public property, on the Project Premises or within the building(s), is obstructing the progress of the Work, or is liable to cause delay in the completion of any Work, or is causing overloading of any portion of the building(s), then the Architect, Inspector or such other District representative shall notify the Contractor in writing to change such place, manner or form of delivery or storage of materials, or placing or storage of equipment, temporary structures or other facilities, and shall fix the time in such notice within which such changes must be made. Upon receipt of such notice, Contractor, at its own cost and expense, shall proceed forthwith to make the changes required in said notice within the time fixed therein.

Materials or work required or necessary to be tested shall be tested under supervision of, as directed by, and at such places as may be convenient to, the Architect, the Inspector or another District representative. The required testing of all structural materials shall be done by a District approved testing laboratory in accordance with the terms and provisions of Section 35b below.

Contractor shall be responsible for all existing structures and improvements within the Work area, and shall provide adequate protection therefor, either by covering or by temporary removal. Any existing structures and/or improvements damaged during construction shall be repaired or replaced with materials, fixtures or equipment of the same kind, quality and size. Any materials or equipment temporarily removed for protection and not damaged shall be reinstalled. Contractor shall be liable for all damage to property of the District or others on the Project Premises within the Work area and all loss thereof by theft, and shall promptly replace or repair, as the case may require, at its sole cost and expense, all such damaged and stolen property.

Contractor shall protect and preserve the Work and the Project Premises, including any adjoining property of the District or others, from all damage or accident, by providing temporary roofs, window and door coverings, boxing, shoring or other construction required.

No materials, supplies, or equipment for the Work under this Contract shall be purchased subject to any chattel mortgage, or under a conditional sale or other agreement by which an interest therein, or in any part thereof, is retained by the seller or supplier thereof. Contractor warrants good title to all materials, supplies and equipment installed or incorporated into the Work and agrees, upon completion of the Work, to deliver the Project Premises, together with all improvements constructed or placed thereon, to the District free of any stop notices, liens, claims or charges.

33. NON-UTILIZATION OF ASBESTOS MATERIAL

a. No asbestos or asbestos-containing products or materials shall be used in this Project or in any tools, devices, clothing or equipment used in connection with the Work or this Project.

b. Asbestos and/or asbestos-containing products or materials shall be defined as all items containing, but not limited to, chrysodile, crodicolite, amosite, anthophylite, tremolite and actinolite.

c. Any or all products or materials containing greater than one-tenth of one percent (.1%) asbestos shall be defined as asbestos-containing material.

d. Any disputes involving the question of whether or not a product or material will be installed with asbestos-containing equipment shall be settled by electron microscopy, and the cost of any such tests shall be paid by the Contractor.

e. All Work, products or materials found to contain asbestos, or Work, products or materials installed with asbestos-containing equipment, will be immediately rejected and this Work will be removed at no additional cost to the District.

34. SAMPLES

Contractor shall furnish for approval, within thirty-five (35) days following receipt of the Notice to Proceed, all samples as required in the Specifications, together with all submittals, catalogs, required MSDS sheets and supporting data required by the Architect. This provision shall not authorize any extension to the Contract Time. Within fourteen (14) working days from receipt of the same, the Architect will check and review such samples only for conformance with design concept of the Work and for compliance with information given in the Contract Documents. Work shall be in accordance with reviewed samples.

Unless specified otherwise, sampling, preparation of samples and tests shall be in accordance with the latest standards of the American Society for Testing and Materials.

Samples of materials and/or articles shall, upon demand, be submitted for tests or examinations and consideration before incorporation of same in the Work is started. Contractor shall be solely responsible for delays due to samples not being submitted in time to allow for proper time to perform tests. Acceptance or rejection will be expressed in writing. Materials furnished must be equal to approved samples in every respect. Samples which are of value after testing will remain the property of the Contractor.

35. TESTS AND INSPECTIONS

a. Tests and Inspections; Payment. If the Contract, the District's instructions, laws, ordinances or any public authority (including, without limitation, the Division of the State Architect (DSA)) require any portion of the Work to be specially tested, inspected or approved, the Contractor shall give notice to the District and any other required authority of its readiness for testing, observation or inspection at least two (2) working days prior to such Work being tested or covered up. If the test or inspection is by an authority other than the District, the Contractor shall nevertheless inform the District of the date fixed for such test or inspection. Required certificates of inspection shall be secured by the Contractor. Observations by the Inspector shall be promptly made, and where practicable at the source of supply. If any Work should be covered up without the approval or consent of the Inspector, it must, if required by the Inspector, be uncovered for examination and satisfactorily reconstructed at Contractor's sole expense in compliance with the Contract Documents.

The Contractor shall notify the District a sufficient time in advance of the manufacture of materials to be supplied by the Contractor under the Contract, which must, by terms of the Contract, be tested in order that the District may arrange for testing of the same at the source of supply. Any materials shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection, or prior to receipt of notice from said representative that such testing and inspection will not be required, shall not be incorporated in the Work without the prior approval of the District and subsequent testing and inspection.

Re-examination of questioned Work may be ordered by the District, and if so ordered, Work must be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, the District shall pay the costs of reexamination and replacement of the Work. If such Work is found not to be in accordance with the Contract Documents, the Contractor shall pay for all such costs. In the event required DSA testing of the Work identifies a failure rate of ten percent (10%) or greater for any system, scope of work, installation or subtrade that has been specifically targeted, the District may, in its sole discretion, order that all such similar systems, installations, scopes of work or subtrade work used in connection with the Work be tested, and the cost to test all such work shall be paid by the Contractor.

The District will pay for all tests and inspections; provided that, in addition to the costs to be paid by the Contractor in accordance with the preceding paragraph, the Contractor shall pay for all tests and inspections under any of the following conditions:

(i) When such costs are stipulated in the provisions of the Contract Documents to be borne by the Contractor;

(ii) When a material is tested or inspected and fails to meet the requirements of the Specifications and/or Drawings; or

(iii) When the source of the material is changed after the original test or inspection has been made and approved.

b. Testing Laboratory. The District, with the approval of the Architect or registered engineer, shall select a qualified person or testing laboratory as the testing agency to conduct the test, and all tests shall be conducted in conformance with Section 4-335 of Title 24 of the California Code of Regulations.

Where such inspection and testing are to be conducted by an independent laboratory or agency, such materials or samples of materials to be tested shall be selected by such laboratory or agency or the District's representative and not by the Contractor.

c. Testing Reports. The testing laboratory shall report the results of all tests in writing and shall furnish the number of copies of the report ordered by the District. The reports shall state that the tests were made under the responsible charge of a testing engineer holding a license to practice civil engineering in the State of California; that the material was tested in accordance with the provisions of the Specifications; and that the material tested either passed or failed to pass the test. The District will send one copy of each test report to the Contractor and will distribute copies to the Architect, the Inspector and others required. For tests shown to be required on the "Testing & Inspection Sheet" issued by the Division of the State Architect (DSA), a copy will also be mailed to DSA, referencing the Project File Number and the DSA manager assigned supervision over the Project

d. Certification of Non-Tested Materials. If a material is not required to be tested, the Architect, the Inspector or the District may require the Contractor to furnish a certificate bearing the official and legal signature of the supplier with each delivery of such material, which certificate shall state that the material complies with the Specifications.

e. Tested Materials on Hand. The Contractor shall have in storage on the Project Premises at all times sufficient quantity of the tested and approved materials so that the progress of the Work will not be delayed because of lack thereof. The Contractor shall not use any material which is required to be tested, nor any material of which tests are being made, until the test reports have been delivered as hereinbefore specified, and said reports show that the material under test conforms to the provisions of the Contract Documents and has been approved by the Architect and the District.

f. Tests or Inspections Not to Delay Work. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work. If tests are to be conducted by District, Contractor shall notify District to provide sufficient time so Tests or inspections may be conducted to avoid unreasonable delay to the Work.

36. CUTTING AND PATCHING

The Contractor shall do all cutting, fitting or patching of the Work as required to make its several parts come together properly and fit it to receive or be received by work of other contractors as shown by, or reasonably implied by, or inferred from, the Drawings and Specifications for the completed structure and shall make good after them as the Architect may direct. Only tradespersons skilled and experienced in cutting and patching shall perform such Work.

All costs incurred as a result of defective or ill-timed work shall be borne by the party responsible therefor.
The Contractor shall not endanger any Work by cutting, excavating, or otherwise altering such Work and shall not cut or alter work of any other contractor except with the consent of the Architect.

New or existing structural members and elements, including reinforcing bars and seismic bracing, shall not be cut, bored, or drilled except by written authority of the Architect. Work done contrary to such authority is at the

Contractor's risk, subject to replacement at its own expense and without reimbursement under the Contract. Agency approvals shall be obtained by the Architect, not by the Contractor.

Permission to patch any areas or items of the Work shall not constitute a waiver of the District's, the Inspector's or the Architect's right to require complete removal and replacement of the areas or items of the Work if, in the opinion of the Architect, the Inspector or the District, the patching does not satisfactorily restore quality and appearance of the Work or does not otherwise conform to the Contract Documents.

37. NOISE CONTROL

The Contractor shall be responsible for the installation of noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction equipment noise is subject to the control of the Environmental Protection Agency's Noise Control Program (Part 204 of title 40, Code of Federal Regulations). If school is in session at any point during the progress of the Project, and, in the District's reasonable discretion, the noise from such Work disrupts or disturbs the students or faculty or the normal operation of the school, at the District's request, the Contractor shall schedule the performance of all such Work around normal school hours or make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall Contractor have a right to receive additional compensation or an extension to the Contract Time as a result of any such rescheduling or the making of such other arrangements. These controls shall be implemented during site preparation and construction.

38. DUST CONTROL

a. The Contractor shall be fully and solely responsible for maintaining and upkeep of all areas of the Work and Project Premises, outdoors and indoors, free from flying debris, grinding powder, sawdust, dirt and dust in general as well as any other product, product waste or work waste, that by becoming airborne may cause respiratory inconveniences to persons, particularly to students and District personnel. Additionally, the Contractor shall take specific care to avoid deposits of airborne dust or other elements that may accumulate on top of equipment, on walls, on floors, furniture and/or any other permanent or movable items. Prior to the commencement of any Work, the Contractor shall determine the probabilities of creating such an environment and provide all of the necessary protective equipment and/or items to contain the dust or airborne elements under a complete and secured control. Such protection devices, systems or methods shall be in accordance with the regulations set forth by the EPA and OSHA, SCAQMD, and other applicable State and/or Federal regulations. Additionally, the Contractor shall be the sole party responsible to clean up and remove any and all deposits of dust and other elements. Damages and/or any liability derived from the Contractor's failure to comply with these requirements shall be exclusively the cost of the Contractor, including, without limitation, any and all penalties that may be incurred for violations of local, state and/or federal regulations, and any amounts expended by the District to pay such damages shall be due and payable to the District on demand and shall bear interest from the date expended until repaid at the rate set forth in Section 54d hereof. The District may also retain or withhold any amounts expended hereunder from progress payments otherwise due Contractor in accordance with Section 6d hereof. Contractor shall protect all of the District's property, fixed or movable, and shall replace any damaged item or part thereof and professionally clean any and all items that might become covered or partially covered to any degree by dust or other airborne elements. If school is in session at any point during the progress of the Project, and, in the District's reasonable discretion, flying debris, grinding powder, sawdust, dirt or dust from such Work disrupts or disturbs the students or faculty or the normal operation of the school, at the District's request, the Contractor shall schedule the performance of all such Work around normal school hours or make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall Contractor have a right to receive additional compensation or an extension to the Contract Time as a result of any such rescheduling or the making of such other arrangements.

b. In the event that the Contractor fails to comply with the requirements for dust control, noise control, or any other maintenance or clean up requirement of this Contract, the District shall so notify the Contractor and the Contractor shall be obligated to take immediate action. Should the Contractor fail to respond with immediate and responsive action and not later than twenty-four (24) hours from the District's notification, the District shall have the absolute right to proceed as it may deem necessary to remedy such matter. Any and all costs incurred in connection with such actions shall be the sole responsibility of, and be borne by, Contractor and will bear interest from the date expended until repaid to the District at the rate set forth in Section 54d hereof. The District may also retain or

withhold any amounts expended hereunder from progress payments otherwise due Contractor in accordance with Section 6d hereof.

39. CLEANING UP

In addition to its obligations set forth in the Sections above, Contractor at all times shall keep the Project Premises free from debris such as waste, rubbish, and excess materials and equipment caused by the Work; debris shall be removed from such Project Premises at Contractor's sole cost. Contractor shall not leave debris under, in, or about the Project Premises. Upon completion of the Work, Contractor shall clean the interior and exterior of buildings, including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal projections, and any areas where debris has collected so surfaces are free from foreign material or discoloration; Contractor shall clean and polish all glass, plumbing fixtures, and finish hardware and similar finish surfaces and equipment and, at the District's direction, shall remove temporary fencing, barricades, planking and construction toilet(s) and similar temporary facilities from the Project Premises. If the Contractor fails to clean up as provided herein, the District may do so at the sole cost and expense of the Contractor after twenty-four (24) hours written notice to the Project superintendent, and any amounts expended by the District hereunder shall accrue interest from the date of expenditure until paid by the Contractor at the rate set forth in Section 54d hereof. The District may also retain or withhold any amounts expended hereunder from progress payments otherwise due Contractor in accordance with Section 6d hereof. These provisions are in addition to the cleanup requirements found in Division One (1) of the Specifications.

40. SEPARATE CONTRACTS

District reserves the right to let other contracts in connection with this Work. Contractor shall afford other contractors reasonable opportunity for (1) introduction and storage of their materials; (2) access to the Work; and (3) execution of their work. Contractor shall properly connect and coordinate its work with that of other Contractors.
If any part of Contractor's Work depends on proper execution or results of any other contractor, the Contractor shall inspect and within seven (7) days or less, report to Architect, in writing, any defects in such work that render it unsuitable for proper execution of Contractor's work. Contractor will be held accountable for damages to District for that work which it failed to inspect or should have inspected. Contractor's failure to inspect and report shall constitute its acceptance of other contractors' work as fit and proper for reception of its work, except as to defects which may develop in other contractors' work after execution of Contractor's work.

To ensure proper execution of the Contractor's Work, Contractor shall measure and inspect work already in place and shall at once report to the Architect any discrepancy between work executed by any other contractor and the Contract Documents. Assistance required by the Architect in obtaining measurements of information on the Work shall be furnished fully and efficiently by the Contractor. Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by the District in prosecution of, or in connection with, the Project to the end that Contractor may perform this Contract in the light of such other contracts, if any. Before starting the various phases of its Work, Contractor shall consult with other contractors on the Project Premises, if any, and with the Architect and Inspector, regarding the installation of such other contractor's work in order to avoid the possibility of conflict in installing Work and the maintenance of Work progression according to the Project Schedule. Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy of the Project Premises. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Project. If simultaneous execution of any contract or contracts for the Project is likely to cause interference with performance of some other contract or contracts, the District shall decide which contractor shall continue or whether work can be coordinated so that the contractors may proceed simultaneously.

The District shall not be responsible for any damages suffered or extra costs incurred by the Contractor resulting directly or indirectly from the award or performance or attempted performance of any other contract or contracts on the Project, or caused by any decision or omission of the District respecting the order of precedence in performance of contracts. Should the Contractor cause damage to the work of another contractor on the Project Premises, Contractor agrees, upon due notice, to settle with such other contractor by agreement or arbitration without cost to the District.

CONTRACTOR IS AWARE THAT THIS CONTRACT MAY BE SPLIT INTO SEVERAL PHASES. IF THE CONTRACT IS SPLIT INTO PHASES THEN CONTRACTOR HAS MADE ALLOWANCE FOR ANY DELAYS OR DAMAGES WHICH MAY ARISE FROM COORDINATION WITH CONTRACTORS FOR OTHER PHASES. IF ANY DELAYS SHOULD ARISE FROM ANOTHER CONTRACTOR WORKING ON A DIFFERENT PHASE, CONTRACTOR'S SOLE REMEDY FOR DAMAGES, INCLUDING DELAY DAMAGES, SHALL BE AGAINST THE CONTRACTOR WHO CAUSED SUCH DAMAGE AND NOT THE DISTRICT. CONTRACTOR SHALL PROVIDE ACCESS TO OTHER CONTRACTORS FOR OTHER PHASES AS NECESSARY TO PREVENT DELAYS AND DAMAGES TO OTHER CONTRACTORS WORKING ON OTHER PHASES OF CONSTRUCTION.

ON MODERNIZATION PROJECTS, CONTRACTOR IS AWARE THAT THE DISTRICT MAY BE CONDUCTING SCHOOL CLASSES, AND CONTRACTOR MAY BE REQUIRED TO RESTRICT THE TIME OF ACTIVITIES, LOCATION OF ACTIVITIES AND SCOPE OF ACTIVITIES. CONTRACTOR'S SCHEDULE MUST ANTICIPATE THE DISTRICT'S PHASING PLAN AND MUST ACCOUNT FOR THE FACT THAT THE ENTIRE PROJECT MAY NOT BE AVAILABLE AT ALL TIMES OR MAY BE AVAILABLE ONLY DURING EVENINGS, WEEKENDS, HOLIDAYS AND OTHER SPECIFICALLY DESIGNATED TIMES. CONTRACTOR AGREES TO PROMPTLY RESCHEDULE ACTIVITIES WHICH ARE DISRUPTIVE TO ONGOING SCHOOL ACTIVITIES.

41. RISK OF LOSS ON CONTRACTOR; SAFETY PRECAUTIONS

Except as otherwise provided in this Section 41, the District assumes no responsibility or liability for the physical condition or safety of the Project Premises or of any improvements thereon. Contractor shall be solely responsible for providing a safe place for performance of the Work. Contractor acknowledges and agrees that any information, materials and test equipment furnished the Contractor by the District, the Architect or any other District representative, excepting the Drawings and Specifications, are supplied solely for the convenience of the Contractor, and the District makes no representation or warranty regarding the accuracy, completeness or adequacy of such information, materials and data, and the Contractor must verify independently that such items are sufficient to be relied upon in connection with the Work.

Upon commencement of Work, the Contractor becomes the constructive owner of the entire site, improvements, material and equipment on Project site. Contractor must ensure proper safety and storage of all materials and assumes responsibility as if Contractor was the owner of the Project site. All risk of loss or damage shall be borne by Contractor during the Work until the date of Completion. As construction owner, Contractor must carry adequate insurance in case of calamity and is not entitled to rely on the insurance requirements as set forth in this agreement as being adequate coverage in case of calamity. The Contractor shall assume the risk of any and all types of loss or damage to the Work or any part thereof, to adjoining property, or to materials or things employed in doing the Work, or stored on the Project Premises, until the earlier of: (x) the date that the District accepts final completion of all Work (including all "punch-list" items), and (y) the date that the District assumes early occupancy pursuant to Section 46 hereof. The District, however, will not in any event assume the risk of any loss or damage to materials and things employed by the Contractor in doing the Work.

The Contractor, with due diligence and dispatch, shall replace or repair, at its own expense, all Work lost or damaged.

The Contractor shall take all necessary precautions for the safety of its employees, Subcontractors, Materialmen and others on the Work and shall comply with all applicable safety laws and building codes to prevent accidents or injuries to persons on, about or adjacent to the Project Premises where Work is being performed. Contractor shall erect and install all necessary safeguards, signs, barriers, lights and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created by such features in the course of construction. Contractor shall designate a responsible member of its organization on the Work whose duty shall be prevention of accidents. The name and position of the person so designated shall be reported to the District. Contractor shall provide and maintain at the Project Premises first-aid supplies for minor injuries.

Use or storage of explosives is prohibited. When use of hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise the utmost care and carry on such activities under the supervision of properly qualified personnel.

In an emergency affecting safety or life, or of Work, or of adjoining property, Contractor, without special instruction or authorization from the Architect or the District, is hereby permitted to act, at its discretion, to prevent such threatened loss or injury, and shall so act, without appeal, if so authorized or instructed by the Inspector, the Architect, the District or any other District representative. Any compensation or extension to the Contract Time claimed by the Contractor on account of emergency work shall be determined by Change Order in accordance with Sections 9 and 10 hereof.

Contractor shall provide such heat, covering and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions.

Contractor shall take adequate precautions to protect existing sidewalks, curbs, pavements, utilities, adjoining property and structures, and to avoid damage thereto, and repair any damage thereto caused by construction operations.

Contractor shall (unless the requirement is waived by the District):

Enclose the working area with a substantial barricade, arrange the Work to cause a minimal amount of inconvenience and danger to students and faculty in their regular school activities, and perform Work which may interfere with school routine before or after school hours;

Provide substantial barricades around any shrubs or trees indicated to be preserved (Contractor shall not trim or remove any tree, for any reason, without the prior written approval of the District);

Deliver materials to building areas over routes designated by the Architect, the Inspector, an assigned project manager or any other District representative;

When directed by the District, take preventative measures to eliminate objectionable dust;

Confine Contractor's apparatus, the storage of materials, and the operation of its workmen to limits indicated by laws, ordinances, permits or directions of the Architect, the Inspector or any other District representative, and shall not unreasonably encumber the Project Premises with material, and enforce all instructions of the District, the Architect, the Inspector or any other District representative regarding signs, advertising, fires, danger signals, barricades and smoking, and require that all persons employed on the Work comply with all regulations while on the Project Premises; and

Take care to prevent disturbing or covering survey markers, monuments or other devices marking property boundaries or corners, and if such markers, monuments or other devices are disturbed, replace the same using an approved civil engineer at no cost to the District.

42. HOLD HARMLESS CLAUSES

The Contractor shall indemnify, defend and hold the District, the Board, the Architect, its and their officers, employees, agents, consultants, other independent contractors, consultants and representatives, harmless from and against every liability, claim, demand, cost, loss, damage or expense which may accrue or be made by reason of:

a. Any injury to person or property sustained by the Contractor or by any person, firm, corporation, partnership, limited liability company or other entity, including, without limitation, any Subcontractor or Materialman of any tier, employed directly or indirectly by it upon or in connection with the Work;

b. Any injury to person or property sustained by any person, firm, corporation, partnership, limited liability company or other entity, caused by any act, neglect, Default or omission of the Contractor or any person, firm, corporation, partnership, limited liability company or other entity, including, without limitation, any Subcontractor or Materialman of any tier, directly or indirectly employed by it upon or in connection with the Work, whether the injury or damage occurs upon or adjacent to the Work or the Project;

c. The furnishing or use of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, process, article, or appliance under the Contract;

d. The violation of any applicable laws, rules or regulations of any governmental entity in connection with the Work; or

e. Any failure or alleged failure of the Contractor (or any person hired or employed, directly or indirectly, by the Contractor) to pay any Subcontractor or Materialman of any tier or any other person employed in connection with the Work, and/or the filing of any stop notice or mechanic's lien claim.

The Contractor, at its own cost, expense and risk, shall defend all legal proceedings that may be brought against the District, the Board, its and their officers, employees, agents, consultants, other independent contractors and representatives, on any such liability, claim, demand, cost, loss, damage or expense, and satisfy any resulting judgment that may be rendered against any of them whether or not the liability, claim, demand, cost, loss, damage or expense was actually or allegedly caused wholly or in part through the negligence or other tortuous conduct of any of them; provided that, notwithstanding anything to the contrary stated above, the Contractor shall not be obligated to indemnify any particular indemnitee if the liability, claim, demand, cost, loss, damage or expense was actually and solely caused by such indemnitee's gross negligence or willful misconduct.

43. INSURANCE

The Contractor shall secure and maintain, as a minimum, the insurance described and as set forth in the General Contract.

The Contractor further shall furnish to the District certificates of insurance, signed by an authorized representative of the insurance carrier no later than five (5) days after Board approval of the Contract or prior to the start of construction, whichever occurs first, which certificates shall be endorsed as follows:

> This policy shall not be suspended, cancelled, reduced in coverage or required limits of liability or amounts of insurance or non-renewed until notice has been mailed to the District. Date of suspension, cancellation, reduction or non-renewal may not be less than thirty (30) days after the date of mailing such notice.
>
> The insurance afforded by this policy is primary and any other insurance carried by the District with respect to the matters covered by such policy shall be excess and non-contributing.

The certificates of insurance and insurance policies required under this Contract shall name the District, the Office of Public School Construction, State of California (when the Project is a State-funded project) and all other indemnitees described in Section 42 hereof as additional insureds; provided that, any Builder's Risk Insurance shall name the District as loss payee thereunder. Facsimile or reproduced signatures are not acceptable. If complete and proper insurance certificates as required hereunder are not delivered to the District within the time period provided above, the District may declare the Contract unexecuted and void and, in its discretion, proceed to award the Contract to the next lowest responsible bidder in accordance with California Public Contract Code Section 5106. As soon as practicable, but not later than 60 days following the execution of contract, Contractor shall provide District endorsements of the policies of insurance provided. The District reserves the right to require complete certified copies of the required insurance policies. All insurance policies shall be on a full "occurrence" basis and not a claim made or modified occurrence basis.

Contractor hereby releases the District, the Office of Public School Construction, State of California (when the Project is a State-funded project) and all other indemnitees described in Section 42 and their boards, officers, directors, agents, partners, servants and employees from any liability, and on behalf of its insurer, waives any right of subrogation, for any loss or damage to any or all of its or their property, which loss or damage is of the type covered by builder's risk insurance required to be maintained by it under the Contract Documents, regardless of any negligence on the part of the released persons which may have contributed to or caused such loss or damage. If the insurance policy does not allow a waiver of the right of subrogation of the insurer, Contractor covenants that it will obtain for the benefit of each of the listed persons a waiver of any right of subrogation which the insurer of such person may acquire against any such person by virtue of the payment of any loss covered by such insurance.

The Contractor in signing this Contract hereby certifies, pursuant to Section 1861 of the California Labor Code, as follows:

> I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract.

The Contractor shall require all Subcontractors engaged on the Work to maintain such insurance as will protect the Contractor and such Subcontractors from all claims and other liabilities as set forth above and in the General Contract (including, without limitation, workers' compensation insurance), and hereby assures the District that all such Subcontractors will maintain such insurance.

The insurance companies providing the insurance required under this Contract shall be subject to the District's prior written approval, which shall not be unreasonably withheld or delayed.

The Contractor shall not commence Work, nor allow any Subcontractor or other person to commence Work, under this Contract until all required insurance and certificates have been obtained and delivered in duplicate to, and approved by, the District. Failure to maintain the insurance and furnish the required certificates or policies shall constitute a Default by the Contractor and the District may terminate the Contract without waiver of any other remedy it may have pursuant to the provisions of Section 54 hereof.

If the Contractor fails to purchase and maintain any insurance required under this Section 43, the District may, but shall not be obligated to, upon five (5) days' written notice to the Contractor, purchase such insurance on behalf of the Contractor and shall be entitled to be reimbursed by the Contractor promptly thereafter or deduct the amount of such premiums from the Contract Price in accordance with Section 6d hereof. Any amounts expended by the District hereunder shall bear interest at the rate set forth in Section 54d hereof from the date expended until repaid to the District.

44. CONTRACT SECURITY

Unless otherwise specified in the Contract Documents, the Contractor shall furnish a surety bond in an amount at least equal to 100% of the Contract Price, as required by California Civil Code Section 3248 (as the same may be amended or recodified from time to time), as security for payment of persons performing labor and furnishing materials in connection with this Contract and shall furnish a separate bond in an amount equal to 100 percent of the Contract Price as security for faithful performance of this Contract. The aforesaid bonds shall be in the forms set forth in Exhibits of this Contract, respectively. Upon request of the Contractor, the District will consider and accept, in its sole discretion, multiple Sureties on such bonds. Only bonds executed by admitted Surety insurers as defined in California Code of Civil Procedure Section 995.120 shall be accepted.

The Contractor shall keep the Surety informed of the progress of the Work. The District shall be notified by the Contractor, in writing, of all communications between the Contractor and the Surety. The District may, in its sole discretion, inform the Surety of the progress of the Work (or lack of progress) or any problems encountered in connection with the Work or the Contractor and may obtain consents, as necessary, to protect the District's rights, interest, privileges and benefits under and pursuant to any bond issued in connection with the Work.

45. MAINTENANCE WARRANTY BOND

If the bid for the Project requires an additional form of security to insure compliance with the requirements of the Guaranty-Warranty provisions of this Contract set forth in Section 57 hereof, the Contractor shall provide, at its sole cost and expense, a maintenance-warranty-guaranty bond for a sum equal to the lesser of (x) ten percent (10%) of the Contract Price, and (y) One Million Dollars ($1,000,000) (the **"Maintenance Bond"**). Such Maintenance Bond will be issued by a Surety meeting the requirements of this Contract. The Maintenance Bond shall cover the entire scope of the Work, shall be in addition to any and all warranties or guaranties issued by manufacturers and suppliers, and shall warrant and guaranty all of the Work for a term equal to the terms of each of the Contractor's warranties and guaranties provided in the Contract Documents so that the Maintenance Bond will fully warrant and guaranty each Contractor warranty and guaranty set forth in the Contract Documents for an equal amount of time as set forth in the Contract Documents. The Maintenance Bond shall further warrant and guaranty a response time of not more than one (1) business day from the time of District's notification to the Contractor of a defect. If the Contractor fails to respond and/or initiate any action for the repair of defects within a period of one (1) business day after notice from the District thereof, the District shall then have the right to summarily execute upon the Maintenance Bond up to its entire value and proceed to remedy and correct the defect without further notice to Contractor.

46. OCCUPANCY OR USE BEFORE ACCEPTANCE OF COMPLETION

The District may occupy any building or portion thereof or use any improvement contemplated by the Contract prior to the completion of the entire Work. A list of Work to be completed and corrected by the Contractor, if any, shall be prepared and agreed to between the District and the Contractor before any such occupancy or use. Such occupancy or use shall not operate as an acceptance of any part of the Work but shall start the guaranty-warranty period on the structure or portion thereof so occupied or improvement or equipment so used; provided, however, that such occupancy or use shall not start the guaranty-warranty period as to items appearing on the list of Work yet to be completed and corrected or as to structures or improvements (or portions thereof) that are not occupied or used. No such occupancy or use shall be deemed to have occurred unless and until the District has given the Contractor written notice of its intention to so occupy or use any particular structure or improvement specifying the portion or portions of the structure, improvement or equipment which will be deemed so occupied or used. The District and the Contractor shall take reasonable steps to obtain the consent of the Contractor's insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse of or reduction of such insurance.

Such occupancy or use by the District shall relieve the Contractor of (and the District shall assume) the responsibility for injury or damage to said occupied or used portions of the Project resulting from use by the District or the public or from the action of the elements or from any other cause, except injury or damage resulting from the operations, negligence or intentional acts of the Contractor, any Subcontractors or Materialmen of any tier, or their officers, employees or agents. Upon occupancy of any building or portion thereof by the District pursuant to this Section 46, the District shall assume payment of all utility costs and expenses incurred in connection with the building or portion thereof so occupied and shall procure insurance for (or self-insure) the occupied building or portion thereof. The Contractor shall continue to pay all utility costs and expenses and provide insurance for any portion of the Project that is not so occupied by the District and shall coordinate with the District before canceling or reducing insurance coverage.

The Contractor shall not be required to reclean such occupied portions of the Project before final acceptance, except for cleanup made necessary by Contractor's operations. Nothing in this Section shall be construed as relieving the Contractor from full responsibility for correcting defective work or materials and from removing the same from the Project Premises.

47. CONTRACT/PROJECT CLOSE-OUT

a. The Contractor shall provide all operations necessary for closing out the Contract and assisting in the District's final inspection and examination of the Project, and shall, prior to requesting inspection by the District, inspect and make certain (and fully verify) that all of the Work is complete in accordance with the content and intent of all of the Contract Documents and is in fact ready for the requested inspection.

b. The District will not review, inspect, examine or walk-through any areas or assemblies that are only partially completed.

c. If the Contractor requests an inspection of areas or assemblies that are evidently or excessively incomplete, and/or if, in the reasonable opinion of the District, the Contractor is using the inspection as a means and way to define or determine a scope of Work or to accelerate the Work of a Subcontractor instead of a means to finally inspect a completed portion of the Work, then the Contractor shall be liable for all costs and expenses that the District may incur in connection with any such inspection, inclusive of, but not limited to, personnel salaries, wages, consultant fees, transportation costs, etc., which amounts the District may retain or withhold from the Contract Price in accordance with Section 6d hereof. Such amounts shall bear interest from the date expended until repaid to the District at the rate set forth in Section 54d hereof.

d. The Supplementary General Terms and Conditions may contain additional close-out formats and required forms to be completed, if any are required.

48. REQUIREMENTS PREPARATORY TO FINAL INSPECTION/EXAMINATION

The following shall be conditions precedent to the final inspection/examination of the Project by the District or any of its representatives:

a. All punchlist items shall be completed;

b. All temporary facilities shall have been removed from the Project Premises if the District has so instructed the Contractor;

c. The buildings, Project Premises and all other facilities located thereon shall have been thoroughly cleaned as required by the Contract Documents;

d. All plumbing, mechanical and electrical equipment shall operate quietly and free from vibration;

e. All systems shall function as designed and shall meet specified requirements for the Project; and

f. All operating instructions for equipment shall be properly mounted and posted as specified by the Contract Documents.

49. FINAL INSPECTION EXAMINATION

a. After all the requirements to final inspection have been completed and satisfied, Contractor shall notify the District so that the final inspection can be performed.

b. Contractor shall submit to the District a written certification certifying that:

(i) The Work has been inspected by the Contractor for compliance with the Contract Documents and by all public agencies having jurisdiction.

(ii) The Work has been completed in accordance with the Contract Documents.

(iii) All equipment and systems have been tested in the presence of the District's designated representative, and when so required, the Architect, the Inspector and other consultants, inspectors and governing agencies, and all such equipment and systems are operational.

(iv) The Work is fully complete and ready for final examination.

c. Contractor shall schedule final inspection and examination in a sequential manner to facilitate the inspection.

d. Inspector(s) will perform final inspection/examination of the Work within seven (7) days after receipt of the certification described above.

e. Should the Architect and the Inspector consider that the Work is "finally complete", the Contractor shall be required to make the close-out submittals immediately.

f. The District representatives, Contractor, consultants and Inspector will coordinate for occupational authorization.

g. If the Architect or the Inspector determines that the Work is not "finally complete":

(i) The Contractor shall be so notified in writing, which writing shall describe all of the reasons for the Architect's or the Inspector's, as applicable, decision and all points of contention.

(ii) The Contractor shall then take immediate steps to remedy the work that has not been completed (or has not been completed correctly) and notify the District's Architect, Inspector and consultants in writing upon completion of the same.

(iii) Once remediation has been completed, Contractor shall resubmit a request for final inspection and examination, together with the certification described in Section 49b above, and the District's representatives and Architect and Inspector will re-inspect the Work within seven (7) days after receipt of such certification.

(iv) The District reserves the right to assess to the Contractor all direct and indirect costs and expenses incurred by the District in connection with any failed inspections if the Work failed to pass inspection as a result of the Contractor's negligence, error or other wrongful conduct. The District may retain or withhold any amounts assessed hereunder from the Contract Price in accordance with Section 6d hereof. All amounts assessed hereunder shall bear interest from the date assessed until paid to the District at the rate set forth in Section 54d hereof.

50. CLOSE-OUT SUBMITTALS

a. Immediately upon the Architect's and Inspector's approval of the final inspection, and in addition to any other submittals required to be made by the Contractor under any other provision of the Contract Documents, the Contractor shall submit the following close-out documentation to the District:

(i) Operations and maintenance data for equipment as required by this Contract, the Specifications, the Drawings, Change Orders, Addenda or any other Contract Document, (including, without limitation, three (3) complete sets of manuals containing manufacturers' instructions on the operation of each item and apparatus furnished under the Contract Documents) and for such other items when and as directed by the District or the Contract Documents;

(ii) Project Record Drawings;

(iii) Warranties and bonds for equipment put into service;

(iv) Keys and keying schedule and "Identification Tagging" master template (if Project Work is tagged);

(v) Tools, spare parts and maintenance materials;

(vi) A list of all Subcontractors and Materialmen of every tier providing services and/or materials in connection with the Project, in a formal, adequately bound, cataloged form, which shall include the names, addresses, telephone numbers and fax numbers of such persons, and shall further include notices as to where pertinent persons can and may be reached for emergency service, inclusive of nights, weekends and holidays; and

Contractor shall certify that each of the items submitted to the District in accordance with this Section 50a above is complete and accurate and all of the items submitted, taken together, cover all of the Work.

b. Contractor shall deliver evidence of compliance with any and all requirements of all applicable governmental regulatory agencies at all levels, including, without limitation, the District, City, State and Federal government and agencies, as may be reasonably required by the District.

c. Contractor shall deliver certificates of inspection for vertical transportation systems, life safety systems and mechanical and electrical Work as may be applicable.

d. Contractor shall deliver certificates of insurance for products and completed operations, bonds, maintenance bonds, warranties and any and all other required certificates as may be applicable and required by any of the Contract Documents.

e. Contractor shall submit Contractor's final affidavit of payment of debts and complete payroll certifications.

51. ACCOUNTS ADJUSTMENT

a. Upon completion of the Project, Contractor shall submit a final statement of accounting to the District, showing in full detail all adjustments and variations to the Contract Price.

b. When required, the District will prepare a final Change Order showing all final adjustments to the Contract Price, which were not made previously by other Change Orders.

c. If at any time prior to the completion of the requirements under the Contract Documents, the District is required to provide or secure additional professional services for any reason by any act of the Contractor, the Contractor shall be invoiced by the District for any costs incurred for any such additional services, which costs shall be deducted from the next progress payment. Such invoicing shall be independent from any other District remedies and shall not be considered a waiver of any District rights or remedies. If payments then or thereafter due to the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the District. Additional services shall include, but shall not be limited to, the following:

(a) Services made necessary by the default of the Contractor.

(b) Services made necessary due to the defects or deficiencies in the Work of the Contractor.

(c) Services required by failure of the Contractor to perform according to any provision of the Contract Documents.

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

(e) Services for evaluating and processing claims submitted by the Contractor in connection with the Work outside the established Change Order process.

(f) Services required by the failure of the Contractor to prosecute the Work in a timely manner in compliance within the specified time of completion.

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

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

52. ACCEPTANCE OF COMPLETION

The District, through the Board, shall accept completion of the Contract and have the Notice of Completion recorded when the entire Work shall have reached the stage of Substantial Completion or final completion, whichever occurs first, to the satisfaction of the Architect, the Inspector and the District.

If, after Acceptance of Completion, the Contractor fails to correct all "punch-list" items prior to the expiration of the 60 day period immediately following the recordation of the Notice of Completion, the District shall withhold from the final payment, in addition to any other amounts that the District may be permitted to withhold pursuant to Section 6d hereof, an amount equal to one and one-half (1.5) of the Architect's estimated cost of the correction of all such items until the last of the items has been corrected. At the end of the 60 day period, if there are items remaining to be corrected, the District may request the Contractor in writing to make immediate correction of said items, and if the Contractor fails to make such correction within ten (10) days of the date of the written notice, the District may make the correction and deduct the costs incurred in connection therewith from the amount withheld therefor.

The parties hereby acknowledge and agree that the Board must formally accept Substantial Completion or final completion, as applicable, by Board resolution in order for Acceptance of Completion to occur.

53. CORRECTION OF WORK BEFORE FINAL PAYMENT

Contractor shall promptly remove from the Project Premises all Work condemned by the District as failing to conform to the requirements of the Contract Documents, whether incorporated or not. Contractor shall promptly replace and re-execute its Work to comply with the Contract Documents without additional expense to the District and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

If the Contractor does not remove such condemned Work within a reasonable time, fixed by written notice, the District may remove it and may store the material at Contractor's expense. If the Contractor does not pay the expenses of such removal within ten (10) days time thereafter, the District may, upon ten (10) days written notice to the Contractor, sell such materials at auction or at private sale and shall account for the net proceeds thereof, after deducting all costs and expenses that should have been borne by the Contractor under this Contract.

54. DEFAULT; REMEDIES

a. Default. The following events shall constitute a default of the Contractor under the Contract (each a **"Default"**):

(i) If the Contractor commences a voluntary action under any chapter of the United States Bankruptcy Code as now or hereafter in effect or if the Contractor takes any equivalent or similar action by filing a petition or otherwise under any other Federal or State law in effect at such time relating to bankruptcy or insolvency;

(ii) If a petition is filed against the Contractor under any chapter of the United States Bankruptcy Code as now or hereafter in effect at the time of filing or if a petition is filed seeking any such equivalent or similar relief against the Contractor under any other Federal or State law in effect at the time relating to bankruptcy or insolvency and such petition or filing is not dismissed within 60 days after being filed;

(iii) If the Contractor makes a general assignment for the benefit of creditors;

(iv) If a trustee, receiver, custodian or agent of the Contractor is appointed under applicable law or under contract whose appointment of authority to take charge of property of the Contractor is for the purpose of enforcing a lien against such property or for the purpose of general administration of such property for the benefit of the Contractor's creditors;

(v) If the Contractor fails to perform the Work in accordance with the Contract Documents, including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to its construction scheduling responsibilities, or if the Contractor fails to complete the Project within the Contract Time;

(vi) If the Contractor disregards laws, ordinances, rules or regulations of any public body having jurisdiction;

(vii) If, in the opinion of the District, the Contractor at any time during the progress of the Work fails to perform any obligation or violates any provision of this Contract, including, without limitation, safety requirements;

(viii) If the Contractor admits in writing an inability to pay its debts generally as they become due; or

(ix) If the Contractor fails to make prompt and timely payment to Subcontractors or Materialmen of any tier for Work performed and/or materials furnished in connection with the Project or any such Subcontractor or Materialman files a valid stop notice or lien against the District, the Project or the Project Premises.

(x) If a dangerous condition is caused by Contractor which may cause serious bodily injury or harm to student(s) or teacher(s)

b. Remedies other than Termination. If a Default occurs, the District may, without prejudice to any other right or remedy, including, without limitation, its right to terminate the Contract pursuant to subsection c below, do any or all of the following: (1) permit the Contractor to continue under this Contract, but make good such deficiencies or complete the Contract by whatever method the District may deem expedient, and the cost and expense thereof shall be deducted from the Contract Price or paid by the Contractor to the District on demand; (2) if the workmanship performed by the Contractor is faulty, or defective materials are provided, erected or installed, then the District may order the Contractor to remove the faulty workmanship or defective materials and to replace the same with Work or materials that conform to the requirements of the Contract Documents, in which event the Contractor, at its sole cost and expense, shall proceed in accordance with the District's order and complete the same within the period of time given by the District in its notice to the Contractor; and (3) initiate procedures to declare the Contractor a nonresponsible bidder for a period of two to five years thereafter. All amounts expended by the District in connection with the exercise of its rights hereunder shall accrue interest from the date expended until paid to the District at the rate set forth in subsection d below. The District may retain or withhold any such amounts from the Contract Price in accordance with Section 6d hereof. If the Contractor is ordered to replace any faulty workmanship or defective materials pursuant to clause (2) above, the Contractor shall replace the same with new Work or materials that conform to the Contract Documents, using methods and materials approved by the Architect and the District, and, at its own cost, shall repair or replace, in a manner and to the extent the Architect or the District shall direct, all Work or material that is damaged, injured or destroyed by the removal of said faulty workmanship or defective material, or by the replacement of the same with acceptable Work or materials. In no event shall anything in this Section 54 be deemed to constitute a waiver by the District of any other rights or remedies that it may have at law or in equity, it being acknowledged and agreed by the Contractor that the remedies set forth in this Section 54 are in addition to, and not in lieu of, any other rights or remedies that the District may have at law or in equity.

In cases other than violation(s) of safety requirements, the District shall first deliver or mail to the Contractor and its Surety at the last address on file in the District's office, a written notice giving the Contractor three (3) business days to cure the Default to the satisfaction of the District (or such longer period as may be necessary under the circumstances if the Default cannot be cured within such three (3) business day period); provided that, in the event

that the District elects to terminate the Contract pursuant to subsection c below, the District shall only be required to deliver the seven (7) day termination notice described in said subsection c and shall not be required to deliver the notice described immediately above. In cases of violation(s) of safety requirements, the District may correct the violation(s) in accordance with clause (1) of the immediately preceding paragraph, or if in the District's opinion circumstances permit, the District will notify the Contractor orally that the violation(s) must be corrected within a specified time period. This oral notification will be followed by prompt written notice to the Contractor and the Surety.

c. Termination of Contract. If a Default occurs, the District may, without prejudice to any of its other rights or remedies, including its rights and remedies under subsection b above, after giving the Contractor and its Surety seven (7) days' written notice (provided that, at the District's election, the Contract will automatically terminate upon the occurrence of an event described in Sections 54a(i), (ii), or (x) above without the need for such seven (7) day notice), terminate the Contract or any or all services of the Contractor hereunder, exclude the Contractor from the Project Premises and take possession of the Project and the Work and of all the Contractor's tools, appliances, construction equipment and machinery at the Project Premises and use the same to the full extent they could be used by the Contractor without liability to the Contractor for trespass or conversion, incorporate in the Work all materials and equipment stored at the Project Premises or off-site and for which the District has paid the Contractor, and finish the Work as the District may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct, indirect and consequential costs of completing the Work, including, but not limited to, fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs, such excess shall be paid to the Contractor. If such costs exceed such unpaid balance of the Contract Price, the Contractor shall pay the difference to the District. The costs incurred by the District in completing the Contract shall be determined by the Architect. When exercising any rights or remedies under this Section, the District shall not be required to obtain the lowest price for work performed. All amounts due to the District or Contractor upon completion of the Work under this Section 54c shall be paid within thirty (30) days after such amount is determined and demand therefor is made in writing by the party to be paid, and any amount not paid within the said thirty (30) day period shall accrue interest from the date of demand until so paid at the rate set forth in subsection d below.

d. Interest on Amounts Due. Except as otherwise provided with respect to progress payments (as set forth in Section 6 hereof), all amounts not paid when due under this Contract shall bear interest at the rate of ten percent (10%) per annum.

55. TERMINATION OF CONTRACT FOR CONVENIENCE

Notwithstanding anything to the contrary stated in the Contract Documents, the District may terminate the Contract for convenience at any time upon ten (10) days' prior written notice to the Contractor. Upon receipt of any such notice of termination for convenience, the Contractor shall immediately, in accordance with the instructions from the District, proceed as follows:

a. cease operations as specified in the notice; provided that, the District, in its sole and absolute discretion, may require the Contractor to complete any Work necessary to facilitate transfer of the Contractor's responsibilities to another contractor;

b. place no further orders and enter into no further subcontracts for materials, labor, services or facilities except as necessary to complete continued portions of the Contract;

c. terminate all subcontracts and orders to the extent they relate to Work terminated (unless the District expressly agrees to assume the same in accordance with Section 15d hereof);

d. proceed to complete the performance of Work not terminated;

e. take actions that may be necessary, or that the District, Architect, Inspector or other District representative may direct for the protection and preservation of the terminated Work; and

f. transfer to the District, in writing, good title to all materials on the Project Premises, or used or to be used on the Project, for which payment has been received from the District, including, without limitation, materials in the process of being fabricated off-site.

Upon such termination, the District's total obligation to the Contractor shall be limited to payment for all Work completed, and materials delivered to the Project premises (and stored thereon or properly stored off-site in accordance with Section 6b hereof) in connection with the Work, as of the effective date of the termination. The

Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, any claim for anticipated profits.

The District shall be credited for (i) payments previously made to the Contractor for the terminated portion of the Work, (ii) claims which the District has against the Contractor under the Contract (or any other amounts that the District may withhold or offset against the Contract Price pursuant to the Contract Documents), and (iii) the value of the materials, supplies, equipment and other items that are to be disposed of by the Contractor that are part of the Contract Price.

Final payment to the Contractor hereunder shall be made upon receipt and approval of a final Contractor Payment Request from the Contractor in accordance with the terms and provisions of Section 6 hereof.

56. DISPUTE RESOLUTION

a. Resolution of Construction Claims of $375,000 or Less. Construction Claims (as defined below) by the Contractor in the amount of $375,000 or less in the aggregate, and all other disputes between the parties relating to the Contract Documents or the Project in the amount of $375,000 or less in the aggregate (even if such claims are not expressly covered by the terms and provisions of Section 20104 *et seq.* of the California Public Contract Code), shall be made and processed pursuant to the terms and provisions of, and the procedures outlined in, California Public Contract Code Sections 20104, et seq. (as may be amended or recodified from time to time), which procedures (as of September 1, 1996) are set forth in Exhibit I attached hereto. As used herein, **"Construction Claims"** shall mean a separate demand by the Contractor for (1) an extension to the Contract Time, (2) payment of money or damages arising from work done by, or on behalf of, the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for in the Contract Documents or the Contractor is otherwise entitled, or (3) an amount the payment of which is disputed by the District. All mediations and arbitrations shall take place at a location selected by the arbitrator in the City of San Gabriel, California, if at all possible, and otherwise in Los Angeles, California.

b. Resolution of Construction Claims in excess of $375,000 and Non-Construction Claims. *Unless agreed otherwise by the parties and except as otherwise provided by Article 74 hereto, all* Construction Claims in excess of $375,000, and all claims by the District or the Contractor that do not constitute Construction Claims but relate to the Contract, the Project or the Work, shall be *resolved by formal judicial proceedings brought in any State or Federal court of competent jurisdiction located in the County of Los Angeles, State of California, and by the execution and delivery of the Contract each party hereto accepts for itself, generally and unconditionally, the nonexclusive jurisdiction of the aforesaid courts and waives any defense of forum non conveniens and irrevocably agrees to be bound by any judgment rendered thereby in connection with this Contract,* made and processed in accordance with the following procedures.

(i) Mediation. If a dispute arises out of or related to this Contract, or the breach thereof, the parties agree first to try in good faith to settle the dispute by mediation in San Gabriel, California, if at all possible, and otherwise in Los Angeles, California, under the American Arbitration Association ("AAA") Rules for the Real Estate Industry (including a mediation alternative) in effect on the date hereof before resorting to arbitration or litigation. Within seven (7) days after the mediation demand from either party hereunder, a mediator shall be selected by the agreement of the parties. In the absence of such agreement within such seven (7) day period a mediator (who shall be an attorney with at least twelve (12) years of real estate law or development experience, including substantial construction and public contract experience) shall be selected pursuant to the AAA rules.

(ii) Arbitration. If the dispute has not been resolved pursuant to the mediation procedure set forth above within sixty (60) days of the commencement of such procedure (which period may be extended by mutual agreement of the parties), then the dispute shall be determined by binding arbitration in San Gabriel, California, if at all possible, and otherwise in Los Angeles, California, under the AAA Arbitration Rules for the Real Estate Industry in effect on the date hereof. Within seven (7) days after the arbitration demand from either party hereunder, an arbitrator shall be selected by agreement of the parties. In the absence of such agreement within such seven (7) day period, an arbitrator (who shall be an attorney with at least fifteen (15) years real estate law or development experience, including substantial construction and public contract experience) shall be selected pursuant to the AAA Rules. Whether a claim is covered by this Contract, or whether the parties have the right to arbitrate a dispute shall be determined by the arbitrator. There shall be no substantive motions or discovery, except the arbitrator shall authorize such discovery as may be necessary to ensure a fair private hearing. The arbitrator shall not be bound by the rules of evidence or of civil procedure, and may limit live testimony and cross-examination to that necessary to ensure a fair private hearing on material issues. The arbitrator shall hold the hearing within sixty (60) days of the initial demand for arbitration, conclude the hearing within two (2) days thereafter and issue a written

decision within fourteen (14) days after such conclusion of the arbitration hearing. These time limits are not jurisdictional, and the arbitrator may for good cause permit reasonable extensions or delays. The arbitrator shall apply the substantive law of the State of California and may award injunctive relief or any other remedy available from a judge, including attorneys' fees and costs to the prevailing party, but shall not have the power to award punitive damages.

(iii) Other Terms All mediations and arbitrations shall take place at a location selected by the arbitrator in the City of San Gabriel, California, if at all possible, and otherwise in Los Angeles, California.

c. Continuing Contract Performance. Pending final resolution of any claim hereunder (whether or not such claim is a Construction Claim), unless otherwise provided by any term or provision of the Contract Documents or instructed by the District in writing, the Contractor shall proceed diligently with performance of the Work, and the District shall continue to make payment of all undisputed amounts in accordance with the Contract Documents.

57. GUARANTY-WARRANTY

Beside guaranties required elsewhere in the Contract Documents, the Contractor shall, and hereby does, guaranty and warrant that the Project and all Work executed and materials furnished under the Contract will be free from defects of materials and workmanship for a period of one (1) year after the date of Acceptance of Completion, except that certain specific items of the Work and Project may require a guaranty or warranty for a greater period of time when so provided in any Contract Document and the guaranty period for certain portions of the Work may commence prior to Acceptance of Completion as provided in Section 54 hereof. Immediately upon receipt of written notice from the District, but in no event later than one (1) business day thereafter, the Contractor shall repair or replace, at its own expense, any defective material or Work which may be discovered before Acceptance of Completion or within the above guaranty period, any material or Work damaged thereby, and all adjacent material or Work which may be displaced in connection with the repair or replacement required hereunder. Inspection of or failure to inspect the Work or the Project by the District shall not relieve the Contractor from these obligations. The Contractor shall notify the District upon completion of the repairs.

If the Contractor fails to repair or replace the material or Work as indicated in the preceding paragraph within five (5) business day (or earlier if due to circumstances which could cause waste of resources or danger to life or property if such circumstances and time period is noted in written notice) from the date of receipt of a written notice from the District notifying the Contractor of the defect, the District, with its own forces or by contract, may proceed with the repair or replacement and assess the costs thereof against the Contractor, which costs will bear interest at the rate set forth in Section 54d from the date expended until repaid to the District, and which amount may be withheld or retained from any portion of the Contract Price outstanding and otherwise owing to the Contractor in accordance with Section 6d hereof. When necessary to keep school open or safely operating, the District, with its own forces or by contract, may make such repairs or replacement without advance notice to the Contractor and assess the costs thereof (together with interest as specified above) against the Contractor. Such action by the District will not relieve the Contractor of the guaranties provided in this Section or elsewhere in the Contract Documents. If Contractor fails to repair or replace any Work or material covered by any guaranty or warranty set forth in the Contract Documents within the applicable guaranty or warranty period, the District may elect to declare the Contractor a non-responsible bidder on future District projects in accordance with Section 54b hereof.

Whether the Contractor or the District actually repairs or replaces defective material or Work within the applicable guaranty period pursuant to either of the preceding two paragraphs, the warranty period shall begin anew from the date of completion of the repair or replacement. For example, if an item with a one year warranty requires repair or replacement during the guaranty period, then the guaranty for that item shall expire one (1) year after the completion of the repair or replacement of such item and not one (1) year after Acceptance of Completion.

Contractor further warrants that title to all Work, materials and equipment will pass to the District upon receipt of payment by Contractor therefor, free and clear of all lien rights, stop notice rights, security interests or encumbrances (collectively referred to as liens). The Contractor shall also defend the District, at the Contractor's sole cost and expense, against any and all actions, lawsuits or proceedings brought against the District as a result of claims, liens or stop notices filed against the District, the Project Premises or otherwise. The Contractor hereby indemnifies, defends and holds harmless the District against any and all such claims, liens and stop notices and agrees to pay any

judgment, lien or stop notice claim against the District or the District's property resulting from any actions, lawsuits or proceedings brought to enforce such liens, stop notices or other claims.
This Section does not in any way limit the guaranty on any items for which a longer guaranty is specified, or on any items for which a manufacturer gives a guaranty for a longer period. Contractor shall furnish the District all appropriate guaranty or warranty certificates immediately upon completion of the Project.

No payment by the District, or any partial or entire use or occupancy of the Project by the District, shall constitute an acceptance of any Work not performed in accordance with the Contract Documents and all applicable laws, rules and regulations.

58. OPERATIONAL-TRAINING

a. The Contractor shall train District personnel in the operation of the systems and equipment incorporated, supplied or otherwise delivered in connection with the Work and the Project, and as may be required in other sections of the Contract Documents. The Contractor shall co-ordinate with the District in order to determine the hours of instruction and scope of material to be covered by such training sessions. Except as otherwise provided herein, training of the District's personnel shall not begin until (i) the District has approved the final submitted copy of the operations manuals and training programs and (ii) the building systems and equipment are completed, operational and formally turned over to the District.

b. The Contractor shall submit to the District the proposed scope of training and materials and instruction schedule for the District's review and approval approximately thirty (30) days before the scheduled completion of the buildings for which training is to occur. Mutually agreeable dates for training shall be arranged with the District's representative; provided, however, that the District may, in its sole discretion, require the entire training to be completed before the final operational test.

c. The training required in this Section is in addition to any other scope of training that may be required by the Contract Documents. The Contractor, or Contractor-provided professional training firm, shall work closely with District personnel in the development and implementation of the training program, including, without limitation, preliminary meetings to set guidelines for the program and choose the required written training materials, all of which are subject to the District's approval. Said training shall include, as may be applicable and acceptable to the District, classroom and on-the-job (hands-on) instruction by qualified installation and operation personnel having the necessary knowledge, experience and teaching skills. The use of videotaping during the instruction period is encouraged. If the instruction period is videotaped, all tapes shall be cataloged and delivered to the District as soon as the training is complete.

d. The Contractor may use professional training firms or its own personnel; provided, however, any person engaged in any part or manner of the training program shall be of a professionally qualified and certified level of expertise in his or her particular field. Persons without certifications for training shall not be acceptable.

e. The entire training program shall be furnished by the Contractor at no additional or separate cost to the District. The training program shall not be the subject of any added costs to the District, Change Orders or increases to the Contract Price. The training program shall be reviewed, evaluated, rejected or accepted by the District, with variances as directed if any are deemed convenient. The entire program, materials, tools and other items shall become the property of the District, which shall include, but not be limited to:

(i) Adequate lesson plans, teacher's guides or training aids used to instruct the students (one full set to be delivered for the District's records and used to instruct students); and

(ii) All written materials, e.g., workbooks, manufacturer's instructions, brochures, student tests, charts or other printed or photographed visual aids (these sets, with one complete reproducible master, to be given to the District).

f. Classroom training shall be conducted in a classroom furnished by the Contractor at no additional cost to the District or, when necessary and if convenient to the District, and with the District's approval, in some District-owned facility.

59. CONTRACT AUDITS

Contractor agrees that the District will have the right to review, obtain and copy all records pertaining to the performance of the Work under the Contract. Contractor agrees to provide the District with any relevant information

requested and shall permit the District access to Contractor's premises, upon reasonable notice, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts and other material that may be relevant to a matter under investigation for the purpose of determining compliance with the Contract or with California Public Contract Code Sections 10115, et seq. (as may be amended from time to time). Contractor further agrees to maintain such records for a period of three years after final payment under the Contract. The District may cause a separate audit of the Project and/or Contractor's books and records kept in connection therewith to be made by a certified public accountant from time to time, but in no event more often than once in any six (6) month period. If any statement of Change Order costs incurred by the Contractor in connection with the Project or amounts paid to the Contractor shall be found to be in error such that the Contractor has been overpaid by an amount in excess of two percent (2%) of the amount rightfully due the Contractor pursuant to this Contract, the Contractor shall immediately pay the cost of such audit. Otherwise, the cost of such audit shall be paid by the District. If any such audit shows that the Contractor has been overpaid to any extent, then the Contractor shall immediately refund to the District the amount of such overpayment, or, at the District's election, the District may deduct such amounts from later payments due to the Contractor under this Contract. All amounts due to the District hereunder shall bear interest from the date of demand until repaid at the rate set forth in Section 54d hereof.

In addition to the above-described rights of the District, pursuant to and in accordance with the provisions of California Government Code Section 8546.7, all books, records, and files of the District, the Contractor, or any Subcontractor or Materialman connected with the performance of Work involving the expenditure of State funds in excess of Ten Thousand Dollars ($10,000.00), including, but not limited to, the administration of such Work, shall be subject to the examination and audit of the Office of the State Auditor of the State of California for a period of three (3) years after final payment is made under this Contract. Contractor shall preserve and cause to be preserved such books, records, and files for the audit period.

60. WAGE RATES

In compliance with the provisions of the California Labor Code, hereby incorporated herein, all workers employed by the Contractor or any Subcontractor of any tier performing Work under this Contract shall be paid not less than the general prevailing rate of per diem wages in effect at the time of execution of the Contract for each craft, classification or type of worker needed to execute the Work under this Contract. Although the District will rely upon the determinations made by the California State Director of Industrial Relations for wage rates, the District reserves the right to establish wage rates and determine classifications in the event of a dispute, as allowed by law.

Pursuant to the provisions of Article 2 (commencing at Section 1770), Chapter 1, Part 7, Division 2 of the California Labor Code, the District has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages and the prevailing rate for holiday and overtime work in the locality in which the Work is to be performed for each craft, classification or type of worker needed to execute the Contract. Holidays shall be as defined in the collective bargaining agreement applicable to each particular craft, classification or type of worker employed under the Contract.

Per diem wages pursuant to California Labor Code Section 1773.1 shall be deemed to include employer payments for health and welfare, pensions, vacation, travel time and subsistence pay as provided in said Section 1773.1 of the California Labor Code, apprenticeship or other training programs authorized by Section 3093 of the California Labor Code, and similar purposes when the term per diem wages is used herein.

Pursuant to Section 1773.6 of the California Labor Code, if during the period this bid is required to remain open, the Director of Industrial Relations determines that there has been a change in the prevailing rate of per diem wages in the locality in which the Work under the Contract is to be performed, he shall make the change available to the District, but the change shall not affect any request for bids or the Contract subsequently awarded.

Pursuant to Section 1815 of the California Labor Code, holiday and overtime work, when permitted by law, shall be paid for at the rate of at least one and one-half (1-1/2) times the specified rate of per diem wages, unless otherwise specified.

There shall be paid to each worker of the Contractor, or any Subcontractors of any tier engaged in Work on the Project, not less than the general prevailing wage rate, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor of any tier and such worker.
Pursuant to California Labor Code Section 1775, the Contractor shall forfeit as a penalty to the District not more than Fifty Dollars ($50.00) for each calendar day or portion thereof for each worker paid less than the prevailing wage rates for such work or craft in which such worker is employed for any Work performed under the Contract by the Contractor or any Subcontractor of any tier, except as otherwise provided in Section 1775(b). The difference between the prevailing rates and the amount actually paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate shall also be paid to each worker by the Contractor or Subcontractor. Such amounts may be retained or withheld from the Contract Price in accordance with Section 6d hereof. The amount of the penalty shall be determined by the Labor Commissioner and shall be based on consideration of the Contractor's or Subcontractor's mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages, or the previous record of the Contractor in meeting his or her prevailing wage obligations, or the willful failure by the Contractor or Subcontractor to pay the correct rates of prevailing wages. A mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages is not excusable if the Contractor or Subcontractor had knowledge of his or her obligations under this Section 60. All penalties or forfeitures from prevailing wage violations shall be deposited into the District's general fund, pursuant to California Labor Code Sections 1771.5 and 1771.6.

Any contract executed between the Contractor and any Subcontractor for the performance of Work under this Contract shall include a copy of the provisions of Sections 1771, 1775, 1776, 1777.5, 1813 and 1815 of the California Labor Code.

The Contractor shall monitor the payment of the specified general prevailing rate of per diem wages by each Subcontractor to each Subcontractor's employees, by periodic review of the certified payroll records of each Subcontractor.

Upon becoming aware of the failure of any Subcontractor to pay his or her workers the specified prevailing rate of wages, the Contractor shall diligently take corrective action to halt or rectify the failure, including, but not limited to, retaining sufficient funds due the Subcontractor for any Work performed under the Contract.

Prior to making final payment to any Subcontractor for any Work performed under the Contract, the Contractor shall obtain and provide to the District an affidavit signed under penalty of perjury from the Subcontractor that the Subcontractor has paid the specified general prevailing rate of per diem wages to his or her employees in connection with the Work and any amounts due pursuant to California Labor Code Section 1813.

The Division of Labor Standards Enforcement shall notify the Contractor within fifteen (15) days of the receipt by the Division of Labor Standards Enforcement of a complaint of the failure of any Subcontractor to pay workers the general prevailing rate of per diem wages. If the Division of Labor Standards Enforcement determines that employees of any Subcontractor were not paid the general prevailing rate of per diem wages and if the District did not retain sufficient money under the Contract to pay those employees the balance of wages owed under the general prevailing rate of per diem wages, the Contractor shall withhold an amount of moneys due the Subcontractor sufficient to pay those employees the general prevailing rate of per diem wages if requested by the Division of Labor Standards Enforcement. The Contractor shall pay any money retained from and owed to a Subcontractor upon receipt of notification by the Division of Labor Standards Enforcement that the wage complaint has been resolved. If notice of the resolution of the wage complaint has not been received by the Contractor within one hundred eighty (180) days of the filing of a valid notice of completion or District's acceptance of the Project, whichever occurs later, the Contractor shall pay all moneys retained from the Subcontractor to the District. If the Subcontractor prevails in the enforcement action, the District shall release any funds retained pursuant to this Section 60.

Contractor shall post, at appropriate conspicuous points on the Project Premises, a schedule showing all determined general prevailing wage rates.

The Contractor is responsible for ascertaining and complying with all rates for all crafts utilized in and during the Work. Questions pertaining to prevailing wages should be directed to the following address:

Division of Labor Statistics and Research
P. O. Box 420603
San Francisco, California 94142
(415) 703-4774

Pursuant to California Labor Code Section 1771, the payment of prevailing wage rates is not required on any project of One Thousand Dollars ($1,000) or less.

61. RECORD OF WAGES PAID: INSPECTOR

Pursuant to Section 1776 of the California Labor Code:

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

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

(2) The employer has complied with the requirements of Sections 1771, 1811, and 1815 of the California Labor Code for any work performed by his or her employees in the public work project under this Contract.

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

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

(2) A certified copy of all payroll records enumerated in subsection a and copies of all cancelled payroll checks shall be made available for inspection or furnished upon request to a representative of the District, the Division of Labor Standards Enforcement and the Division of Apprenticeship Standards of the Department of Industrial Relations.

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

c. The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the division.

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

e. Any copy of records or payroll checks made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor awarded the Contract or the Subcontractor performing the Contract shall not be marked or obliterated.

f. The Contractor shall inform the District of the location of the records enumerated under subsection a, including the street address, city and county, and shall, within five (5) working days, provide a notice of a change of location and address.

g. The Contractor or Subcontractor shall have ten days in which to comply subsequent to receipt of a written notice requesting the records enumerated in subsection a. In the event that the Contractor or Subcontractor fails to comply within the ten-day period, he or she shall, as a penalty to the state or the District, forfeit twenty-five dollars ($25) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, such penalties shall be withheld from progress payments otherwise due the Contractor hereunder in accordance with Section 6d hereof. The Contractor is not subject to a penalty assessment pursuant to this subsection (g) due to the failure of a Subcontractor to comply with this Section 61.

62. HOURS OF WORK

As provided in Article 3 (commencing at Section 1810), Chapter 1, Part 7, Division 2 of the California Labor Code, eight (8) hours of labor shall constitute a legal day's work. The time of service of any work employed at any time by the Contractor or by any Subcontractor upon the Work, or upon any part of the Work contemplated by this Contract, is limited and restricted to eight (8) hours during any one calendar day and forty (40) hours during any one calendar week, except as hereinafter provided. Notwithstanding the provisions hereinabove set forth, Work performed by employees of the Contractor or any Subcontractor in excess of eight (8) hours per day and forty (40) hours during any one week shall be permitted upon this public work; provided that, compensation for all hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be at not less than one and one-half (1-1/2) times the basic rate of pay.

As provided in Section 1813 of the California Labor Code, the Contractor shall pay to the District a penalty of Twenty-Five Dollars ($25.00) for each worker employed in the execution of this Contract by the Contractor or by any Subcontractor, for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any calendar day or forty (40) hours in any one calendar week, in violation of the provisions of Article 3, (commencing at Section 1810), Chapter 1, Part 7, Division 2 of the Labor Code, unless compensation to the worker so employed by the Contractor is not less than one and one-half (1-1/2) times the basic rate of pay for all hours worked in excess of eight (8) hours per day or forty (40) hours per week, as applicable. The District may retain or withhold any such amounts from the Contract Price in accordance with Section 6d hereof.

Any work required to be performed after regular working hours or on Sundays or other holidays shall be performed without additional expense to the District.

63. APPRENTICES

All apprentices employed by the Contractor to perform services under the Contract shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which such apprentice is employed, and shall be employed only at the work of the craft or trade to which he or she is registered. Only apprentices, as defined in California Labor Code Section 3077, who are in training under apprenticeship standards and written apprenticeship agreements under Chapter 4 (commencing at Section 3070), Division 3 of the California Labor Code, are eligible to be employed under this Contract. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprenticeship agreements under which he or she is training.

When the Contractor to whom the Contract is awarded by the District or any Subcontractor on the Project, in performing any of the Work under the Contract or subcontract, employs workers in any apprenticeable craft or trade, the Contractor and Subcontractor shall apply to the Joint Apprenticeship Committee administering the apprenticeship standards of the craft or trade in the area of the site of the public work for a certificate approving the Contractor or Subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, approval as established by the Joint Apprenticeship Committee or Committees shall be subject to the approval of the Administrator of Apprenticeship. Every Contractor and Subcontractor shall submit contract award information to the applicable Joint Apprenticeship Committee, which shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices to be employed, and the approximate dates the apprentices will be employed. There shall be an affirmative duty upon the Joint

Apprenticeship Committee or Committees administering the apprenticeship standards of the craft or trade in the area of the site of the public work, to ensure equal employment and affirmative action in apprenticeship for women and minorities. Contractors or Subcontractors shall not be required to submit individual applications for approval to local Joint Apprenticeship Committees provided they are already covered by the local apprenticeship standards. The ratio of work performed by apprentices to journeymen who shall be employed in the craft or trade on the public work may be the ratio stipulated in the apprenticeship standards under which the Joint Apprenticeship Committee operates, but in no case shall the ratio be less than one hour of apprentices work for each five hours of labor performed by a journeyman, except as otherwise provided in Section 1777.5 of the California Labor Code. However, the minimum ratio for the land surveyor classification shall not be less than one apprentice for each five journeymen.

Any ratio shall apply during any day or portion of a day when any journeymen, or the higher standard stipulated by the Joint Apprenticeship Committee, is employed at the job site and shall be computed on the basis of the five hours worked during the day by journeymen employed, except for the land surveyor classification. The Contractor shall employ apprentices for the number of hours computed as above before the end of the Contract. However, the Contractor shall endeavor, to the greatest extent possible, to employ apprentices during the same time period that the journeymen in the same craft or trade are employed at the job site. Where an hourly apprenticeship ratio is not feasible for a particular craft or trade, the Division of Apprenticeship Standards, upon application of a Joint Apprenticeship Committee, may order a minimum ratio of not less than one apprentice for each five journeymen in a craft or trade classification.

The Contractor or Subcontractor, if he, she or it is covered by this Section and California Labor Code Section 1777.5, upon the issuance of the approval certificate, or if he, she or it has been previously approved in the craft or trade, shall employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the apprenticeship standards. Upon proper showing by the Contractor or Subcontractor that it employs apprentices in the craft or trade in the State on all of its contracts on an annual average or not less than one hour of apprentice work for every five hours of labor performed by a journeyman, or in the land surveyor classification, one apprentice for each five journeymen, the Division of Apprenticeship Standards may grant a certificate exempting the Contractor or Subcontractor from the 1 to 5 hourly ratio as set forth in this Section and said Section 1777.5. This Section does not apply to contracts of general contractors or to contracts of specialty contractors not bidding for work through a general or prime contractor when the contracts of general contractors or those specialty contractors involve less than Thirty Thousand Dollars ($30,000.00) or twenty (20) working days. Any work performed by a journeyman in excess of eight (8) hours per day or forty (40) hours per week shall not be used to calculate the hourly ratio required by Section 1777.5. "Apprenticeable craft or trade", as used in Section 1777.5 and this Section, means a craft or trade determined as an apprenticeable occupation in accordance with rules and regulations prescribed by the California Apprenticeship Council. The Joint Apprenticeship Committee has the discretion to grant a certificate, which shall be subject to the approval of the Administrator of Apprenticeship, exempting a contractor from the 1 to 5 ratio set forth in Section 1777.5 and this Section when it finds that any one of the following conditions is met:

a. In the event unemployment for the previous three month period in such area exceeds an average of 15 percent (15%), or

b. In the event the number of apprentices in training in the area exceeds a ratio of 1 to 5, or

c. If there is a showing that the apprenticeable craft or trade is replacing at least one-thirtieth (1/30) of its journeymen annually through apprenticeship training, either (1) on a statewide basis or (2) on a local basis, or

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

When exemptions are granted to an organization that represents contractors in a specific trade from the 1 to 5 ratio on a local or statewide basis, the member contractors will not be required to submit individual applications for approval to local Joint Apprenticeship Committees, provided they are already covered by the local apprenticeship standards.

A Contractor to whom the Contract is awarded or any Subcontractor on the Project, who, in performing any of the Work under the Contract, employs journeymen or apprentices in any apprenticeable craft or trade and who is not contributing to a fund or funds to administer and conduct the apprenticeship program in any craft or trade in the area of the site of the public work, to which fund or funds other contractors in the area of the site of the public work are contributing, shall contribute to the fund or funds in each craft or trade in which he, she or it employs journeymen or

apprentices on the public work in the same amount or upon the same basis and in the same manner as the other contractors do, but where the trust fund administrators are unable to accept the funds, contractors not signatory to the trust agreement shall pay a like amount to the California Apprenticeship Council. The Contractor or Subcontractor may add the amount of the contributions in computing its bid for the Contract. The Division of Labor Standards Enforcement is authorized to enforce the payment of the contributions to the fund or funds as set forth in California Labor Code Section 227.

The responsibility of compliance with California Labor Code Section 1777.5 and this Section for all apprenticeable occupations is with the Contractor.

All decisions of the Joint Apprenticeship Committee under this Section and California Labor Code Section 1777.5 are subject to the provisions of California Labor Code Section 3081.

Pursuant to Section 1777.6 of the California Labor Code, it shall be unlawful for an employer or a labor union to refuse to accept otherwise qualified employees as registered apprentices on any public works on the grounds of the race, religious creed, color, national origin, ancestry, sex or age of such employee (except as provided in Section 3077 of the California Labor Code).

Pursuant to California Labor Code Section 1777.7, upon a determination that the Contractor or any Subcontractor has willfully failed to comply with the provisions of this Section or Section 1777.5 of the California Labor Code, the Director of Industrial Relations may deny to the Contractor or Subcontractor, both individually and in the name of the business entity under which the Contractor or Subcontractor is doing business, the right to bid on, or to receive, any public works contract for a period of up to one (1) year for the first violation and for a period of up to three (3) years for the second and subsequent violations. Each period of debarment shall run from the date the determination of noncompliance by the Administrator of Apprenticeship becomes and order of the California Apprenticeship Council.

A Contractor or Subcontractor who violates Labor Code Section 1777.5 or this Section shall forfeit as a civil penalty the sum of fifty dollars ($50) for each calendar day of noncompliance. Notwithstanding Labor Code Section 1727, upon receipt of a determination that a civil penalty has been imposed, the awarding body shall withhold the amount of the civil penalty from Contract progress payments then due or to become due pursuant to Section 6d. In lieu of such penalty, the director may for a first-time violation and with the concurrence of the joint apprenticeship committee, order the Contractor or Subcontractor to provide apprentice employment equivalent to the work hours that would have been provided for apprentices during the period of noncompliance.
Any funds withheld by the District pursuant to this Section and Section 1777.5 of the California Labor Code shall be deposited in the general fund of the District.

The interpretation and enforcement of Section 1777.5 and Section 1777.7 of the California Labor Code shall be in accordance with the rules and procedures of the California Apprenticeship Council.

64. ASSIGNMENT OF ANTITRUST CLAIMS

In entering into a public works contract or a subcontract to supply goods, services or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the District all rights, title and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the California Business and Professions Code), arising from purchases of goods, services or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the District tenders final payment to the Contractor, without further acknowledgment by the parties.

If the District receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Chapter 11 (commencing with Section 4550) of Division 5 of Title 1 of the California Government Code, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the District any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the District as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

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

65. REQUIRED ATTENDANCE AT JOB START MEETING

The Contractor and all Subcontractors (to the extent required by the District) are required to attend a mandatory Job Start Meeting (Pre-Job Conference) that shall be conducted by the District in accordance with Section 1771.5 of the California Labor Code and minutes taken at meetings. For major projects, multiple Job Start Meetings may be held before each significant phase of the Work.

At that meeting the District representatives shall discuss the Federal and State labor law and District requirements applicable to the public works contract, including a checklist of prevailing wage requirements, the recordkeeping responsibilities, the requirement for the reporting of certified payroll records to the District, and the prohibition against discrimination in employment. The Contractor and all Subcontractors will then be required to sign the checklist.

66. FAIR EMPLOYMENT PRACTICES

a. The following provisions pertaining to fair employment practices are incorporated into this Contract. All references to "contractor" in this Section 66 shall be deemed to refer collectively to the Contractor named herein and all Subcontractors of any tier performing Work on the Project.

b. In connection with the performance of the Work under this Contract, each contractor agrees as follows:

(i) During the performance of the Contract, contractor will not unlawfully discriminate against, or deny the Contract's benefits to, any person on the basis of religion, color, ethnic group identification, sex, age, physical or mental disability, nor shall contractor discriminate unlawfully against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, mental disability, medical condition, marital status, age (over 40) or sex. Contractor shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination.

(ii) The contractor shall comply with the provisions of the Fair Employment and Housing Act (Cal. Gov. Code, Section 12900, et seq.), the regulations promulgated thereunder (Cal. Admin. Code, Tit. 2, Sections 7285.0 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Tit. 2 of the Government Code (Cal. Gov. Code, Sections 11135-11139.5), and the regulations or standards adopted by the District to implement such article.

(iii) The contractor shall give written notice of their obligations under this Section 66 to labor organizations with which the contractor has a collective bargaining or other agreement.

(iv) The contractor agrees to post at the Project Premises in conspicuous places, available to employees and applicants for employment, notices to be provided by the District setting forth the provisions of this Section 66.

(v) In all advertisements for labor or other personnel, or requests for employment of any nature, the contractor shall encourage persons of all races and ethnic groups to apply and state the intention of the company to hire qualified minority and female applicants.

(vi) The contractor shall permit access by representatives of the Department of Fair Employment and Housing and the District upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours notice, to such of its books, records, accounts, other sources of information and its facilities as said Department or the District shall require to ascertain compliance with this Section 66.

(vii) The contractor's commitment to specific goals for minority and female utilization, as herein required, shall constitute a commitment to make every good faith effort to meet such goals. If the contractor fails to meet the established goals, a determination of good faith in achieving those goals will be based in part upon those efforts used to broaden the recruitment base.

(viii) Following the award, but within ten (10) days after issuance of the Notice to Proceed, the contractor shall meet the following standards for affirmative action compliance, and shall ensure that each Subcontractor of every tier will meet these requirements within ten (10) days after receiving a notice to proceed from the contractor, unless the District provides for a greater time period:

(A) Provide evidence, as required by the District, that all Subcontractors of every tier, the contractor's supervisors, and other personnel have been notified, in writing, of the content of this Fair Employment Practices section and their responsibilities under it by posting notices in conspicuous places, including, without limitation, the Project Premises, the contractor's offices, and in other places available to supervisors and other personnel; and

(B) Provide evidence, as required by the District, that all sources of employee referrals (including, but not limited to, unions, employment agencies, and the State Employment Development Office) have been notified of the content of the Fair Employment Practices provisions set forth herein.

(ix) After a determination by the District that a contractor has knowingly committed a violation of Fair Employment Practices as set forth herein or of the California Fair Employment and Housing Act (if a State funded project), or of any applicable federal law or executive order concerning equal employment practices, the District shall cause written notice to be served on the contractor and to any Subcontractor of any tier involved in such violation. The notice shall set forth the nature of the violation. Upon the District's request, the contractor shall meet with representatives of the District in order to determine the means of correcting the violation and the time period within which the violation shall be corrected. If within ten (10) days the parties are unable to agree upon a means of remedying the violation or upon the time period within which said remedy shall be effected, the District shall serve a second written notice upon the manner in which the violation shall be corrected. If the contractor has not corrected the violation in the manner prescribed by the District within fifteen (15) days after receipt of the second notice, the District may impose any or all of the following penalties:

(A) Determine the contractor not to be a responsible bidder for any future contract until such time as the contractor has satisfied the District that the requirements of this Section 66 have been met;

(B) Terminate the entire Contract, in which case the District shall not be liable for any further payments thereunder, or for any damages to the contractor caused by such termination, except as provided in subsections (xii) and (xiii) below;

(C) Terminate and cancel any portion of the Contract or Work hereunder, or require the contractor to terminate and cancel (or cause to be terminated and cancelled) the subcontract of any offending Subcontractor, which is related to the violation in which case the District shall not be liable for any further payments as to said portion of the contract or for any damages caused by such termination, except as provided by subsections (xii) and (xiii) below, and may engage another contractor or Subcontractors to perform said Work; or

(D) Assess as liquidated damages payable as provided by law the penalties provided in California Labor Code Sections 1777.5 and 1775, for each calendar day, or portion thereof, for each person who was denied employment as a result of such violation.

(x) Nothing contained in these Fair Employment Practices provisions shall be construed so as to prevent the District from pursuing any other remedies that may be available to it at law or in equity.

(xi) The contractor shall include the provisions of this Section 66 in every first tier subcontract and require each Subcontractor to bind each further Subcontractor with whom a contract exists to such provisions so that such provisions will be binding upon every Subcontractor of every tier who performs any of the Work required by the Contract.

(xii) Should the termination, under the provisions of subparagraph (b)(ix) above, of part or all of any contract be finally determined by a court of law to have been improper and unauthorized, the District shall compensate each employee of any affected contractor who was actually working on the Project Premises at the time of the contract termination for wages that such employee would have received had such contract not been so terminated, less any wages the employee earned or had the opportunity to earn during the time the employee otherwise would have been employed on the Project Premises.

(xiii) Should the termination, under subparagraph (b)(ix) above, of part or all of any contract be finally determined be a court of law to have been improper and unauthorized, then the District shall reimburse the contractor for all direct damages which it may have incurred by reason of such termination.

(ix) The District shall have the right, but not the obligation unless requested in writing by the contractor within three (3) days of service of any summons and complaint or other pleading, to defend the contractor against any legal action which may be brought by reason of any action that the District may have taken under the provisions of subparagraphs (b)(ix)(B) or (b)(ix)(c) above. In the event a dispute arises between the District and the contractor as to whether or not the contractor was acting upon District direction, the decision of the matter by the District, made by and through the Assistant Superintendent, Business Services, shall be final.

67. CONTRACTOR NOT A PARTNER, OFFICER, EMPLOYEE OR AGENT OF THE DISTRICT

While engaged in carrying out and complying with the terms and conditions of the Contract, the Contractor is an independent contractor and not a partner, officer, employee or agent of the District, and the District shall not be liable for any of the Contractor's acts, omissions, liabilities or other obligations as such.

68. ATTORNEYS' FEES

In the event of any dispute between the District and the Contractor relating to the Work, the Project or this Contract, the prevailing party (as determined by the court or arbitrator, as applicable) shall be entitled to recover from the other party its reasonable attorneys' fees, costs and expenses incurred in connection therewith. The term "attorneys' fees" or "attorneys' fees, costs and expenses" shall mean the fees and expenses of counsel to the parties hereto, which may include printing, photostating, duplicating and other expenses, air freight charges, and fees billed for law clerks, paralegals and other persons not admitted to the bar but performing services under the supervision of an attorney, and the costs and fees incurred in connection with the enforcement or collection of any judgment obtained in any such proceeding, at rates customary in the Project locality and shall include, specifically, all fees, costs and expenses of expert witnesses. For purposes of the Contract Documents, the term "prevailing party" shall include a prevailing party as defined and described in California Code of Civil Procedure Section 998.

69. CHANGE IN NAME OR NATURE OF CONTRACTOR'S LEGAL ENTITY

Should a change be contemplated in the name or nature of the Contractor's legal entity, the Contractor shall first notify the District in order that proper steps may be taken to have the change reflected on the Contract Documents.

70. ASSIGNMENT

The Contractor shall not assign or transfer, by operation of law or otherwise, any or all of its rights, burdens, duties or obligations under this Contract, under any of the Contract Documents, or any part hereof or thereof without the prior written consent of the Surety(ies) on the Payment Bond and Performance Bond and the District, which may be given or withheld in their sole and absolute discretion. Should the Contractor request an assignment of monies under

the Contract, the District shall be entitled to assess against the Contractor the reasonable costs for processing such assignment. Any assignment of monies due or to become due under this Contract shall be subject to (i) prior lien and stop notice rights for services rendered or materials supplied for performance of the Work called for under this Contract in favor of all persons, firms, or corporations rendering such services or supplying such materials (including, without limitation, Subcontractors and Materialmen) to the extent that claims are filed pursuant to the California Civil Code, the California Code of Civil Procedure or the California Government Code and (ii) deductions for liquidated damages if liquidated damages have been assessed against the Contractor as specified in Section 7 herein.

71. NOTICE AND SERVICE THEREOF

All notices, requests, demands, consents, instructions or other communications hereunder shall be in writing (which shall include telex, telegram or telecopy) and shall be deemed to have been duly given or made upon transmittal thereof by telex, answer back received, if transmitted on a business day, otherwise on the first business day after transmittal, or on the date of confirmed dispatch if sent by telecopy on a business day, otherwise on the first business day thereafter, or upon the delivery thereof to the telegraph office if sent by telegraph on a business day, otherwise on the first business day thereafter, or three (3) business days after deposit in the mails if sent by certified mail, postage prepaid, return receipt requested, or on the next business day if sent by overnight personal delivery, in each case addressed to the party to which such notice is requested or permitted to be given or made hereunder, at the address and numbers set forth underneath such party's signature line to the General Contract, or at such other address and number of which such party shall have notified in writing the party giving such notice.

72. WAIVER

No action or failure to act by the District, the Architect or any other District representative, or by the Contractor, shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act constitute approval of, or acquiescence in, a breach thereunder, except as may be specifically agreed in writing.

73. ENTIRE AGREEMENT; AMENDMENT

The Contract Documents represent and constitute the entire and integrated agreement between the parties hereto with respect to the matters set forth therein and supersede all prior negotiations, representations or agreements, either written or oral. The Contract Documents may be amended or modified only by a writing executed by both parties hereto or by a written Change Order issued in accordance with the terms and provisions hereof or otherwise as expressly provided herein (including, without limitation, by the issuance of an Architect/Engineer Field Directive).

74. JOINDER

Each party to this Contract hereby consents to the joinder of any claim or cause of action arising out of or relating to this Contract or the services hereunder in any other legal action or proceeding relating to the Project, including any mediation, arbitration or litigation proceedings involving the District, Architect, other consultants, Contractors or Subcontractors with respect to the Project. It is hereby expressly acknowledged and agreed by the Contractor and District that a claim or cause of action arising out of or relating to this Contract may be related to various claims and/or causes of action involving other persons working on the Project (such as the Architect, other consultants, Contractors or Subcontractors), that it would be most expeditious and efficient to resolve all claims in a single proceeding and that, in entering into the Contract, each party is relying upon the other's consent and agreement to permit any claim or cause of action relating to the Contract or the services under the Contract to be joined in any such proceeding.

EXHIBIT I

CONSTRUCTION CLAIMS
RESOLUTION PROCEDURES

I. CLAIMS; REQUIREMENTS; TORT CLAIMS EXCLUDED. For any Construction Claim, the following requirements apply:

A. The claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment under the Contract. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by the Contract for the filing of claims.

B (1) For claims of less than fifty thousand dollars ($50,000), the District shall respond in writing to any written claim within 45 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim that the District may have against the Contractor.

(2) If additional information is thereafter required, it shall be requested and provided pursuant hereto, upon the mutual agreement of the District and the Contractor.

(3) The District's written response to the claim, as further documented, shall be submitted to the Contractor within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the Contractor in producing the additional information, whichever is greater.

C (1) For claims of over Fifty Thousand Dollars ($50,000) and less than or equal to Three Hundred Seventy-Five Thousand Dollars ($375,000), the District shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim that the District may have against the Contractor.

(2) If additional information is thereafter required, it shall be requested and provided pursuant hereto, upon the mutual agreement of the District and the Contractor.

(3) The District's written response to the claim, as further documented, shall be submitted to the Contractor within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional information or requested documentation, whichever is greater.

D. If the Contractor disputes the District's written response, or the District fails to respond within the time prescribed, the Contractor may so notify the District, in writing, either within 15 days of receipt of the District's response or within 15 days of the District's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the District shall schedule a meet and confer conference within 30 days for settlement of the dispute.

E. Following the meet and confer conference, if the claim or any portion remains in dispute, the Contractor may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the Contractor submits his or her written claim pursuant to subdivision A until the time that the claim is denied as a result of the meet and confer process, including any period of time utilized during the meet and confer process.

F. These procedures do not apply to tort claims and nothing in this Exhibit is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing

with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code.

II. CIVIL ACTION PROCEDURES; MEDIATION AND ARBITRATION; TRIAL DE NOVO; WITNESSES. The following procedures are established for all civil actions filed to resolve Construction Claims subject to this Exhibit.

A. Within 60 days, but no earlier than 30 days, following the filing of responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15 day period, any party may petition the court to appoint the mediator.

B (1) If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

(2) Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes hereof shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

(3) In addition to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, any party who after receiving an arbitration award requests a trial de novo but does not obtain a more favorable judgment shall, in addition to the payment of costs and fees under that chapter, pay the attorneys' fees of the other party arising out of the trial de novo.

C. The court may, upon request by any party, order any witnesses to participate in the mediation or arbitration process.

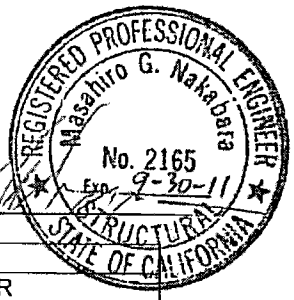
III. PAYMENT ON UNDISPUTED PORTION OF CLAIM; INTEREST ON ARBITRATION AWARD OR JUDGMENTS.

A. The District shall not fail to pay money as to any portion of a Construction Claim which is undisputed except as otherwise provided or permitted in the Contract.

B. In any suit filed under Section II above, the District shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law

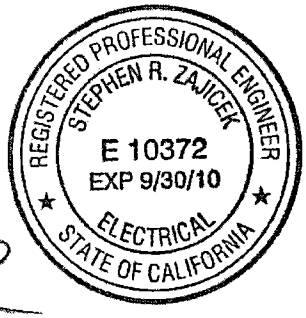
SPECIFICATIONS





Kevin S. Fleming, AIA	George Nakabara
ARCHITECT OF RECORD	STRUCTURAL ENGINEER
IBI Group	Martin, Chow, Nakabara
18401 Von Karman Ave-Suite 110	3185-C Airway Avenue
Irvine, CA 92612	Costa Mesa, CA 92626





Paulo Fundament	Steve Zajicek
MECHANICAL ENGINEER	ELECTRICAL ENGINEER
Fundament & Associates	FBA Engineering
26 Executive Park #100	3240 Irvine, Suite 200
Irvine, CA 92614	Newport Beach, CA 92660

DSA APPROVALS

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APP03 1 1 2 6 2 0

AC FLS SS

DATE

DEL MAR HIGH SCHOOL
C.E.C. BUS DEPOT CONVERSION

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SECTION 01100

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY OF WORK

A. Work under this Contract necessary for and incidental to execution and completion of Work indicated in Contract Documents for construction of:

Bus Depot Conversion
Del Mar High School CEC
San Gabriel Unified School District
San Gabriel, California

Contract Documents were prepared by IBI Group, 18401 Von Karman Avenue, Suite 110, Irvine, CA 92612.

1.02 GENERAL DESCRIPTION OF WORK

A. Work under this Contract includes furnishing all labor, materials, services and transportation, except as specifically excluded which is required for completion of Project in accordance with provisions of Contract Documents.

B. Work to be included as part of this Contract:

1. A modification of a single-story Bus Depot building built in 1952 on the existing Del Mar High School site.
2. Site work consisting of, but not limited to demolition of existing site improvements to receive the new work, service utilities, landscape areas, a courtyard, concrete site paving, concrete benches, a half court basketball court, new parking layout and site perimeter fencing.

C. Related Work

1. Documents affecting work of this contract include, but are not necessarily limited to the GENERAL CONDITIONS, and Sections in DIVISION 1 of these Specifications. Work shall be designated on the project plans and a specified herein.
2. Provide all preparation, patching, repairing, reinstallation, and clean up associated with this work to maintain a clean work site.

1.03 SCHEDULE

A. The Notice to Proceed date is anticipated to be April 21, 2010.

1. The time between the Notice to Proceed and the Start of Construction may be used for mobilization and submittals.

B. The Contract Date is anticipated to be May 4, 2010.

C. Construction shall be completed within 300 days of the Contract Date, with a completion date of February 28, 2011.

1.04 SITE USE RESTRICTIONS

A. The following restrictions apply to access and to use of site and existing buildings:

3. Use of Site: Limit use of premises to Work in areas indicated. Confine operations to areas within Contract limits indicated. Do not disturb portions of site beyond areas in which Work is indicated. Allow for Owner occupancy and use by public.
4. Partial Owner Occupancy: Owner reserves right to occupy and to place and install equipment in completed areas of building before Certified Completion provided such occupancy does not interfere with completion of Work. Such placing of equipment and partial occupancy shall not constitute acceptance of total Work.
5. Additional requirements for Contractors use of the premises: Refer to Section 01115.

1.05 WORK UNDER OTHER CONTRACTS

A. At times, the District will have concurrent work under separate contracts. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with, or delaying, work under this Contract. Allow time in the schedule for delays caused by contractor interfaces.

1.06 PERMISSIBLE WORKING DAYS AND HOURS

A. Work may be conducted on weekdays: (Monday-Friday) 7:00 am to 7:00 pm; weekends and holidays: 9:00 am to 6:00 pm per City of San Gabriel local ordinance for construction work.

B. Conform to Division 01, General Requirements for required payment for Inspector's services performed during overtime hours.

1.07 INTERRUPTION OF EXISTING UTILITY SERVICES

A. When necessary to interrupt any existing utility service to make connections, minimum of 48 hours advance notice shall be given to Owner and Architect. Interruptions in utility services shall be of shortest possible duration for Work at hand and shall be approved by Architect.

B. No interruptions of any utilities services shall occur during school hours.

C. In event any utility service is interrupted without required 48 hours notice, Contractor shall be financially liable for all damages suffered by Owner due to unauthorized interruption.

1.08 VERIFICATION OF EXISTING CONDITIONS

A. Contractor shall be responsible to examine site of Work and after investigation to decide for himself/herself character of materials, equipment and utilities to be encountered and all other existing conditions affecting Work. Contractor is also responsible to provide sufficient costs to cover provisions of all items of Work under existing conditions referred to herein.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01115

CONTRACTOR'S USE OF THE PREMISES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section applies to all situations in which the Contractor or his representatives including, but not necessarily limited to, suppliers, subcontractors, employees, and field engineers, who enter the school campus. Contractor shall coordinate his use of the premises under the direction of the District representative.

1. It shall be noted that the existing school campus will be occupied and in use during the entire construction duration of this project, including summertime. The Contractor shall observe all required aspects of behavior, protocol and requirements as set forth by the District and per the General Conditions.

B. Related Work: Documents affecting work of this Contract include, but are not necessarily limited to, the General Conditions and all Sections of these Specifications.

1.02 QUALITY ASSURANCE

A. Promptly upon award of the Contract, notify all pertinent personnel regarding requirements of this Section.

B. Require that all personnel who will enter the school campus certify their awareness of and familiarity with the requirements of this Section.

1.03 SITE INVESTIGATION

A. The Contractor shall investigate the job site to ascertain all conditions affecting necessary procedures and sequencing of the work operations in execution of the contracted work.

1. The Contractor shall report to the District any adverse conditions which would affect the proper execution of the contracted work, and shall not proceed until instructed by the District.

2. Start of the contracted work at the job site shall imply the Contractor's acceptance of job conditions.

3. Work Determination: Contractor shall satisfy himself regarding job conditions, the nature and types of work to be performed and shall be responsible for the nature and types of work to be performed and shall be responsible for the determination of all classes of work to be accomplished at the job site.

4. Allotted Working Space: Contractor shall limit work operations to be the "working site" and areas immediately adjacent thereto, or as specified or authorized by the District. Accumulation of materials shall be kept to a minimum and only for the portion of work scheduled at the time.

1.04 ACCESS TO THE JOB SITE

A. As instructed by the District, Contractor shall restrict the Contractor's employees to the immediate work areas on the job site and in no way go beyond the work limits, or as otherwise directed by the District. See Section 01 10 00 for hours of access.

1. Deliver materials, tools and equipment to the site as directed by the District.

2. Contractor and his employees shall enter the work area as directed by the District, and shall not go beyond the work area limits.

B. Contractor shall in no way block such entrances to the job site.

C. Use of such accesses to the job site will only be for the purpose of parking, delivery and/or removal of materials, equipment, tools, vehicles and removal of rubbish and debris, and shall be kept free of obstructions and in a safe condition at all times during extent of contracted work.

1.05 PARKING

A. Limited parking of the Contractor's vehicles will be allowed on the job site for purposes of unloading, and labor. Areas for parking will be designated by the District.

1.06 STORAGE

A. Project materials shall only be stored in areas designated by the District.

B. Contractors shall assume full responsibility for the protection and safekeeping of products under this contract stored on site.

C. Contractor shall move any stored products under Contractor's control which interfere with the operation of the District.

D. Contractor is responsible for obtaining and paying for the use of any additional storage or work areas needed in performance of the work.

1.07 SECURITY AND WORKERS' CONDUCT

A. Restrict the access of all personnel in connection with the work to the access route and to the actual site of the work.

B. All employees of the Contractor who will be engaged in the construction of the project will be screened by the Contractor for proper identification and good behavior. Any reports of misbehavior by the Contractor's personnel will result in having such persons removed from campus grounds by the Contractor.

C. In accordance with State and local regulations, Contractor's personnel are not permitted to smoke or consume alcoholic beverages in any area of the school grounds. Any person caught smoking on school grounds, including parking lots, is subject to arrest by local authorities.

D. In accordance with general District policy, Contractor's personnel are requested to observe appropriate dress and language. No social contact, verbal or physical, is allowed between Contractor's personnel and students. Any reports or misbehavior by Contractor's personnel will result in having such persons removed from school grounds and terminated from the project.

1.08 PROTECTION

A. Where necessary for the safety of the public, students, and District employees provide and maintain adequate protection, fences, signage, and/or barricades to separate work areas from

other public areas, as directed by the District or other authorities having jurisdiction. All such protection shall remain in place during the extent of this Contract or as otherwise directed by the District.

B. Protection of Existing Improvements:

1. Provide barricades, signage, coverings, or other types of protection necessary to prevent damage to existing infrastructure improvements indicated to remain in place.

2. Protect infrastructure improvements on City/County properties and on District property.

3. Restore infrastructure improvements damaged by this work to their original condition as acceptable to the District or other parties and authorities having jurisdiction.

C. Protection of New Improvements:

1. Schedule work and provide security as required to protect the new concrete from graffiti and vandalism. All surfaces requiring designated cure or set time shall have security in place until material is set on fully cured surface.

D. Protection of Classroom Furnishings:

1. Protect all furniture, equipment, and furnishings as necessary to prevent damage. Any furniture moved during the course of the workday must be restored to its original position prior to leaving the site each day.

1.09 REPAIR OF DAMAGES

A. Repair or replace any damage to existing construction, including damage to walls and floors, as caused by this Contractor's operations, at Contractors expense.

1.10 CONTRACTOR'S USE OF PREMISES

A. Contractor shall limit his use of the premises for work and for storage, to allow for District occupancy of adjacent buildings and portables/trailers.

B. Coordinate use of premises under direction of the District representative.

C. Contractor shall assume full responsibility for the protection and safekeeping of products under this contract, stored on site.

D. Move any stored products under Contractor's control which interfere with operation of the District.

E. Obtain and pay for the use of any additional storage or work areas needed for operations.

1.11 INTERRUPTION OF SERVICE

A. Contractor shall make all provisions to accomplish contract work without undue interference with the Owner's operations of the adjacent facilities. Any necessary interruptions to existing facilities shall be done only after consultations with the District, and at such time and duration as instructed by the District.

1.12 NON-INTERFERENCE WITH OTHERS

A. Contractor shall confine contracted work operations to the immediate boundaries of the job site and shall execute work operations in a manner to minimize interference with the District operations of other contractors working on the premises, as directed by the District.

1.13 JOB SAFETY

A. Contractor shall observe all safety rules and regulations of Title 24 and CAL/OSHA as applicable to the safety of the Contractor, Contractor's personnel, and the student/faculty during contracted work operations.

B. All contractor employees shall wear approved PPE and safety devices where required.

1.14 HAZARDOUS WORK CONDITIONS

A. All contract work that is performed for the District by outside contractors or workers must meet all the regulations that have been set forth in the Asbestos Hazard Emergency Response Act (AHERA) rule. This means that all work which could disturb the integrity of any Asbestos Containing Building Material (A.C.B.M.) needs to be approved by the District. This refers to the sawing, grinding, cutting, or drilling of any A.C.B.M. in occupied areas of the District buildings.

B. Materials containing asbestos are expected to be encountered during the demolition portion of the Contract. If hazardous materials are encountered, stop work and notify the District immediately.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 01200

PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:

1. Change Procedures.
2. Schedule of Values.

1.02 SCHEDULE OF VALUES

A. Submit printed schedule on AIA Forms G702 and G703 - Application and Certificate for Payment and Continuation Sheet. Contractor's standard form or electronic media printout will be considered, submit sample forms to Architect for approval.

1. Submit application for progress payment in accordance with the General and Supplementary Conditions.

B. Submit Schedule of Values in duplicate within 15 calendar days after date of Owner-Contractor Agreement for Architect's approval.

C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of the major Specification Section. Identify site mobilization and bonds and insurance. On projects of more than one building, list buildings separately. List mechanical, electrical, plumbing and fire protection Work separately for each building and for site Work.

D. Include separate line items, showing amount of General Contractor's overhead and profit, bonds and insurance, supervision, and then remainder of general items.

E. Revise schedule to list approved Change Orders, with each Application for Payment.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 01250

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes administrative and procedural requirements for handling requests for substitutions submitted 35 days after the date established in the Notice of Award and pursuant to the General Conditions.

B. Related sections:

1. Section 01330: Submittal Procedures
2. Section 01700: Closeout Submittals

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 APPLICATION

A. Contractor proposed changes in products or materials required by the Contract Documents 35 days or more after the Notice of Award are considered to be requests for substitutions. Architect will consider requests for substitution if a product is no longer manufactured and/or the Architect/ Engineer, after a diligent search have verified that product or material is not available to Contractor. The following are not considered to be valid requests for substitutions:

1. Revisions to the Contract Documents requested by Owner or Architect.
2. Specified options of products included in the Contract Documents.
3. Substitutions requested on a “or equal” basis.

3.02 SUBMITTALS

A. Items claimed to be “equal” are considered to be substitution items, as well as items that are used as alternatives to those listed.

B. Comply with the provisions of the General Conditions and the following:

1. The Contract is based on the standards of quality established in the Contract Documents.
2. Products proposed for use, including those specified by required attributes and performance shall require review by the Architect before being incorporated into the work.
3. Requests for substitutions of specified items must be received by the Architect within 35 days of contract award.
4. If the Contractor elects to submit a substitution for a specified product, all appropriate information and data of the originally specified product must be included in the submittal for comparison purposes. In addition, an index denoting such substitution(s) including some method of "high-lighting" for the specific

substitutions shall be made in the submittal. The submittal will not be reviewed until this format is followed.

5. The Contractor shall allow 20 calendar days for review of substitutions. The review period is not grounds for delays in the Construction Schedule and they are the responsibility of the Contractor.
6. The Architect reserves the right to reject an installed material or product if said product is installed without being submitted and noted as a deviation during the submittal process or without providing the formatting as defined in paragraph 4 of this section.
7. Do not substitute materials, equipment, or methods unless the Architect has specifically reviewed such substitution, for this work.
8. Substitutions of materials or work procedures that affect health, safety, or welfare of the public, are to have prior approval of the DSA field representative.

C. "Or equal":

1. Where the phrase "equal" occurs in the Contract Documents, do not assume that materials, equipment, or methods will be reviewed as equal unless the Architect has specifically been asked to review the item, for this work.
2. When a brand of materials is proposed as an equal, sufficient information shall be included to prove equality and for comparison with the named brand. The burden of proving the equality rests with the Contractor.
3. Equal products shall be of the same size, shape, weight and quality of the specified product and must be evaluated by the Architect. The Architect shall be the sole judge of a product's equality and the Architect's decision is final.

D. Use of equal and substitute products.

1. Contractor assumes full responsibility for the adequacy of substitute products. The architect's review does not transfer this responsibility.
2. Work by other trades, affected by the substitution product, must be coordinated and accommodated by the contractor at no cost to the District.

E. Availability of specified items:

1. Verify, immediately after notice to proceed, that all specified items will be available in time for installation during orderly and timely progress of the work.
2. In the event specified items will not be so available, notify the Architect within 14 days from notice to proceed.
3. Costs of delays because of non-availability of specified items, when the Contractor could have avoided such delays, shall not be borne by the District.

3.03 ARCHITECT'S REVIEW

A. General: Review by the Architect shall not be construed as a complete check, but only that the general method of construction and detailing is satisfactory. Review shall not relieve the Contractor from responsibility for errors that may exist.

B. Authority to proceed: The notations "reviewed, no exceptions noted" or "Revise as noted" allow the Contractor to proceed with fabrication, purchase, or both, of the items so noted, subject to the revisions, if any, required by the Architect's review comments.

C. Revisions: Make all revisions required by the Architect. If the Contractor considers any required revision to be a cost related change, he shall so notify the Architect before proceeding with the work. Show each drawing revision by number, date, and subject in a revision block on the drawing. Make only those revisions directed by the Architect.

D. The Architect's review comments in no way amend the contract or authorize additional work, nor do they imply the submittal is accurate.

E. Unless specifically noted on the cover of the submittal, the items provided will be assumed to be as specified.

3.04 REVIEWED SUBMITTALS

A. Materials, fabricated articles and other items to be installed in permanent work shall be those of reviewed submittals only and shall not be fabricated, delivered or incorporated in the work until submittals are reviewed as provided herein.

B. Review or acceptance of items will not preclude rejection of any item upon discovery of defects prior to final acceptance of completed work.

C. After an item has been reviewed, no change in brand or make will be permitted unless:

1. Satisfactory written evidence is presented to the Architect that manufacturer cannot make scheduled delivery of reviewed item; or
2. The item delivered has been rejected and substitution of a suitable item is an urgent necessity; or
3. Other conditions become apparent that indicate review of such substitute item to be in best interest of District.

3.05 CALCULATIONS OR TEST DATA

A. The manufacturer or supplier of certain products will be required to submit substantiating data to show compliance with structural requirements, including seismic considerations, for items in this Specification.

1. Calculations shall be prepared by a structural engineer licensed in California, and test data shall be by an independent testing lab.
2. Submittals shall be made to the Architect, who will review and comment and forward to the Division of the State Architect for final approval.

END OF SECTION

SECTION 01260

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.03 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions, or bulletin, authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within 10 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, 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 the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, 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 in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use forms approved by Owner.

1.05 ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.

1.06 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor.

1.07 CONSTRUCTION CHANGE DIRECTIVE (CCD)

A. Construction Change Directive: Architect may issue a Construction Change Directive (CCD) on architects form. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OR SECTION

SECTION 01261

REQUESTS FOR INFORMATION (RFI)

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:
   1. Administrative requirements for Requests for Information (RFI).

1.02 DEFINITIONS

A. Request for Information:

   1. Document submitted by Contractor requesting clarification of portion of Contract Documents, hereinafter referred to as RFI.
   2. Properly prepared request for information shall include detailed written statement that indicates specific Drawings or Specification in need of clarification and nature of clarification requested.
      a. Drawings shall be identified by Drawing number and location on Drawing sheet.
      b. Specifications shall be identified by Section number, page and paragraph.

B. Improper RFIs:

   1. RFIs that are not properly prepared.
   2. Improper RFIs will be processed by Architect at Architect's standard hourly rate and Architect will charge Owner, and such costs will be deducted from moneys still due the Contractor. Architect will notify Contractor before processing of improper RFIs.

C. Frivolous RFIs:

   1. RFIs that request information that is clearly shown on Contract Documents.
   2. Frivolous RFIs may be returned unanswered or may be processed by Architect at Architect's standard hourly rate and Architect will charge Owner, and such costs will be deducted from moneys still due Contractor. Architect will notify Contractor before processing of frivolous RFIs.

1.03 CONTRACTOR'S REQUESTS FOR INFORMATION

A. When the Contractor is unable to determine from Contract Documents, material, process or system to be installed, Architect will be requested to make clarification of indeterminate item.

   1. Whenever possible, such clarification shall be requested at next appropriate project meeting, with response entered into meeting minutes. When clarification at meeting is not possible, because of urgency of need, or complexity of item, Contractor shall prepare and submit RFI to Architect.

B. Contractor shall endeavor to keep number of RFIs to a minimum. In event that process becomes unwieldy, in opinion of Architect, because of number and frequency of RFIs submitted, Architect may require Contractor to abandon process and submit future requests as either submittals, substitutions or requests for change.

C. RFIs shall be submitted on form acceptable to Architect. Forms shall be completely filled in, and if prepared by hand, shall be fully legible after photocopying or transmission by facsimile (fax). Each page of attachments to RFIs shall bear RFI number in lower right corner.

D. RFI's shall be originated by Contractor:

1. RFIs from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by Contractor before submittal to Architect.
2. RFIs sent by subcontractor or suppliers directly to Architect or Architect's consultants shall not be accepted and will be returned unanswered.

E. Contractor shall carefully study Contract Documents to ensure that requested information is not available therein. RFIs which request information available in Contract Documents will be deemed "improper" or "frivolous" as noted above.

F. In cases where RFIs are issued to request clarification of coordination issues, for example pipe and duct routing, clearances, specific locations of Work shown diagrammatically, and similar items, Contractor shall fully lay out suggested solution using drawings or sketches drawn to scale, and submit same with RFI. RFIs which fail to include suggested solution will be returned unanswered with requirement that Contractor submit complete request.

G. Do not use RFIs for following purposes:

1. To request approval of submittals.
2. To request approval of substitutions.
3. To request changes which entail additional cost or credit.
4. To request changes which entail change of time of completion.
5. To request different methods of performing Work than those drawn and specified.

H. In event Contractor believes that clarification by Architect results in additional cost or time, Contractor shall not proceed with Work indicated by RFI until Change Order, Instruction Bulletin or Construction Change Directive is prepared and approved. RFIs shall not automatically justify cost increase in Work or change in project schedule.

1. Answered RFIs shall not be construed as approval to perform extra Work.
2. Unanswered RFIs will be returned with stamp or notation: Not Reviewed.

I. Contractor shall prepare and maintain log of RFIs, and at any time requested by Architect, Contractor shall furnish copies of log showing outstanding RFIs. Contractor shall note unanswered RFIs in log.

J. Contractor shall allow up to 14 days review and response time for RFIs, however, Architect will endeavor to respond in timely fashion to RFIs.

1.04 ARCHITECT'S RESPONSE TO RFIs

A. Architect will respond to RFIs on one of following forms:

1. Properly prepared RFIs:
   a. Architect's Supplemental Instructions herein attached.
   b. Request for Proposal.
   c. Instruction Bulletin.
   d. Construction Change Directive
2. Improper or Frivolous RFIs:
   a. Notification of Processing Fee(s).

b. Unanswered RFIs will be returned with stamp or notation: "Not Reviewed".

3. Answers to properly prepared RFIs may be made on Architect-approved RFI form.
4. Attach the original Contractor's RFI to all responses.

B. Architect may opt to retain RFIs for discussion during regularly scheduled project meetings for inclusion of responses in meeting minutes in lieu of responding on written form.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01310

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for Project meetings, including but not limited to, the following:

1. Job start meeting.
2. Pre-installation conferences.
3. Progress meetings.
4. Meetings as required by DISTRICT.

1.02 RELATED SECTIONS

A. Section 01330: Submittal Procedures

B. Section 01320: Construction Progress Documentation

PART 2 - PART 2 – PRODUCTS (Not used)

PART 3 - PART 3 - EXECUTION

3.01 JOB START MEETING

A. In accordance with General Conditions, DISTRICT will schedule a job start meeting before starting the Work, at a time and date determined by DISTRICT. Meeting shall be held at the Project site or another location as determined by DISTRICT. Meeting will be held in order to review responsibilities, procedures, and other administrative requirements contained within the Contract Documents.

B. Authorized representatives of DISTRICT, IOR, ARCHITECT, CONTRACTOR and other parties shall attend the meeting. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda items shall include significant items which could affect progress of the Work, including, but not limited to the following:

1. Preliminary Construction Schedule
2. Critical work sequencing
3. Designation of responsible personnel
4. Identification of DISTRICT's authorized representative
5. Procedures for processing field decisions
6. Request for Proposal

7. Request for Information (Clarification)
8. Construction Directive and Change Order
9. Procedures for processing Applications for Payment
10. Prevailing wages
11. Submittal and review of Shop Drawings, Product Data, material lists, and Samples
12. Preparation of project record documents
13. Use of the Project site and/or premises
14. Parking availability
15. Office, work, and storage areas
16. Equipment deliveries and priorities
17. Safety procedures
18. First Aid
19. Security
20. Housekeeping
21. Working hours
22. Contract Compliance Officer
23. Insurance Services including OCIP
24. Environmental Health & Safety
25. Substantial Completion, Administrative Closeout and Contract Completion requirements and procedures.
26. Procedures for Mandatory Dispute and Claim Resolution
27. Storm Water Pollution Prevention Plan (SWPPP)
28. CEQA Compliance

D. ARCHITECT shall prepare and issue meeting minutes to attendees and interested parties no later than five (5) calendar days after the meeting date.

3.02 PRE-INSTALLATION CONFERENCES

A. CONTRACTOR shall coordinate and conduct pre-installation conferences at the Project site as required by related Sections of the Contract Documents.

B. CONTRACTOR, manufacturers, and fabricators involved in or affected by the installation and its coordination or integration with other pre-ceding and/or subsequent installations of Work shall attend the meeting. CONTRACTOR shall advise DISTRICT, IOR, and ARCHITECT of scheduled meeting dates in order to secure their attendance.

1. CONTRACTOR shall review the progress of construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:

   a. Contract Documents
   b. Options
   c. Related Construction Directives and Change Orders

d. Purchases
e. Deliveries
f. Shop Drawings, Product Data, and quality-control samples
g. Review of mockups
h. Possible conflicts
i. Compatibility problems
j. Time schedules
k. Weather limitations
l. Manufacturer's recommendations
m. Warranty requirements
n. Compatibility of materials
o. Acceptability of substrates
p. Temporary facilities
q. Space and access limitations
r. Governing regulations
s. Safety
t. Inspecting and testing requirements
u. Required performance results
v. Recording requirements
w. Protection

2. CONTRACTOR shall record significant discussions and directives received from each conference. CONTRACTOR shall, within three (3) calendar days after the meeting date, distribute the minutes of the meeting to all concerned parties, including but not limited to, DISTRICT, IOR, and ARCHITECT.

3.03 PROGRESS MEETINGS

A. Progress meetings will be held at the Project site at regular intervals, typically weekly, as determined by the DISTRICT.

B. In addition to representatives of CONTRACTOR, DISTRICT, and ARCHITECT, each Subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of the Work shall, if requested by DISTRICT, be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude all matters relating to the Work.

C. Failure of CONTRACTOR to be so represented at any progress meeting which is held at a mutually agreed time or for which a written notice is given, shall not relieve CONTRACTOR from abiding by any and all DISTRICT determinations or directives issued at such meeting.

D. DISTRICT will review and correct or approve minutes of the previous progress meeting and will review other significant items affecting progress. Topics for discussion as appropriate to the status of the Project include but are not limited to:

1. Interface requirements
2. Construction Schedule
3. Sequence and coordination
4. Status of submittals / RFI's
5. Deliveries
6. Off-site fabrication

7. Access
8. Site utilization
9. Temporary Construction Facilities and Controls
10. Hours of work
11. Hazards and risks
12. Housekeeping
13. Quality and workmanship
14. Unforeseen conditions
15. Testing and Inspection
16. Defective Work
17. Construction Directive
18. Request for Proposal
19. Change Order Proposals and Change Orders
20. Documentation of information for payment requests
21. Application for Payment
22. Other items as required or as brought forth.
23. Storm Water Pollution Prevention
24. CEQA Compliance

E. No later than three (3) calendar days after each progress meeting, ARCHITECT will prepare and distribute minutes of the meeting to each present and absent party.

F. Schedule Updating: CONTRACTOR shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized, and issue the revised schedule at the next scheduled progress meeting.

3.04 ADDITIONAL MEETINGS

A. DISTRICT, upon giving notice to the intended parties and without further obligation, may require additional meetings to discuss Work and/or Project related activities.

END OF SECTION

SECTION 01320

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.

B. Related Sections include the following:
1. Division 01 Section "Price and Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Meetings".
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.03 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

J. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.04 SUBMITTALS

A. Qualification Data: For scheduling consultant.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

C. Preliminary Construction Schedule: Submit two opaque copies.

D. Preliminary Network Diagram: Submit two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

E. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1.05 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.06 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, 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 in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than [20] <Insert number> days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than five days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

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 using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

F. Computer Software: Prepare schedules using a program that has been developed specifically to manage schedules.

2.03 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction.

2.04 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

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

2.05 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized time-scaled CPM network analysis diagram for the Work.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.

b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Testing

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

2.06 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. 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. 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

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 01 Section "Quality Requirements" for submitting test and inspection reports.
4. Division 01 Section "Closeout Procedures" for submitting warranties.
5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
6. Division 01 Section "Facility Operation" for submitting operation and maintenance manuals.
7. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.03 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.04 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals on request and only after signing a CADD release document furnished by the Architect.

B. Coordination: Coordinate 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.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

E. 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. Provide a space approximately 4 by 6 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. DSA application number (shown on drawings).
    c. Date.
    d. Name and address of Architect.
    e. Name and address of Contractor.
    f. Name and address of subcontractor.
    g. Name and address of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a dash and then a sequential number (e.g., 061000-01). Resubmittals shall include a successive number (e.g., 061000-02).

    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

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

G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "Revise as Noted" or "No Exceptions Taken."

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating "Revise as Noted" or "No Exceptions Taken" taken by Architect.

K. Deferred Submittals: Please see sheet T0.2 for detailed information. Below are the additional notes required beyond the above mentioned submittal requirements.
1. Review Time: Allow minimum 60 days for DSA review.
2. Copies: 3 additional clean copies will be required for submittal to DSA for final review and for each successive required DSA review.

PART 2 - PRODUCTS

2.01 ACTION SUBMITTALS

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

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Standard color charts.
e. Manufacturer's catalog cuts.
f. Wiring diagrams showing factory-installed wiring.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operation and maintenance manuals.
k. Compliance with specified referenced standards.
l. Testing by recognized testing agency.
m. Application of testing agency labels and seals.
n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: The preferred method of the submittal process is digital. Please prepare a pdf file no greater than 5 megabites to be emailed to the Architect/ Construction Manager. Upon review the submittal will be emailed back and copied to the Owner, Inspector, Contractor, and/or Construction Manager and will be kept of file for the project record.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Shop drawings may also be submitted digitally except where otherwise noted (i.e. deferred approvals).

1. Preparation: Fully illustrate requirements in the Contract Documents. 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. Design calculations.
    j. Compliance with specified standards.
    k. Notation of coordination requirements.
    l. Notation of dimensions established by field measurement.
    m. Relationship to adjoining construction clearly indicated.
    n. Seal and signature of professional engineer if specified.
    o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: 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.
3. Number of Copies: Shop drawings may also be submitted digitally except where otherwise noted (i.e. deferred approvals). Upon review the shop drawings will be emailed back.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

    b. Product Schedule or List: As required in individual Specification Sections, prepare a written

E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.

F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

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

2.02 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

D. Qualification Data: 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.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. 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 in the Contract Documents.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. 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.

L. 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. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

O. 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.

P. 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 in the Contract Documents.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

S. 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. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.

4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.03 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

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

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

1. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01350

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: This section establishes special project procedures regarding: documents; including the Environmental Impact Report

1. preparation of "Safety Plan", (Site Utilization Plan) protection of existing facilities;
2. limits of work and storage areas;
3. construction controls and use of public rights-of-way;
4. coordination;
5. existing utilities.

1.02 QUALITY ASSURANCE

A. Perform all work in strict accordance with pertinent requirements of these Specifications and, in the even no such requirements are determined, in conformance with the Architect's written direction.

B. Related work described elsewhere:
1. General Conditions
2. Special Conditions

1.03 SUBMITTALS

A. Written documentation as may be requested by the Architect.

PART 2 - PRODUCTS

2.01 GENERAL

A. It is the intent of these Specifications and other Contract Documents to provide a complete workable design in all parts; any equipment shown or specified shall be furnished and installed with all accessories, controls, power, and full connections as may be necessary to assure safe and proper installation and operation.

2.02 PRECEDENCE

A. The Contract and each of the Contract Documents are complementary and they shall be interpreted so that what is called for in any one shall be as binding as if called for in all.

B. If there is a conflict between different provisions within the same area of precedence, the provisions requiring the most expensive method of work, materials, or equipment shall control. Contractor shall secure written permission from, Architect before proceeding with work affected by omission or discrepancies in the Contract.

C. Separate sections of this Specification are arranged only for convenience of Contractor, and nothing stated herein should be misconstrued as suggesting jurisdiction over items of work by any different building trades.

2.03 DOCUMENTS CONTROL

A. When Agreement is signed, the Contractor will be given four (4) complete sets of plans and specifications by the District. Any additional copies required by the Prime contractor or their subcontractors and suppliers are the responsibility of the Prime Contractor.

B. The Contractor shall set aside one set of drawings (plans) and specifications, and create a Master Construction Set for the implementation of the project. The Master Construction Set shall have incorporated all addenda revisions issued during the bid phase. This shall be accomplished by cutting and pasting individual items denoted for revision into the appropriate location in the drawings and specifications.

C. In addition to Item B, the Contractor shall incorporate all change items (change orders) and Request for Information (RFI) clarifications as affects the construction scope within the Master Construction Set during the course of construction. This set shall be the basis for transferring the Project Record Documents into a final version at the end of the project to complete the Contractor's close-out requirements as defined in Section 01 77 00.

PART 3 - EXECUTION

3.01 ENVIRONMENTAL IMPACT REPORT

A. Not applicable.

3.02 CARE OF EXISTING STRUCTURES, GROUNDS AND UTILITIES

A. The Drawings show, if applicable, existing above and below grade structures, drainage lines, storm drains, sewers, water, gas, electrical, hot water, and other utilities which are known to District. Contractor shall be held responsible, so far as his operations are concerned, for the care and preservation of the adjacent premises, utilities, walks, streets and co-terminus property. Any parts of them injured, damaged, or disturbed because of his work shall be repaired, replaced, or cleaned, at Contractor's expense, to the satisfaction of District Representative.

B. Locate all known existing utility installations before proceeding with construction operations which may cause damage to such installations. The existing installations shall be kept in service where shown and damage shall be repaired at no increase in Contract Sum. Any such

facilities as existing roads, curbing, utility poles, or underground utility lines damaged by Contractor in execution of this Contract shall he restored to former condition by Contractor at no change in the Contract price to satisfaction of Architect. If any other structures or utilities are encountered, request District's Representative to provide direction on how to proceed with the work. If any structure or utility is damaged, take immediate action to ensure the safety of persons and property. Notify Inspector of Record, Architect and District immediately before proceeding with work in damaged area.

C. Shoring: Pursuant to Labor Code 6707, Contractor shall include in its base bid all costs incident to the provision of adequate sheeting, shoring, bracing or equivalent method for the protection of Life and Limb which shall conform to the applicable Federal and State Safety Orders.

1. Before beginning excavation four feet or more in depth, Contractor shall submit to District's Representative a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazards of caving ground during the excavation. The proposed plan shall comply with the State of California Construction Safety Orders (Title 8) and State Building Code (SBC) (Title 24) of the California Code Regulations (CCR). If the detail varies from such shoring systems standard, it shall be prepared by a registered civil or structural engineer whose name and registration number shall be indicated on the Drawings. If a dispute arises as to whether the plan must be prepared by a registered civil or structural engineer, District's Representative's determination of the matter shall be final and conclusive on Contractor and District. The costs of required engineering services shall be borne by Contractor and shall be deemed to have been included in the amount bid for the work we stated in the Agreement.

2. Neither the review nor approval of any plan showing the design of shoring, bracing, sloping, or other provisions for worker protection shall relieve Contractor from its obligation to comply with Construction Safety Orders (CCR Title 8) and SBC (CCR Title 24) for the design and construction of such protective work, and Contractor shall indemnify District and District's Representative from any and all claims, liability, costs, action and cause of action arising out of or related to, the failure of such protective systems. Contractor shall defend District, its officers, employees, and agents and District's Representative in any litigation or proceeding brought with respect to the failure of such protective systems.

D. Contractor shall record and submit to Architect for verification any damage prior to commencement of work. Any damage not recorded and verified by Architect's the responsibility of the Contractor to correct.

3.03 LIMITS OF WORK, SAFETY OF PERSONS, PROPERTY, AND STORAGE AREAS

A. Submit for District Architect's review a "Safety Plan" (site utilization plan) for construction prior to commencement. Plan shall indicate all safety measures, limits of work, storage areas and truck routes. Contractor shall incorporate information shown on the applicable Drawings as required. Incorporate safety measures as required per applicable standards for the protection of all persons and property. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

B. Contractor shall take adequate precautions for safety of and shall provide adequate protection to prevent damage, injury, or loss to the following:

1. Employees involved in the Work and other persons (site occupants) who may be affected thereby.

2. The Work in place and materials and equipment to be incorporated therein, whether in storage on or off the project site, under care, custody, or control of Contractor or Subcontractors, as well as, other property at the project site and adjoining property

C. Contractor shall erect and maintain, as required by existing conditions and performance of the work, adequate safeguards for safety and protection, including providing adequate lighting and ventilation, posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

D. When use or storage of explosives, other hazardous materials, equipment, or unusual methods are necessary for execution of the Work, Contractor shall exercise the utmost care and carry on such activities only under the supervision of properly qualified personnel.

3.04 CONSTRUCTION CONTROLS

A. Erosion Control: Erosion control measures shall be provided and maintained by the General Conditions in strict accordance with all regulations governing the Contractors' use of the site. Evidence and conditions of erosion shall be corrected subject to acceptance by the Architect, Registered Civil Engineer and the Geotechnical Consultant. Refer also to Section 01 57 23.

B. Dust palliation: In addition to cleanup provisions of the Specifications, Contractor shall take appropriate steps during and throughout term of the Project to prevent airborne dust due to work under this Contract. Water shall be applied to settle and prevent dust, particularly during excavation and moving of materials. No chemical palliatives shall be used without permission of the District.

C. Noise control: Noise from job equipment shall be kept to a minimum by adequate mufflers and other means as approved by Architect.

D. Interruptions of existing services shall be held to minimum and shall be made only at such times as the District directs. Approval of the District shall be requested at least 7 days in advance of desired interruption time.

3.05 USE OF OFF-SITE ROADS, HAUL ROADS AND PUBLIC RIGHTS-OF-WAY, CONSTRUCTION HOURS AND RELATED REQUIREMENTS

A. Prior to commencement of demolition and grading, the contractor shall prepare and submit for review and approval by the City's Director of Public Works and the District's representative a planned route for construction equipment access and truck route to the project site that minimizes exposure of residential uses to construction-related truck and equipment activity. Approved route maps shall be provided to contractors. A note and map shall be provided on all grading plans and building plans specifying the route to be followed by all contractors and their agents for access to the site.

B. During all phases of construction, the contractor shall ensure that construction activities shall be limited to weekdays: (Monday-Friday) 7:00 am to 8:00 pm; weekends and holidays: 9:00 am to 6:00 pm per City of Montebello local ordinance for construction work.

C. Construction equipment shall be equipped with proper mufflers and shall be properly maintained to minimize noise impacts during construction.

D. In order to reduce fugitive dust from demolition and construction-related activities, the contractor shall furnish documentation to the satisfaction of the District's representative that the following provisions are included in the grading contractor's contract:

1. Apply non-toxic chemical soil stabilizers according to manufacturers' specifications to all inactive construction areas and previously graded areas inactive for five days or more.

2. Enclose, cover, water at least twice daily, or apply non-toxic soil binders according to manufacturers' specifications to exposed stockpiles (i.e., gravel, sand, or dirt) with five percent or greater silt content.

3. Automatic water mist or sprinkler systems should be installed in areas with stockpiles. Adequate amounts of water shall be applied to areas of excavation, trenching, and stockpiles to precluded generation of visible dust plumes.

E. In order to reduce fugitive dust from on-site and off-site activity, the contractor shall furnish documentation to the satisfaction of the District's representative that the following provisions are included in the grading contractor's contract:

1. All trucks hauling dirt, sand, soil, or other loose materials are to be covered, or shall maintain at least two feet of freeboard in accordance with the requirements of California Vehicle Code section 23114 ("freeboard" means vertical space between the top of the load and top of the trailer; "covered" means a tightly secured covering attached to the truck).

2. Sweep adjacent streets once a day if visible soil materials are carried to adjacent streets (recommend water sweepers with reclaimed water). Sweep streets immediately after period of heaviest vehicular track-out activity.

3. Install wheel washers where vehicles enter and exit unpaved roads (or areas) onto paved roads, or wash off trucks and any equipment leaving the site each trip. Set up truck washing area on paved access road area so subsequent truck travel on unpaved roads can be eliminated.

4. Pave or provide gravel roadbed on all on-site construction access roads at least 100 feet onto the site from the main road.

5. Apply water at least two times daily, or apply non-toxic stabilizers, according to manufacturers' specifications, to all unpaved parking or staging areas or unpaved road surfaces.

6. Traffic speeds on all unpaved roads shall be 15 mph or less; effective traffic control or signage shall be installed and maintained.

7. All clearing, grading, earth moving, or excavation activities shall cease during periods of high winds (i.e., greater than 25 mph averaged over one hour) or during Stage 1 or Stage 2 smog episodes.

F. In order to reduce short-term construction impacts from emissions from equipment and vehicles, prior to commencement of grading, the contractor shall ensure compliance with all of the following measures, to the satisfaction of the District's representative:

1. The construction contractor shall select the construction equipment used on the site based on low emission factors and high energy efficiency, as reported by the federal government.

2. The construction contractor shall ensure that construction grading plans include a statement that all construction equipment will be tuned and maintained in accordance with the manufacturer's specifications.

3. The construction contractor shall ensure that construction grading plans include a statement that work crews will shut off equipment when not in use. During smog season (May through October), the overall length of the construction period should be extended, thereby decreasing the size of the area prepared each day, to minimize vehicles and equipment operating at the same time.

4. The construction contractor shall time the construction activities so as not to interfere with peak hour traffic, and to minimize obstruction of through traffic lanes adjacent to the site; if necessary, a flag person shall be retained to maintain safety adjacent to existing roadways.

5. The construction contractor shall support and encourage ridesharing and transit incentives for the construction crew.

6. Weekly monitoring reports documenting compliance with the above conditions shall be submitted by the contractor to the District's representative.

3.06 VERIFICATION OF EXISTING UTILITIES

A. Prior to constructing any new underground utility the Contractor shall expose and verify all existing underground facilities that may conflict with the new utility, to ensure accuracy of the information shown on the Drawings.

1. In addition, the Contractor shall use below-grade utility detection equipment, as necessary, and as defined elsewhere in the plans and specifications, to determine the location of existing utilities within the influence of the new construction.

2. Unless specifically noted on the drawings, the Contractor shall review such utility conflicts as may exist, and discuss with Architect, as necessary, if the new utilities shall route above or below the existing utilities, and other related requirements and aspects of the construction as may exist.

3.07 EXISTING PETROLEUM PIPELINES

A. Prior to starting work, contact "Dig Alert" (Underground Service Alert of Southern California) by dialing 811 for location of underground petroleum pipelines surrounding property to comply with California Government Code Section 4216.

3.08 HAZARDOUS MATERIALS

A. Should asbestos, PCB or other hazardous materials be encountered in any area, immediately stop all work in that area and notify the District's representative; the District will remove all hazardous material, clean the area, and have it certified as safe by a Certified Industrial Hygienist before work under this contract may proceed in that area. A time extension will be granted for delay caused by this cleanup. (It is not anticipated that these materials are currently present within the project scope limits.)

B. Materials, products or assemblies containing asbestos or other hazardous materials are expressly prohibited from use or installation in this project.

C. As presently defined by the State of California under Department of Health Services regulations, CAC Title 22, Division 4, Chapter 30, all refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, and similar products) have chemical constituents which are considered to be hazardous waste. As such, the indiscriminant dumping or spillage of these fluids onto the ground constitutes a misdemeanor, punishable by fines and/or imprisonment.

1. Current state requirements require the contaminated soils to be re-mediated either by removal from the site for disposal in a properly permitted landfill (i.e., Class I or designated Class II landfill) or by onsite treatment to reduce the contaminants to non-toxic levels.

3.09 ADDENDA AND CHANGE ORDERS

A. Changes in the Plans and Specifications shall be made by Addenda and Change Orders approved by the Division of the State Architect.

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:
1. Reference Standards.
2. Quality Assurance and Control of Installation.
3. Field Samples.
4. Mock-up
5. Project Inspector and Inspections.
6. Permits and Fees.
7. Verified Reports.
8. Manufacturers' Field Services and Reports.
9. Laboratory Testing Services.

1.02 REFERENCE STANDARDS

A. Conform to reference standards by date of issue current on date of Contract Documents.

B. For products or workmanship specified by Association, Trade or Federal Standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

C. Obtain copies of standards when required by Contract Documents.

D. Maintain copy of standards at jobsite during submittals, planning and progress of the specified Work until Certified Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

F. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, products, services, site conditions and workmanship to produce Work of specified quality.

B. Comply fully with manufacturers' instructions including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Perform Work by persons qualified to produce workmanship of specified quality.

E. Where experience minimums for workmen, applicators, companies or manufacturers are required in individual Sections, written certification and documentation substantiating such minimums shall be submitted and approved by the Architect, when requested.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

G. Field Samples
1. Install field samples at the site as required by individual Specification Sections for review by Architect.

H. Mock-Up
1. Test will be performed under provisions identified in this Section.
2. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals and finishes.
3. Where mock-ups are specified in individual Sections, shall be removed after approval per this Section unless are to remain as part of the Work.

1.04 PROJECT INSPECTOR

A. An Inspector, herein referred to as the "Project Inspector" or "Job Inspector", will be employed by the Owner and approved by Department of General Services, Division of State Architect (DGS/DSA) in accordance with Part 1, Title 24, Section 4-333, California Code of Regulations. His duties are described in Part 1, Title 24, Section 4-342 **[7-144]**, CCR and defined in Sections 17309, 17311, 81141 and 81143 of the California Education Code as they relate to schools. Inspector shall be Class 1, in accordance with Title 24, Part I, Section 4-333(b), any of the below:

B. The Work of construction in all stages of progress shall be subject to the personal continuous observation of the Project Inspector. He shall have free access to any or all part of the Work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the Work and the character of the materials. Inspection of the Work shall not relieve the Contractor from any obligation to fulfill this Contract.

1.05 PERMITS AND FEES

A. Where required by the provisions of individual sections of the Specifications, and where required to carry out construction operations, Contractor shall obtain and pay for permits and fees, including, but not limited to, Demolition, Grading, Disposals, requirements of Water, Gas, Sewer, Flood and Sanitary Districts, Municipal and County Building Departments having jurisdiction.
1. Fees for final utility connections shall be paid by the Contractor and reimbursed to the Contractor by the Owner at direct cost.
2. Building Permits or approvals issued by the DSA requiring fees will be obtained and paid by the Owner.

1.06 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable and to initiate instructions when necessary.

B. Manufacturer's representatives shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report of observation to Architect for review.

1.07 ADDENDA AND CHANGE ORDERS

A. The intent of these drawings and specifications is that the work of the alteration or reconstruction is to be in accordance with Title 24, California Code of Regulations. Should any conditions such as deterioration or non-complying construction be discovered which is not covered by the contract documents wherein the finished work will not comply with Title 24, California Code of Regulations, a change order, or a separate set of plans and specifications, detailing and specifying the required work shall be submitted to and approved by the Division of the State Architect (DSA) before proceeding with the work.

B. In accordance with Part 1, Title 24, Section 4-338, California Code of Regulations, all addenda and Change Orders shall be approved by Division of the State Architect (DSA).

1.08 CODES AND REGULATIONS

A. All work pertaining to and all materials supplied for executing and completing this Contract shall comply with provisions specified in the Contract Documents and with all applicable laws, regulations and ordinances governing Work including, but not necessarily limited to, those of:

1. Title 24, California Code of Regulations (CCR), California Building Standards Code.
    a. Part 1: 2007 California Building Standards Administrative Code
    b. Part 2: 2007 California Building Code (CBC), based on 2006 Uniform Building Code, Volumes 1, 2 and 3, and 2007 California Amendments.
    c. Part 3: 2007 California Electrical Code (CEC) based on 2005 National Electrical Code (NEC) and 2007 California Amendments.
    d. Part 4: 2007 California Mechanical Code (CMC), based on 2006 Uniform Mechanical Code (UMC) and 2007 California Amendments.
    e. Part 5: 2007 California Plumbing Code (CPC), based on 2006 Uniform Plumbing Code (UPC) and 2007 California Amendments.
    f. Part 6: 2007 California Energy Code (CEC).
    g. Part 7: 2007 California Elevator Safety Construction Code.
    h. Part 8: 2007 California Historical Building Code (CHBC).
    i. Part 9: 2007 California Fire Code (CFC), based on 2006 Uniform Fire Code (UFC) and 2007 California Amendments.
    j. Part 10: 2007 California Code for Building Conservation.
    k. Part 12: 2007 California Referenced Standards Code (CRSC).
    l. Uniform Building Code Standards Volumes 1, 2 and 3.
2. Partial List of Applicable Standards
    a. NFPA 13-02, Installation of Sprinkler Systems.
    b. NFPA 14-03, Installation of Standpipe and Hose Systems.
    c. NFPA 17-02, Dry Chemical Extinguishing Systems.
    d. NFPA 17A-02, Wet Chemical Systems.
    e. NFPA 20-03, Installation of Stationary Pumps for Fire Protection.
    f. NFPA 24-02, Installation of Private Fire Service Mains and Their Appurtenances.
    g. NFPA 72-02, National Fire Alarm Code (California Amended).
        (Note: See UL Standard 1971-02 for "Visual Devices".)

h. NFPA 253-06, Critical Radiant Flux of Floor Covering Systems.

i. NFPA 2001-04, Clean Agent Fire Extinguishing Systems.

j. For NFPA Standards, reference Chapter 35, 2007 CBC (SFM).

3. Applicable Ordinances of City and County in which the project is located.

4. Title 19, CCR, Public Safety, State Fire Marshal Regulations.

5. Comply with California Fire Code, Article 87.

B. Administrative Regulations, Part 1, California Building Standards Administrative Code:

1. Chapters 1 Administrative Regulations of the California Building Standards Commission.

2. Chapter 4 and Chapter 5 DSA.

3. DSA not subject to Arbitration.

4. Changes in the Work, including minor changes, by Addenda or Change Orders per Section 4-338.

5. Inspector shall be approved by DSA. Inspector, continuous inspection of work and special inspections per Sections 4-333(b), 4-342 and this Section.

6. Tests and testing per CBC Section 4-335 with Owner paying Testing Laboratory and this Section.

7. Contractor shall submit Verified Reports per Sections 4-336, 4-343 and this Section.

8. Copy of Parts 1 and 2, (CBC), Title 24 CCR, shall be kept and made available at the construction site office during construction.

9. DSA shall be notified by the Contractor upon start of construction per Section 4-331 and supervision shall be provided by DSA per Section 4-334.

10. Administration of construction by Architect, Structural Engineer or Professional Engineer per Section 4-333(a) and 4-341.

11. Administration of construction by Contractor per Section 4-343.

C. Requirements for accessibility shall conform to the California Accessibility Statutes and California Accessibility Regulations, 2007 California Building Code.

D. Enforcement includes all other codes or regulations referenced in the above listed codes.

E. The preceding listed codes, regulations and ordinances of the regulatory agencies are hereby made a part of this Contract. Nothing in the Contract shall be construed as allowing any violation of any provision of any of above listed documents.

F. Owner properties are designated No Smoking Areas. Smoking is not permitted on Owner Property.

1.09 VARIATIONS WITH LAWS

A. If Contractor his subcontractors or suppliers, or any of their employees ascertain at any time that requirements of this Contract conflict with or are in violation of applicable laws, codes, regulations and ordinances he shall not proceed with Work in question, except at his own risk. Contractor shall be required to remove that Work from site and replace such Work with all complying Work at no additional cost to Owner.

1.10 SELECTION AND PAYMENT-TESTING LABORATORY AND INSPECTORS

A. Owner will employ and pay for services of independent Testing Laboratory and Special Inspectors approved by Architect and DSA to perform inspection and testing in accordance with Part 1, Title 24, Section 4-335, California Code of Regulations and this Section.

1. In accordance with AB1329 dated February 23, 2001, when hazardous materials abatement measures are included in the Work, Owner will employ and pay for the services of an independent testing laboratory, licensed and certified by the State, to conduct clearance and air sampling tests.

B. Offsite fabrication requiring Inspection and Testing: submit the qualifications of Inspectors and laboratory, including proposals for services, to the Owner and Architect for approval of qualifications and costs. Inspectors and laboratories shall conform to the requirements of Part 1 Title 24 Section 4-335.

C. Contractor shall pay for mileage, including room and board, in excess of 50 miles or 2 hours of travel time for inspection services from the project site to test products purchased by the Contractor. Testing Laboratory shall forward all billings and records of such costs to the Owner for approval. Such costs, if determined by the Owner to be attributable to the Contractor under this provision, will be deducted from Contractor's final payment (or any funds due and payable) by Change Order.

D. When tests and inspections are required on an overtime basis, initial payment will be made by Owner. At termination of Work or completion of Project, all costs for overtime testing and inspections will be deducted from Contractor's final payment (or any funds due and payable) by Change Order.

E. Before the Testing Laboratory files testing and inspection billings with Owner, they shall be billed indicating segregate straight time from overtime costs. All overtime costs shall be substantiated with detailed explanation for necessity of such work costs.

F. When materials tested fail to meet requirements herein specified, they shall be promptly corrected or removed and replaced, re-inspected and retested in a manner required by the Architect. Costs involved in re-inspection and retesting will be paid by the Owner and deducted from Contractor's final payment (or any funds due and payable) by Change Order.

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

1.11 LABORATORY RESPONSIBILITIES

A. Laboratory shall be licensed to conduct testing and inspection operations in California and shall be approved by DSA. It shall be supervised by a State Licensed Civil Engineer who shall certify and sign all reports.

B. Provide qualified personnel at site. Cooperate with Architect, Project Inspector and Contractor in performance of services.

C. Perform specified inspection, sampling and testing of products in accordance with standards specified herein.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Promptly notify Architect, Project Inspector and Contractor by letter of observed irregularities or non-conformance of Work or products.

F. Perform additional inspections and test required by Architect or governing agencies.

G. Immediately upon Testing Laboratory determination of a test failure, the laboratory shall telephone the results of test to Architect. On the same day, laboratory shall send written test results to those named on the distribution list below.

1.12 LABORATORY REPORTS

A. After each inspection and test, promptly submit one copy of laboratory report to the following:

1. Owner
2. Contractor.
3. Project Inspector.
4. Special Inspectors: Special Inspector's Verified Reports as required by Section 4-336 and shall be submitted in a timely manner.
5. Architect
6. Structural Engineer.
7. Mechanical and Electrical Engineers (Related Tests and Inspections).
8. Division of the State Architect (DSA).

B. Include:

1. Date issued.
2. Project title, Architect's number, DSA Application and File number.
3. Name of inspector.
4. Date and time of sampling and Specifications Section.
5. Identification of product and Specifications Section.
6. Location in the Project.
7. Type of inspection or tests.
8. Date of test and ambient conditions at time of test.
9. Results of tests.
10. Conformance with Contract Documents.
11. Signature by Registered Professional Engineer licensed in California.
12. Statement that tests were conducted in accordance with Parts 1 and 2, Title 24, California Code of Regulations.

C. Test reports shall include tests made, whether such tests indicate that the material performed satisfactorily or not. Samples taken but not tested shall be reported. Reports shall show that the materials were sampled and tested in accordance with the requirements of the approved Specifications. Reports shall show the specified design strength and shall state whether or not the materials tested comply with requirements. Report special sampling operations where required.

D. Submit a report verifying that tests and inspections herein specified and otherwise required have been completed and material and workmanship complies with the Contract Documents. Such verification reports shall be submitted at the completion of the Project and at any time the Project is suspended. Parties to receive such reports are the same as listed above.

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

1.13 LIMITS ON TESTING LABORATORY AUTHORITY

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

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

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop the Work.

E. Laboratory shall not interpret code in relation to the design of the building.

1.14 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing. Selection of materials required to be tested shall be by the Lab or Owner's Representative and not by the Contractor.

B. Cooperate with laboratory personnel, Owner's Representative, Project Inspector and the Architect, and provide access to the Work including weekends and after work hours and to manufacturer's facilities.

C. Provide incidental labor materials and facilities to provide at all times, safe access to Work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.

D. Notify Architect, Project Inspector and laboratory 24 hours prior to expected time for operations requiring inspection and testing services. Also, notify Owner in advance of manufacturer of materials to allow testing at source of supply.

E. The Owner, Project Inspector or the Architect shall have the right to reject materials and workmanship that are defective or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without cost to the Owner. If the Contractor fails to correct such rejected Work within a reasonable time, fixed by written notice, the Owner will correct same and charge the expense to the Contractor by Change Order.

F. Should it be considered necessary or advisable by the Owner at any time before date of completion of the entire Work to make an examination of Work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such Work is found to be defective in any respect due to fault of the Contractor or his subcontractor, all extra expenses shall be charged to the Contractor by Change Order. If, however, such Work is found to meet the requirements of the Contract, the additional cost of labor and materials necessarily involved in the examination and replacement costs shall be allowed the Contractor by Change Order.

G. When changes of construction schedule are necessary during construction, coordinate such changes with the Testing Laboratory as required.

H. When the Testing Laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, extra charges for testing attributable to the delay shall be charged to the Contractor by Change Order.

I. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

J. Selection of materials to be tested shall be made by the Testing Laboratory or the Project Inspector and not by the Contractor.

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

L. Contractor shall submit statement of responsibility for the construction of lateral force resisting system complying with 2007 CBC sec. 1706A.1.

1.15 SCHEDULE OF STRUCTURAL TESTS AND INSPECTIONS (SSS 103-1) ATTACHED AT THE END OF THIS SECTION (2007 CALIFORNIA BUILDING CODE REFERENCED).

A. MASONRY – CBC CHAPTER 21A
(NOT APPLICABLE THIS PROJECT)

B. WOOD – CBC CHAPTER 23A
(NOT APPLICABLE THIS PROJECT)

C. CONCRETE – CBC CHAPTER 19A

1.	Materials:		
	a.	Portland Cement	1916A.1
	b.	Concrete Aggregates	1903A.3
	c.	Reinforcing Bars	1916A.2
	d.	Mix Designs	1905A.1.1, 1905A.2,1903A.3, 1905A.2
	e.	Admixtures	1903A6
2.	Concrete Quality:		
	a.	Proportions of Concrete	1905A.1,A.2,A.3,A.4, A.5, A.6
	b.	Strength Tests of Concrete	1916A.5, 1905A.6.3
	c.	Composite Construction Cores -	1916A.5
	d.	Gypsum Concrete Strength Tests	1916A.7
	e.	Slump Tests	1704A.4
3.	Concrete Inspection:		
	a.	Jobsite Inspection	1913A.1, 1916A.5, 1905A.6.2.1
	b.	Continuous Batch Plant Inspection	1704A.4.3
	c.	Waiver of Batch Plant (Weighmaster certificate)	1704A.4.4
	d.	Reinforcing Bar Welding	1704A.4.2
	e.	Post-installed anchors	1916A.8

D. STEEL – CBC CHAPTER 22A

1.	Materials:		
	a.	Structural Steel, Cold Formed Steel	2209A.1
	b.	Material Identification	2212A.1
	c.	Steel Deck	2209A.3
2.	Inspection and Tests of Structural Steel:		
	a.	Tests of Structural & Cold Formed Steel	2212A.1
	b.	Tests of High Strength Bolts, Nuts, Washers	2212A.2
	c.	Tests of End Welded Studs	2212A.3
	d.	Tests of beam-to-column moment connections	2212A.4
	e.	Shop Fabrication Inspection	1704A.3.2.1
	f.	Welding Inspection	1704A.3.1.1
	g.	High Strength Bolt Installation Insp.	1704A.3.3, 2231A.6
	h.	Non-Destructive Weld Testing	1704A.3.1.1

3. Special Inspections
   a. Test of Spray-applied Fire-resistive Materials - steel. 1704A.10

E. ALUMINUM – CBC CHAPTER 20A
1. Materials:
   a. Alloys 2002
2. Inspection:
   a. Aluminum 2003

F. EXCAVATIONS, FOUNDATIONS & RETAINING WALLS CBC CHAPTER 33
1. Inspection:
   a. Compaction 1704A.71

1.16 MOISTURE AND ALKALINITY TESTING - CALCIUM CHLORIDE TEST

A. Field Testing of concrete slabs, resilient flooring ASTM F710

B. Field Testing of concrete slabs ASTM F1869.

1.17 APPROVED ANCHORS

A. Wedge Type: KWIK Bolt TZ (KBTZ), ICC ESR-1917, by Hilti Inc., Tulsa, OK.

1. Eyebolt HCKB KWIK-BOLT ICC ER-5224 drill-in anchor for suspended ceilings. Provide minimum 5/16 inch size anchor, requires testing.

B. Adhesive Anchors System for normal concrete construction per ESR-2322, Hilti HIT HY-RE500-SD.

C. Maximum Values: The maximum allowable shear and tension values shall be determined in one of the following ways:

1. The allowable load values shall be based on the ultimate shear and tension load data from qualification tests, in accordance with ASTM E-488, of at least five test specimens, using a factor of safety of five on the average of the test values, or a factor of safety of four on the lowest test value, whichever is lower, or;

2. An allowable load equal to but not more than eighty percent of the allowable load listed in the ICC Evaluation Report recommendation for a specific anchor in the same configuration as tested.

D. Expansions anchors installed in the tension zone (underside) of structural members (beams and slabs) shall have allowable load values modified beyond that defined in D.1 and D.2, unless data is submitted indicating that the specific anchor is not adversely affected by the cracking of concrete in the tension zone. From qualification test per D.1, a factor of safety equal to eight shall be used on those anchors. If loads are determined from an ICC Evaluation Report, the allowable loads shall be based on bolts installed without special inspection.

E. Embedment, Spacing and Edge Distance: The minimum spacing between anchors shall be as defined in the ICC Report and shall be in conformance with the 2007 CBC, Sections 1911A and 1912A.

F. All expansion anchors shall be installed and inspected in accordance with the manufacturer's ICC Report – Installation Recommendations. The minimum slab thickness established in the manufacturer's technical guide for the specified anchor shall also be adhered to.

1.18 REQUIRED TESTING FOR EXPANSION ANCHORS

A. Testing: In accordance with Section 1916A.8 Interpretations of Regulations IR 19-1.

B. When the design tension for expansion anchors is less than seventy-five pounds, ten percent of the total number shall be proof tested.

C. Structural Applications: Tension test all expansion-type anchors. Expansion-type anchors shall not be used as hold-down bolts.

D. Non-Structural Applications: Tension test 50% or alternate bolts in a group. Nonstructural may include such applications as equipment anchorage.

E. Tension testing shall be done in the presence of the project inspector and a report of the test results shall be submitted to DSA. If any anchors fail the tension-testing requirements, the additional testing requirements shall be acceptable to DSA.

F. Test Values: Conform to the following table for either Hard rock or Lightweight Concrete:

ANCHOR DIAMETER	WEDGE LOAD	TORQUE	SHELL LOAD	TORQUE
(in.)	(lbs.)	(ft.-lbs.)	(lbs.)	(ft.-lbs.)
1/4	800	10	1000	-
5/16		-	1400	-
3/8	1100	25	1800	-
1/2	2000	50	2700	-
5/8	2300	80	3700	-
3/4	3700	150	5400	-
1	5800	250		-

1. Anchor diameter refers to the thread size for the wedge and shell categories and to the anchor outside diameter for the sleeve category.
2. Apply proof test loads to wedge anchors without removing the nut if possible. If not, remove nut and install a threaded coupler to the same tightness of the original nut using a torque wrench and apply load.
3. For shell internally threaded categories, verify that the anchor is not prevented from withdrawing by a base plate or other fixtures. If restraint is found, loosen and shim or remove fixture(s) prior to testing.
4. Reaction loads from test fixtures may be applied near the anchor being tested, provided the anchor is not restrained from withdrawing by the fixture(s).
5. Shell type anchors shall be tested as follows: Visually inspect 25 percent for full expansion as evidence by the location of the expansion plug in the anchor body. Plug location of a fully expanded anchor should be as recommended by the manufacturer, or in the absence of such recommendation, as determined on the job site following the manufacturer's installation instructions, and; Proof load 5 percent as indicated in the table above, but not less than three anchors per day, for each different person or crew installing anchors, or; Test 50 percent of the installed anchors per 1923A.3.5.

6. Test equipment shall be calibrated by an approved testing laboratory in accordance with standard recognized procedures.
7. Torque testing may occur on an individual basis when test procedures are submitted and approved by the enforcement agency.
8. The following criteria apply for the acceptance of installed anchors:
   a. Hydraulic Ram Method: The anchor shall have no observable movement at the applicable test load.
   b. Torque Wrench Method: The applicable test torque must be reached within the following limit for wedge type:
      1) One-half (1/2) turn of the nut.
      2) One-quarter (1/4) turn of the nut for the 3/8 inch sleeve anchor only.
9. Testing shall occur within 24 hours after installation.
10. If the manufacturer's recommendation installation torque is less than the test torque listed in the table above, the manufacturer's installation torque shall be used in lieu of the tabulated values.

1.19 POWDER ACTUATED FASTENERS

A. Allowable Loads: Limited 100 lbs. Maximum or 80% of ICC approved values. Testing required.

B. Permissible for Sill and Interior Plate Anchorages:
   1. At wood sills to normal-weight concrete foundations: Hilti X-ZF72, ICC ESR-2379.

1.20 REQUIRED TESTING FOR POWDER ACTUATED FASTENERS

A. Testing: Operator, tool and fastener shall be pre-qualified by the Project Inspector.
   1. Tools shall conform to ANSI A10.3 safety requirements for Powder Actuated Fastening Systems and to all OSHA requirements.
   2. Manufacturer's representative shall provide safety training for all installation personnel and provide powder actuated tool operator certification in accordance with OSHA requirements.

B. The Project Inspector shall observe the testing of the first 10 fastener installations.

C. A test pullout load of not less than twice the design load or 200 lbs., whichever is greater, shall be applied to the fastener in such a manner as not to resist the spalling tendency of concrete in which the fastener is imbedded. Thereafter, random tests under the Project Inspector's supervision shall be made of approximately 1 in 10 fasteners.

D. Should failure occur on any fastener tested, all installations shall be tested until twenty consecutive fasteners pass, then resume the initial testing frequency.

1.21 INSTALLATION

A. When installing drilled-in anchors or powder driven pins in reinforced concrete, use care and caution to avoid cutting or damaging reinforcing bars. When required by the Architect, locate the reinforcing by using a non-destructive method prior to installation. Exercise extreme care and caution to avoid cutting or damaging reinforcing during installation. Maintain a minimum clearance of one inch between the reinforcing and the anchor and/or pin.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

FINAL JA

STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES
DIVISION OF THE STATE ARCHITECT

FORM
DSA-103

INCREMENT #

DSA File No.: 19-94
Application No.: 03-112620

Date Submitted:

Revised:
Revised:

Statement of Structural Tests and Special Inspections

School Name	Del Mar High School C. E. C. Bus Depot Conversion	District	San Gabriel Unified School district

IMPORTANT: This form is only a summary list of the tests and special inspections required on the project. The actual tests and inspections must be performed as detailed on the approved plans and specifications. The project inspector is responsible for providing inspection of all facets of construction, including, but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A.

INSTRUCTIONS: Click a plus sign (+) before any category or subcategory to reveal additional tests and special inspections. An "X" before a listed test or inspection indicates it is a mandatory requirement. A shaded box indicates a test or special inspection that may be required, depending on the scope of the construction and other issues. A shaded box can be clicked indicating your selection of that test. **Note:** A minus (-) on a category or subcategory heading indicates that it can be collapsed. However, any selections you may have made will be cleared. Click on the "COMPILE" button to show only the tests finally selected. For more information on use of this form, see DSA-103.INSTR.

Note: All references to the California Building Code (CBC) are to the 2007 edition.

REQUIRED?	TEST OR SECIAL INSPECTION	TYPE**	PERFORMED BY**	CODE REFERENCE AND NOTES
-	**SOILS**			
	1. General:	2007 CBC, Table 1704A.7		
X	a. Verify that: • site has been prepared properly prior to placement of controlled fill and/or excavations for foundations, • foundation excavations are extended to proper depth and have reached proper material, and • materials below footings are adequate to achieve the design bearing capacity.	Periodic	GE*	* By geotechnical engineer or qualified representative.
-	2. Compacted Fills:	2007 CBC, Table 1704A.7		
X	a. Perform qualification testing of controlled fill materials.	Test	Lab*	* Under the supervision of a geotechnical engineer
X	b. Verify use of proper materials and inspect lift thicknesses, placement, and compaction during placement of controlled fill.	Continuous	GE*	* By geotechnical engineer or qualified representative.
X	c. Test compaction of controlled fill.	Test	Lab*	* Under the supervision of the geotechnical engineer.
-	**CONCRETE**	(based on 2007 CBC, Table 1704A.4)		
-	7. Cast in Place Concrete			
	Material Verification and Testing:			
X	a. Verify use of required design mix.	Periodic	*	* To be performed by batch-plant special inspector and project inspector.
X	b. Test reinforcing steel. (F5 and LANGOR)	Test	Lab	1916A.2; (see 1916A.4 for waiver). ASTM A370-06.
X	c. Perform slump test, determine the temperature of the concrete, and (where required) perform air content test.	Test	Lab	ASTM C172-04, ASTM C31-98.
X	d. Test concrete (compression test).	Test	Lab	1905A.6. ASTM C39-05.
	Inspection:			
X	e. Inspect batching of concrete.	Continuous	Special	1704A.4.3; (see 1704A.4.4 for waiver).
X	f. Inspect placement of formwork, reinforcing steel, embedded items and concrete. Inspect curing and form removal.	Continuous	Project*	* May be performed by a special inspector when specifically approved by DSA.
X	g. Welding of reinforcing steel.	Provide special inspection per STEEL, category 18.4, below.		
-	11. Post-installed Anchors:			
X	a. Inspect installation of post-installed anchors	Continuous	Project	Table 1704A.4

Statement of Structural Tests and Special Inspections

X	b. Test post-installed anchors.	Test	Lab	1916A.8
+	**MASONRY**	(based on 2007 CBC, Table 1704A.5.3)		
-	**STEEL**	(based on 2007 CBC, Table 1704A.3)		
-	17. Structural Steel			
	Material Verification:			
X	a. Verify that all materials are appropriately marked and that: • Mill certificates indicate material properties that comply with requirements, • Material sizes, types and grades comply with requirements.	Periodic	*	* By special inspector when performed off-site; by project inspector for steel shipped directly to project site without welding or fabrication.
X	b. Test unidentified materials	Test	Lab	2212A.1. ASTM A370-06.
X	c. Examine seam welds of structural tubes and pipes	Periodic	Special*	* See DSA IR 17-3.
	Inspection:			
X	d. Verify member locations, bracing and all details constructed in the field.	Continuous	Project	
X	e. Verify stiffener locations, connection tab locations and all construction details fabricated in the shop.	Periodic	Special	
-	19. Welding:			DSA IR 17-3. AWS D1.1-06.
	Verification of Materials, Equipment, Welders, etc:			
X	a. Verify weld filler material identification markings per AWS designation listed on the DSA approved documents and the WPS.	Periodic	Special	
X	b. Verify weld filler material manufacturer's certificate of compliance.	Periodic	Special	
X	c. Verify WPS, welder qualifications and equipment.	Periodic	Special	See DSA IR 17-3
-	19.1 Shop Welding:			
X	b. Inspect single-pass fillet welds ≤ 5/16"	Periodic	Special	Per AISC 360 (and AISC 341 as applicable).
-	19.2 Field Welding:			
X	a. Inspect groove, multi-pass, and fillet welds > 5/16"	Continuous	Special	Per AISC 360 (and AISC 341 as applicable).
X	b. Inspect single-pass fillet welds ≤ 5/16"	Periodic	Special	Per AISC 360 (and AISC 341 as applicable).
X	e. Inspect welding of cold-formed steel	Periodic	Special*	* May be performed by the project inspector when approved by DSA..
X	g. Verification of reinforcing steel weldability	Periodic	Special	1704A.4.2 Verifies carbon equivalent reported on mill certificates.
X	h. Inspect welding of reinforcing steel.	Continuous	Special	Table 1704A.3 Item 5b. AWS D1.4-05
-	22. Shop Fabrication:			
X	a. Verify fabricator's fabrication and quality control procedures.	Periodic	Special	* 2007 CBC, Section 1704A.2.1
X	b. Verify all aspects of shop fabrication including member locations, dimensional layout of all parts and pieces, all welding, bolting, etc.	Continuous	Special	
-	23. Other Steel:			
X	Metal deck material verification	Periodic		refer to 17a and 17b
+	**WOOD**			
-	**OTHER**			
X	26. Skylight Load Test	Test	Lab	
X	27. Skylight shop fabrication	Periodic	Special	

STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES
DIVISION OF THE STATE ARCHITECT

FORM
DSA-103

INCREMENT #

DSA File No.: 19-94
Application No.: 03-112620

Date Submitted:

Revised:
Revised:

Statement of Structural Tests and Special Inspections

Summary of Verified Reports Required:

Note: Project inspector, contractor, architect and engineer verified reports are always required (Form DSA-6 or DSA 6A/E as applicable).

1 Soils testing and Inspection: Geotechnical Verified Report - Form DSA-293
2 All Structural Testing: Laboratory Verified Report - Form DSA-291
3 Concrete Batch Plant Inspection: Special Inspection Verified Report - Form DSA-292
4 Shop Welding Inspection: Special Inspection Verified Report - Form DSA-292
5 Field Welding Inspection: Special Inspection Verified Report - Form DSA-292
6 Shop Fabrication Inspection: Special Inspection Verified Report - Form DSA-292

KEY to Columns

** Type -	** Performed By -
Continuous – Indicates that a continuous special inspection is required	**GE** – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
Periodic – Indicates that a periodic special inspection is required	**Lab** – Indicates that the test is to be performed by a testing laboratory accepted in the DSA laboratory Evaluation and Acceptance (LEA) Program
Test – Indicates that a test is required	**Project** – Indicates that the special inspection is to be performed by the project inspector
	Special – Indicates that the special inspection is to be performed by a special inspector
(Note: The difference between "tests" and "special inspections" is addressed in IR 17-B)	**(Note that reassignment of responsibility is permitted only with the written approval of DSA)**

IBI Group/Kevin S. Fleming, A. I. A.
Name of Architect or Engineer in general responsible charge

Martin, Chow & Nakabara, Inc./M. George Nakabara, S. E.
Name of Structural Engineer (When structural design has been delegated)

Signature of Architect or Structural Engineer — 2-1-10 date

REGISTERED PROFESSIONAL ENGINEER
Masahiro G. Nakabara
No. 2165
Exp 9-30-11
STRUCTURAL
STATE OF CALIFORNIA

IDENTIFICATION STAMP
DIV OF THE STATE ARCHITECT
APP. # 03-112620
AC N/A F/LS N/A SS JH
DATE 2/23/10

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:
   1. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone data service, water and sanitary facilities.
   2. Temporary Controls: Barriers, enclosures, fencing, protection of Work and security.
   3. Construction Facilities: Access, parking, progress cleaning, project sign and field office trailer.
   4. Special Controls: Water Control, Dust Control, Erosion and Sediment Control, Noise Control, Pollution Control, weed abatement, debris control, and pest control.
   5. Comply with Title 24, Part 9, California Fire Code, Article 87 Fire Safety During Construction/Demolition during all Phases of project.

1.02 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Emergency Plan.

1.03 TEMPORARY ELECTRICITY

A. Provide temporary electrical service suitable to conduct construction operations.

B. Contractor shall pay cost of energy used. Exercise measures to conserve energy. Contractor to cooperate with Owner in ascertaining prorated cost of energy used for his portion of Work.

C. Provide power outlets for construction operations with branch wiring and distribution boxes located where needed. Provide flexible power cords as required.
   1. Exposed cords that cross pedestrian or vehicular through fares shall have cord savers.

D. Provide feeder switch at source distribution equipment.

E. Permanent existing convenience receptacles may be utilized during construction.

1.04 TEMPORARY LIGHTING

A. Provide and maintain adequate lighting for construction operations.
   1. Site security lighting.

B. Maintain lighting and provide routine repairs.

C. Permanent building lighting may not be utilized during construction.

1.05 TEMPORARY HEAT

A. Provide heating devices and heat as required to maintain specified conditions for construction operations.

B. Contractor shall pay cost of energy used. Exercise measures to conserve energy.

1.06 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials to dissipate humidity and noxious fumes and to prevent accumulation of dust, fumes, vapors or gases.

1.07 TEMPORARY WATER SERVICE

A. Provide for suitable quality water service. Connect to existing water source for construction operations.

B. Contractor shall pay cost of water used. Exercise measures to conserve water.

C. Extend branch piping with outlets located so water is available by hose with threaded connections.

1.08 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facilities shall not be used.

1.09 TEMPORARY FIRE PROTECTION

A. Provide fire protection during construction according to CFC Article 87 including but not limited to fire extinguisher requirements and exit access requirements.

B. Conform to Title 24, Part 9, California Fire Code, Article 87, Fire Safety During Construction/Demolition.

1.010 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades declination and signage required by governing authority for public rights-of-way and for public access to existing facilities.

C. Provide protection for plant life designated to remain. Replace damaged plant life.

D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

E. Provide steel trench plates, orange mesh fencing, construction site marker and other protective means to keep site and users safe, protected, and separated from ongoing construction operations. Provide temporary access at all paths of travel. Yellow warning tape is not acceptable means of separation and protection. At all open trenching operations, enclose entire trenching operation area including stockpiled backfill within orange mesh construction fencing. Provide steel trench plate "bridges" at all walkways.

1.011 FENCING FOR CONSTRUCTION OPERATIONS

A. Prior to commencement of Work, provide an enclosure fence in accordance with the GENERAL CONDITIONS, with lockable entrance gates to the limits of construction as indicated on the drawings, and/or as follows.
   1. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth. Mesh shall be fully covered with tarp or slats for a visual barrier.

2. Provide (2) pedestrian gates for the convenience of the District.
3. Provide a minimum of (2) vehicular entrance gates.
4. Provide double locks on all gates. Deliver the keys for one lock on each gate to District Project Manager for delivery for use by Campus Security Police.
5. Construction fencing and appurtenances that are damaged shall be replaced or repaired within 24 hours.

B. At completion of project repair substrate, fill holes to match existing materials flush with adjacent surface.

1.012 STAGING AREAS

A. Coordinate with Owner for location, extent and type of construction staging area.

1.013 EXTERIOR ENCLOSURES

A. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual Specification Sections, and to prevent entry of unauthorized persons. Provide access doors with hardware and locks.

1.014 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as required to separate Work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas and to prevent damage to existing materials and equipment.

B. Construction: Wood framing and polyethylene, plywood or gypsum board sheet materials with closed joints and sealed edges at intersections with existing surfaces.

C. Paint surfaces exposed to view from Owner occupied areas.

1.015 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills and openings. Provide protective and removal coverings for metal finishes intended to be exposed.

D. Protect finished floors and other surfaces from traffic, dirt, wear, damage or movement of heavy objects by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces.

F. Prohibit traffic from landscaped areas.

1.016 SECURITY

A. Provide security and facilities to protect Work, existing facilities and Owner's operations from unauthorized entry, vandalism or theft.

B. Coordinate with Owner's security program.

C. Within 48 hour period, replace or repair, to Architect's satisfaction, all surfaces or items damaged by graffiti during course of construction.

D. Where security or fire detection systems are disabled for any reason, including where Owner has given approval for such system shutdown, provide fire watch or security guard service as directed by Owner at no additional cost to Owner.

1.017 ACCESS

A. Security Enclosure and Lockup: Install temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism and theft. Where materials and equipment must be stored, provide a secure lockup.

B. Provide means of removing mud from vehicle wheels before entering streets.

C. Designated existing on-site roads may be used for construction traffic.

D. Where construction traffic occurs when students and staff are on campus provide "spotter" responsible for leading construction traffic through site areas.

E. Route construction equipment, trucks, and similar vehicles via existing public streets to and from site as approved by governing authorities.

1.018 PARKING

A. Arrange for temporary parking areas with signage to accommodate construction personnel.

B. When site space is not adequate, provide additional off-site parking.

1.019 PROGRESS CLEANING

A. Refer to Section 01700 Execution Requirements and the requirements of this Section.

B. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean, safe and orderly condition.

C. Remove debris and rubbish from closed or remote spaces, prior to enclosing space.

D. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.

E. Remove waste materials, debris and rubbish from site weekly and dispose off-site.

F. Maintain public streets free of mud, dust and debris and as required by jurisdictional authority.

1.020 PROJECT SIGNAGE

A. Provide project sign as detailed of exterior grade plywood and wood frame construction, painted with exhibit lettering by professional sign painter to Architect's design and colors.

B. List title of Project, names of Owner and State of California Office of Public School Construction, Architect and Contractor.

C. Erect on site at locations established by Architect.

D. No other signs are allowed without Owner permission except those required by law.

1.021 FIELD OFFICE TRAILER(S)

A. Contractor Field Office: The Contractor shall provide and maintain field office(s) at the site for his own use.
   1. Contractor shall keep one copy of all contract documents, including addenda, change orders, RFIs, Submittals, Title 24 of the California Code of Regulations, and the Uniform Building Code, 2006 Edition, with the State of California 2007 amendments which are part of the contract documents, on the job at all times. Said documents shall be kept in good order and available to Architect and his representatives. Contractor shall be acquainted with and comply with the provisions of Title 24 as they relate to this project. (See particularly the Duties of Contractor, Title 24, California Code of Regulations §4-343.)

B. The Contractor shall provide expendable supplies (paper, toner, etc.) and on site service for all equipment provided throughout the duration of the project.

C. Install no closer than 45 feet from project buildings in accordance with NFPA 241.

D. Maintain facility until Substantial Completion of entire project. Remove within 1 week of Substantial Completion.

E. Provide property insurance and protection.

1.022 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials prior to Certified Completion inspection.

B. Remove temporary underground or overhead installations.

C. Clean and repair damage caused by installation or use of temporary Work.

D. Restore permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.023 RELOCATION OF UTILITIES

A. Contractor shall not have responsibility of timely removal, relocation or protection of public utility facilities that are not identified by Owner in Drawings and Specifications, in accordance with California Government Code 4215. Owner shall compensate Contractor for costs of locating and repairing damage not due to failure of Contractor to exercise reasonable care in removing and relocating such public utility facilities. If Contractor, while performing Contract, discovers public utility facilities not identified by Owner in Contract Drawings or Specifications, he shall immediately notify Owner and utility in writing. Contractor shall not be assessed liquidated damages for delay when delay was caused by failure of Owner to provide for relocation for utility facilities.

1.024 WATER CONTROL

A. Do not permit surface, rainwater or subsurface water or other liquids to accumulate in or about premises and vicinity thereof. Should such conditions be encountered or develop, control water or other liquid and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams or other methods as reviewed by Architect and approved by authority having jurisdiction.

B. Dewatering Facilities and drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations and construction free of water.

C. Dispose of rainwater in lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

1.025 DUST CONTROL

A. Conduct earthwork operations in a manner to prevent windblown dust and dirt from interfering with progress of Work, Owner's activities and existing occupied structures in areas immediately adjacent as well as adjacent properties.

B. Periodically water construction areas as required minimizing accumulation of dust and dirt.

C. Water spray or cover with tarpaulins truck loads of soil to additionally minimize generation of dust and dirt from construction operations.

D. Prevent dust and dirt from accumulating on walks, roadways, parking areas and from washing into sewer and storm drain lines.

1.026 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize amount of bare soil exposed at one time.

C. Provide temporary measures such as berms, dikes and drains to prevent water flow over adjacent properties or City rights-of-way.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
   1. Utilize spray binding agent or soil cement product where required.

F. Reference Section 01570 for Storm Water Pollution Prevention Plan Requirements.

1.027 NOISE CONTROL

A. Avoid excessive noise where adjacent Owner's functions may be detrimentally affected.
   1. Provide noise control and barriers as required and as necessary so not to increase ambient noise level of the surrounding community.

1.028 POLLUTION CONTROL

A. Provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.

B. Burning of refuse, debris or other materials will not be permitted on Site.

C. Comply with regulatory requirements and anti-pollution ordinances during course of construction and disposal operations.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 REMOVAL

A. Remove all temporary control measures in accordance with regulatory requirements at completion of construction.

END OF SECTION

SECTION 01570

STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:
   1. Requirements for compliance with the Storm Water Pollution Prevention Plan (SWPPP) developed specifically for this Project are the responsibility of the Contractor.
      a. SWPPP satisfies the mandates of Federal Clean Water Act as enforced by State of California Water Resources Control Board and its Regional Water Quality Boards.

B. Related Sections
   1. Other Sections of this Specification shall comply with requirements of this Section.
   2. SWPPP requires compliance of all trades on Project that use or manipulate materials of any nature which can potentially enter natural storm-water drainage system.
   3. Representative materials controlled by SWPPP include erosion of native soils and fill materials, leakage or spills from construction vehicles and machinery, stored fuels, concrete truck washout, chemical treatments, curing, compounds, paints, plasters, paving materials, adhesives and sealants, trash and general construction debris, pesticides, fertilizers, and any other material which can be carried by running water or percolate into earth.

1.02 SUBMITTALS

A. Closeout Submittals: Submit documentation certifying compliance with the SWPPP and notification of Agencies of completion of operations.

1.03 REGULATORY BACKGROUND

A. After January 1, 2001, as required by Federal Water Pollution Control Act (Clean Water Act) and regulations of U.S. Environmental Protection Agency and of State of California Water Resources Control Board, any construction activity of ONE acre or more must be covered by National Pollutant Discharge Elimination System (NPDES) permit.

B. The Act further decrees fines of as much as $27,500 per day per violation.

C. It is implicit that SWPPP satisfies requirements of NPDES permit.

D. If Owner is cited for violation of Clean Water Act due to failure of SWPPP to address requirement, Contractor shall be liable for any fines or penalties that might be imposed by regulatory agency, he shall be obligated to perform mandated corrective measures at his own expense.

E. If Owner, Architect, or Owner's Inspector becomes aware of violations of SWPPP, they will immediately inform Contractor in writing. Contractor shall immediately cease violation and shall restore site, at his own expense, to same conditions it was in before violation, to approval of Owner.

F. Should Contractor continue to violate requirements of SWPPP, or refuse to comply, or refuse to repair results of violation to Owner's approval, for purposes of this Contract it shall be

considered as any other violation of Contract. Owner will take necessary measures as set forth in General Conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide all temporary and permanent storm water pollution prevention equipment, material, and facilities as required by or as necessary to comply with SWPPP.

PART 3 - EXECUTION

3.01 IMPLEMENTATION

A. Measures required in SWPPP shall be executed as dictated by SWPPP itself.

B. Contractor shall prepare and submit Notice of Intent to comply with terms of this General Permit prior to commencement of construction activity.

1. An annual fee of $700.00 or amount required by the agency, paid by Contractor shall accompany Notice of Intent. Notice of Intent will not be processed if not accompanied by fee.

2. Send Notice of Intent and annual fee to:
State Water Resources Control Board (SWRCB)
Division of Water Quality
Attention: Storm Water Section, Permit Unit
P.O. Box 1977
Sacramento, CA 95812-1977.

3. Copies of General Permit and Notice of Intent form may be obtained from California Regional Water Control Board, Santa Ana Region, 2010 Iowa Avenue, Suite 100, Riverside, CA 92507-2409, 951/782-4130.

4. Concurrent with commencement of construction activities, Contractor shall develop, implement and retain at project site, a Storm Water Pollution Protection Plan and a monitoring program and reporting plan in accordance with the General Permit.

C. Contractor shall be responsible for paying the necessary permit fees and complying with State Water Resources Control Board Order No. 92-08-DWQ, implementing provisions of the Clean Water Act relating to storm water discharges.

D. Contractor must obtain the necessary permits from the State Water Resources Control Board and develop and implement Storm Water Pollution Prevention Plan in accordance with the State Water Resources Control Board requirements prior to commencing any portion of construction which will disturb land (i.e.; excavation, grading, etc.).

E. The plan shall address all potential sources of pollutants which may enter the storm water system, it must explain what steps will be taken during construction to minimize the risk of storm water contamination and must address management procedures to be utilized during construction to prevent pollution discharges such as spills, leaking, and dumping.

F. A copy of said plan shall be provided to District and upon request contractor shall certify, in writing, compliance with the relevant rules, regulations and laws.

G. Additional information regarding State Water Resources Control Board requirements can be obtained from State Water Resources Control Board, Division of Water Quality, Attention: Storm

Water Permit Unit, P.O. Box 1977, Sacramento, CA 95812-1977. Telephone Number (916) 657-1146.

H. During construction, make changes as necessary for proper functioning of SWPPP measures.

I. At completion of work, Contractor shall remove temporary SWPPP measures and dispose of any pollutants in legal manner offsite, or as otherwise required by SWPPP.

END OF SECTION

SECTION 01700

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:
1. Field engineering and surveying.
2. Requirements and limitations for cutting and patching of Work.
3. Cleaning throughout construction period.
4. Project Record Documents.
5. Closeout procedures.
6. Adjusting.
7. Operation and maintenance data.
8. Warranty and Guarantee.
9. Spare parts and maintenance materials.
10. Instruction to Owner's personnel.

1.02 FIELD ENGINEERING QUALITY CONTROL

A. Employ Land Surveyor registered in the State of California and acceptable to Architect.

B. Submit name, address and telephone number of Surveyor before starting survey work.

C. Maintain complete and accurate log of control and survey Work as it progresses.

D. On completion of foundation walls, floor slabs and major site improvements, prepare a certified survey illustrating dimensions, locations, angles and elevations of construction.

1.03 SURVEY REFERENCE POINTS

A. Contractor to locate and protect survey control and reference points.

B. Control datum for survey is that established by Owner provided survey.

C. Protect survey control points prior to starting site Work; preserve permanent reference points during construction.

D. Promptly report to the Architect loss of destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to the Architect.

1.04 SURVEY REQUIREMENTS

A. Provide field engineering services. Utilize recognized engineering survey practices.

B. Establish a minimum of two permanent 3-inch diameter brass plate benchmarks on site, referenced to established control points. Record locations, with horizontal and vertical data on Project Record Documents. Establish additional temporary bench marks at all floor levels.

C. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means, make use of laser instrumentation. Field Engineering and Staking furnished and paid for by Contractor.
   1. Site improvements including pavements; stakes for grading, fill placement; utility locations, slopes, invert elevations and batter boards.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.
   4. Floor elevations of existing structures that relate to project.
   5. Partition layouts on rough floor as a guide to all trades.

D. Periodically verify layouts by same means.

1.05 EXISTING CONDITIONS

A. Before beginning Work, investigate and verify existence and location of mechanical and electrical systems and other construction affecting Work, including underground utilities.
   1. Before construction, survey and record points of connection of utility services.
   2. Locate invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
   3. Employ a utility service locator company to locate underground utilities.
   4. Verify Owner's Record Drawings.
   5. Furnish survey of existing utilities.

1.06 CUTTING AND PATCHING

A. Where Work requires that particular existing building element such as partition, wall, paving, window, or similar element of existing building construction be removed, it is the intention of this Specification that such Work be part of the Demolition Section and not part of Cutting and Patching.

B. New Work required to replace such removals is considered as part of separate sections of Specifications covering similar new construction.

C. Where incidental cutting and patching is required for installation of specific item or piece of equipment (including piping, ductwork, conduit, etc.) all such cutting and patching is considered to be specified as part of Section requiring cutting and patching.

D. Contractor shall verify and check areas to be cut and patched and shall coordinate Work of various trades involved.

E. Where doubt exists as to size, location, or method of cutting concrete or any other structural element, Contractor shall contact Architect before proceeding.

F. Where doubt exists, Contractor shall distinguish between "cutting" and "demolition".

G. Unless specifically designated otherwise, existing Work cut, altered, or revised to accommodate new Work shall be patched to duplicate undisturbed adjacent finishes, colors, textures, and profiles. New Work in existing portions shall also be finished to match adjacent existing Work unless noted otherwise.

H. Submit written request in advance of cutting or alteration which affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather-exposed or moisture-resistant element.
   3. Efficiency, maintenance or safety of any operational element.
   4. Visual qualities of sight exposed elements.

5. Work of Owner or separate Contractor.
6. Coordinated Drawings in accordance with Division 01, General Requirements (Section 01 30 00).

I. Include in request:
1. Identification of Project.
2. Location and description of affected Work.
3. Necessity for cutting or alteration.
4. Description of proposed Work and products to be used.
5. Alternatives to cutting and patching.
6. Effect on Work of Owner or separate Contractor.
7. Written permission of affected separate Contractor.
8. Date and time Work will be executed.

1.07 QUALITY ASSURANCE – CLEANING

A. Inspection: Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.

B. Codes and Standards: In addition to requirements specified herein, comply with pertinent requirements of authorities having jurisdiction.

C. For final cleaning, use only professional cleaning company experienced in commercial cleaning.

1.08 PAYMENT WITHHELD – CLEANING

A. Architect reserves right to withhold certification of payment requests for failure on part of Contractor to regularly clean Project in conformance with Requirements of this Section.

1.09 CLOSEOUT PROCEDURES

A. Owner Occupancy:
1. Conform to Part 1, Title 24, Section 4-336 CCR Requirements for Verified Reports and Closeout Procedures.
2. In conjunction with Project Inspector, Contractor shall prepare list of items to be completed or corrected (Punchlist). List may be developed by areas when approved by Architect.
3. Within reasonable time after receipt of list, Architect will inspect to determine status of completion.
4. Should Architect determine that Work is not complete.
   a. Architect will promptly notify Contractor in writing, giving reasons for his determination.
   b. Contractor shall remedy deficiencies and notify Architect when Work is ready for re-inspection.
   c. Architect will re-inspect Work.
5. When Architect concurs that Work is substantially complete and ready for occupancy.
   a. Owner will prepare the Notice of Completion Architect will prepare a Certificate of Substantial Completion accompanied by Contractor's list (Punchlist) of items to be completed or corrected as verified by Architect.
   b. The Certified Notice of Completion will be submitted to the Owner and to Contractor for their written acceptance of responsibilities assigned to them in such notice.
   c. Contractor shall provide consent by insurer for Partial or Beneficial Occupancy

B. Final Completion:
   1. Prepare and submit notice that Work is ready for final inspection and acceptance.
   2. Verify Work is complete.
   3. Clarify that:
      a. Work has been inspected by all governing agencies and is in compliance with Contract Documents.
      b. Work has been completed in accordance with Contract Documents.
      c. Equipment and systems have been tested as required and are operational.
      d. Work is completed and ready for final inspection.
   4. Architect will make an inspection to verify status of completion.
   5. Should Architect determine Work is incomplete or defective:
      a. Architect will promptly notify Contractor in writing, listing incomplete or defective Work.
      b. Contractor shall remedy deficiencies promptly and notify Architect when ready for re-inspection.
   6. When Architect determines Work is acceptable under the Contract Documents, he will request Contractor to make closeout submittals.

C. Closeout Submittals include, but are not necessarily limited to:
   1. Inspection Procedures.
   2. Project Record Documents.
   3. Operation and maintenance data for items so listed in pertinent Sections of these Specifications and for other items when so approved by Architect.
   4. Warranties and Guarantees.
   5. Keys and keying schedule.
   6. Spare parts, materials, extra stock to be turned over to Owner.
   7. Evidence of payment and release of Stop Notices, when requested by Owner.
   8. List of subcontractors, service organizations and principal vendors, including names, addresses and telephone numbers, where they may be contacted for emergency service at all times, including nights, weekends and holidays.
   9. Final Site Survey.
   10. Notification of insurer for completion of Project.
   11. Submittal of extra stock of the materials installed.

D. Final Payment:
   1. Submit Final Payment Request, showing all adjustments to Contract Sum.
   2. Retention will be released no sooner than 35 days after Notice of Completion has been recorded with County Recorders Office.

1.010 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.011 PROJECT RECORD DOCUMENTS

A. Record Documents: As-Built Drawings, Project Manual with Specifications including but not limited to the documents required herein.

B. Owner will provide one set of drawings and one copy of Project Manual for use during construction to record changes made during construction.

C. Record Documents: As-Built drawings and Project Manual, record in concise manner using industry-standard drafting techniques on drawings, on weekly basis all actual revisions to Work:
   1. Changes made on Drawings, including Clarification Drawings.
   2. Changes made to Specifications.
   3. Changes made by Addenda.

4. Changes made by Construction Change Directives/Instruction Bulletins, Architect's Supplemental Instructions, minor changes.
5. Change Orders or other authorized Modifications to Contract.
6. Revisions made to shop drawings, product data and samples.

D. Store Record Documents separate from documents used for construction. Replace soiled or illegible documents.

E. Record information concurrent with construction progress.

F. Specifications: Legibly mark and record at each product Section description of actual products installed, including following:
1. Manufacturer's name, trade name, product model and number and supplier.
2. Authorized product substitutions or alternates utilized.
3. Changes made by Addenda and Modifications.

G. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Identify drains and sewers by invert elevation.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of Work. Identify ducts, dampers, valves, access doors and control equipment wiring.
4. Field changes of dimension and detail.
5. Details not on original drawings.

H. Obtain Inspector's signed certification that Record Documents have been fully updated prior to submitting monthly payment requests. Compliance is mandatory before payment will be made.

I. Submit Inspector's certified Record Documents to Architect with claim for final Application for Payment. Fully completed Record Documents are a prerequisite to final payment.

J. Record Drawings: In addition to the As-Built drawings required herein, upon completion of Work obtain a set of Project's reproducible drawings from Owner's Representative; incorporate all changes from the Record Documents. Include all Change Orders, addenda, Field Orders and as-installed conditions. All changes shall be neatly and legibly drawn to scale using standard architectural or engineering drafting practices. Identify set as "RECORD DRAWINGS". Deliver to the Owner's Representative (1) set of the reproducible drawings together with one (1) set of prints.

1.012 OPERATION AND MAINTENANCE DATA AND INSTRUCTIONS

A. Submit six (6) sets prior to final inspection, bound in 8-1/2 by 11 inch text pages, in binders with durable covers. Include operation and maintenance data for all items for which submittals are requested in individual Sections of Specifications.
1. Two completed manuals: One manual to Maintenance Department; one manual to Facilities Division.

B. Arrange for the installer of equipment that requires regular maintenance to meet with the Districts personnel to provide instruction in proper operation and maintenance. Include a detailed review of the following:
1. Maintenance manuals.
2. Spare parts and materials.

3. Tools.
4. Lubricants.
5. Control sequences.
6. Hazards.
7. Maintenance agreements and similar continuing commitments.
8. Time clocks zone, area, or station maps and charts.

1.013 WARRANTY AND GUARANTEE

A. Contractor, manufacturer's warranties and guarantees not withstanding, warrants entire Work against defects in materials and workmanship for twelve (12) months from date of Certified Notice of Completion. Warranties and guarantees between Contractor and manufacturers and Contractor and suppliers shall not affect warranties or guarantees between Contractor and Owner. Refer to General and Supplementary Conditions for additional requirements.

B. Execute and assemble documents from subcontractors, suppliers and manufacturers.

C. Submit prior to final Application for Payment.

D. For items of Work delayed beyond date of Notice of Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of Guarantee Period.

1.014 WARRANTIES – FORM OF SUBMITTALS

A. Bind in commercial quality, 8-1/2 by 11 inch, three-ring side binders with hardback, cleanable, plastic covers.

B. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible principal.

C. Table of Contents: Neatly typed, in sequence of Table of Contents of Project Manual, with each item identified with number and title of Specification Section in which specified, and name of product or Work item.

D. Separate each warranty or bond with index tab sheets keyed to Table of Contents listing. Provide full information, using separate typed sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.015 WARRANTIES – PREPARATION OF SUBMITTALS

A. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item or Work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until date of Certified Notice of Completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

1.016 WARRANTIES – TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with Owner's permission submit documents within ten days after acceptance.

B. Make other submittals within ten days after date of Certified Notice of Completion, prior to final Application for Payment.

C. For items of Work when acceptance is delayed beyond date of Notice of Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty period.

1.017 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections.

B. Deliver to project site location as directed by Owner.

1.018 INSTRUCTIONS TO OWNER'S PERSONNEL

A. Instruct Owner's personnel in proper operation and maintenance of all systems, equipment and similar items which were provided as part of Work. Provide maintenance and inspection schedules that conform to manufacturer's recommendations.

B. Contractor shall provide schedule to Owner for approval for each of instruction periods required.
   1. Organize instruction sessions into group sizes and schedule elapsed time for instruction in manner to provide complete coverage of subject matter.

C. Instruction sessions will be held in Owner designated area on project site and at Owner's convenience. Amount of time required for each session shall be as specified in individual sections.

D. Instructors shall be qualified by product manufacturer in subject matter presented at each session.
   1. Submit names of instructors and qualifications to Architect and Owner for approval, 30 days prior to each scheduled session.
   2. Substitution of instructors will not be permitted without prior approval of Architect or Owner.

PART 2 - PRODUCTS

2.01 MATERIALS – CUTTING AND PATCHING

A. Primary Products: Those required for original installation.

2.02 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment and materials needed to maintain specified standard of cleanliness.

2.03 COMPATIBILITY

A. Use cleaning materials and equipment that are compatible with surfaces being cleaned, as recommended by manufacturer of material to be cleaned.

PART 3 - EXECUTION

3.01 EXAMINATION – CUTTING AND PATCHING

A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching. Confirm status and current warranties and guarantees.

B. Indicate proposed routing of utilities in Coordinated Drawings and submit to Architect. Do not commence coring cutting operations prior to approval of Coordinated Drawings.

C. After uncovering existing Work, inspect conditions affecting performance of Work.
1. Prior to cutting, boring or drilling through new or existing structural members or elements including reinforcing bars not specifically detailed, Contractor shall prepare detailed drawings for review and approval by Architect, Structural Engineer of Record and DSA Field Engineer. Approval by DSA is required prior to commencement of Work. Agency approvals will be obtained by Architect not Contractor.

D. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION – CUTTING AND PATCHING

A. Provide temporary support to ensure structural integrity of Work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas that may be exposed by uncovering Work.

C. Maintain excavations free of water.

3.03 CUTTING AND PATCHING

A. Execute cutting, fitting, and patching to complete Work.

B. Fit products together, to integrate with other Work.

C. Uncover Work to install ill-timed Work.

D. Remove and replace defective non-conforming Work.

E. Provide openings in Work for penetration of mechanical and electrical Work.

3.04 PERFORMANCE – CUTTING AND PATCHING

A. Execute Work by methods to avoid damage to other Work and which will provide appropriate surfaces to receive patching and finish.

B. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

C. Restore Work with new products in accordance with requirements of Contract Documents.

D. Fit Work air tight to pipes, sleeves, ducts, conduits and other penetrations through surfaces.

E. At penetrations of fire-rated walls, partitions, ceiling or floor construction, completely seal voids with fire-rated devices or materials in accordance with Section 07 84 00 to full thickness of penetrated element.

F. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.05 SLEEVES AND HANGERS

A. Provide conduit, outlets, piping sleeves, boxes, inserts or other materials or equipment necessary to be built into Work. Promptly furnish same and set such sleeves or other materials as construction program required.

B. In event delays occur in delivery of sleeves or other materials, arrange to have boxes or other forms set at locations where piping or other material is to pass through or into slabs or other Work.

C. Upon subsequent installation of sleeves or other material, install fill materials as required. Necessary expenditures incurred for boxing out or filling shall be without extra cost to Owner.

3.06 PROGRESS CLEANING

A. General:
1. Comply with all requirements of Owner's Storm Water Pollution Prevention Plan, Section 01 57 23.
2. Retain stored items in orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing required protection of materials.
3. Do not allow accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
4. At least twice each month, and more often if necessary, remove scrap, debris, and waste material from jobsite.
5. Provide adequate storage for items waiting removal from jobsite, observing requirements for fire protection and protection of ecology.

B. Site:
1. Daily, and more often if necessary, inspect site and pick up all scrap, debris, and waste material. Remove items to place designated for their storage. Combustible waste shall be removed from site. Flammable waste shall be kept in sealed metal containers until removed from site.
2. Weekly, and more often if necessary, inspect, arrangements of materials stored on site, re-stack, tidy, or otherwise service arrangements to meet requirements specified above.
3. Maintain site in neat and orderly condition.

C. Structures:
1. Weekly, and more often if necessary, inspect structures and pick up scrap, debris, and waste material. Remove items to place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.
   a. "Clean", for purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom, i.e., "broom-clean".
3. As required preparatory to installation of succeeding materials, clean structures of pertinent portions thereof to degree of cleanliness recommended by manufacturer of succeeding material, using equipment and materials required to achieve required cleanliness.
4. Following installation of finish floor materials, clean finish floor daily, and more often if necessary, and while Work is being performed in space in which finish materials have been installed.
   a. "Clean", for purpose of this subparagraph, shall be interpreted as meaning free from foreign materials which, in opinion of Architect, may be injurious to finish floor material, i.e., "vacuum clean".

3.07 FINAL CLEANING

A. Definition: Except as otherwise specifically provided, "clean", for purpose of Article, shall be interpreted as meaning level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials, i.e., "scrub and polish clean".

B. General: Complete following cleaning operations before requesting inspection for certification of Notice of Completion.
   1. Prior to completion of Work, remove from jobsite all tools, surplus materials, equipment, scrap, debris, and waste, conduct final progress cleaning as described above.
   2. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      a. Unless otherwise specifically directed by Architect, water and broom clean paved areas on site and public paved areas directly adjacent to site. Remove resultant debris.
   3. Rake grounds that are neither planted nor paved to smooth, even-textured surface.
   4. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces

C. Structures:
   1. Exterior: In areas affected by Work under this Contract, visually inspect exterior surfaces and remove traces of soils, waste material, smudges and other foreign matter. Remove traces of splashed material from adjacent surfaces. If necessary to achieve uniform degree of exterior cleanliness, hose down exterior of structure. In event of stubborn stains not removable with water, Architect may require light sandblasting or other cleaning at no additional cost to Owner.
   2. Interior: In areas affected by Work under this Contract, visually inspect interior surfaces and remove traces of soil waste material, smudges, and other foreign matter. Remove traces of splashed materials from adjacent surfaces. Remove paint drippings, spots, stains, and dirt from finished surfaces. Use only cleaning materials and equipment instructed by manufacturer of surface material.
   3. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
   4. Polished Surfaces: On surfaces requiring routine application of buffed polish, apply polish recommended by manufacturer of material being polished. Glossy surfaces shall be cleaned and shined as intended by manufacturer.
   5. Carpet: Use only dry-chemical method of cleaning. Steam cleaning or water based cleaning shall not be used on carpet. Use only dry-chemical materials and methods fully approved by carpet manufacturer, as instructed in manufacturer's published literature.
   6. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

D. Mechanical and Electrical Systems
   1. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   2. Replace parts subject to unusual operating conditions.
   3. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

4. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
5. Clean ducts, blowers, and coils if units were operated without filters during construction
6. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

E. Timing: Schedule final cleaning acceptable to the Architect to enable Owner to accept completely clean project.

3.08 CLEANING DURING OWNER'S OCCUPANCY

A. Should Owner occupy Work or any portion thereof prior to its completion by Contractor and acceptance by Owner, responsibilities for interim and final cleaning of occupied spaces shall be determined by Architect in accordance with General Conditions of the Contract.

END OF SECTION

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SECTION 01730

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Division 01 Section "Selective Structure Demolition" for demolition of selected portions of the building.
2. Divisions 02 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.03 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.04 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Fire-suppression systems.
3. Mechanical systems piping and ducts.
4. Control systems.
5. Communication systems.
6. Electrical wiring systems.

C. Miscellaneous Elements: 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. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping, ductwork, vessels, and equipment.
5. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. 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. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.03 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

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. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, 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.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01730

SECTION 01740

CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Throughout the construction period maintain the buildings and site in a standard of cleanliness as described in this section, including site, public roadway and existing buildings adjacent to new construction.

B. Related work described elsewhere: In addition to standards described in this section, comply with all requirements for cleaning as described in other sections of these Specifications.

1.02 QUALITY ASSURANCE

C. Inspection: Daily, and more often if necessary, conduct inspection to verify that requirements of cleanliness are being met.

D. Codes and standards: In addition to the standards described in this section, comply with all pertinent requirements of Division of the State Architect and City codes.

PART 2 - PRODUCTS

2.01 CLEANING MATERIALS AND EQUIPMENT

A. Use only cleaning materials and equipment that are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION

3.01 PROGRESS CLEANING

A. General:

1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of the work.
3. At least once each week, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
4. Provide adequate storage for all items awaiting removal from the job site; observe requirements for fire protection and protection of the ecology.
5. Provide sufficient number of personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site; restack, straighten, or otherwise service all arrangements to meet the requirements of Paragraph 3.01, A.1 above.

3. Maintain the site in a neat and orderly condition at all times.

C. Structures:

1. Weekly, or more often if necessary, clean areas outside the work area, affected by dust or debris. Include windows, building walls, asphalt, and any items on which dust collects.

3.02 STREET CLEANING

A. During delivery of dirt, clean the site, streets and public ways at the end of each day. Clean street as far as dirt can be detected as coming from the site.

B. Broom-clean all paved areas on the site and all public paved areas directly adjacent to the site. Completely remove all resultant debris. Wash down entire area with a hose to remove all traces of dirt.

3.03 FINAL CLEANING

A. Definition: Except as otherwise specifically provided, "clean," for the purpose of this Article, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality cleaning maintenance equipment and materials.

B. General: Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, buildings, sheds, scrap, debris, and waste. Conduct final progress cleaning as described in Article 3.01 above.

C. Site:

1. Asphaltic Concrete and Concrete Pavers: Clean all areas on the site and all public, paved areas directly adjacent to the site. Completely remove all resultant debris.

   a. Use a commercial street sweeper for areas over 3,000 square feet.

   b. Broom and then wash down entire area with a hose to remove all traces of dirt for areas under 3,000 square feet.

2. Concrete and Concrete Pavers. Remove stains that cannot be removed with water with an acid wash. Remove tire tracks, oil, paint and any other foreign material.

3. Lawn areas shall be raked of all dirt and debris. Plants and trees shall be cleaned with water to remove all dust. Replace damaged planting with similar size and type of plant.

D. Structures:

1. Exterior: Visually inspect all exterior surfaces and remove all traces of soil, waste material, smudges, labels, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Hose down the exterior of the structure and clean all windows such that there are no streaks or drop stains. In the event of stubborn stains, not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the District.

2. Timing: Schedule final cleaning such that the areas can be protected and will not become dirty prior to move-in by the District.

3.04 CLEANING DURING DISTRICT'S OCCUPANCY

A. Should the District occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the District, responsibilities for interim and final cleaning of the occupied spaces may be modified by the Architect.

END OF SECTION

SECTION 01780

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents, as described in Article 3.01 below.

2. Contractor shall periodically transfer the recorded changes to a set of "as-built" documents, as described in Article 3.02 below, and submit such "as-builts" to Architect.

B. Related work described elsewhere: Section 01330, SUBMITTAL PROCEDURES.

1.02 QUALITY ASSURANCE

A. General: Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Provide the Architect with the name of the person selected.

B. Accuracy of records: Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of a clean set of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Accuracy of records shall be such that future searches for items shown in the Contract Document may reasonably rely on information obtained from the approved Record Documents.

C. Timing of entries: make all entries within 24 hours after receipt of information.

1.03 SUBMITTALS

A. General: The Architect's approval of the current status of Record Documents will be a prerequisite to the Architect's signature on requests for progress payment and request for final payment under the Contract.

B. Progress submittals: Prior to submitting each request for progress payment, secure the Inspector of Record's approval of the Record Documents as currently maintained.

C. Final submittals: Prior to submitting request for final payment, submit the Final Record Documents to the Architect and secure his approval.

1.04 PRODUCT HANDLING:

A. Use all means necessary to maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the work and transfer of the recorded data to the Final Record Documents. In the event of loss of recorded data, use all means necessary to secure the data to the Architect's approval; such means shall include, if necessary in the opinion of the Architect, removal and replacement of concealing materials and, in such case, all replacements shall be to the standards originally specified in the record Documents.

PART 2 - PRODUCTS

2.01 RECORD DOCUMENTS

A. Promptly following award of Contract, mark one set of documents as "RECORD DOCUMENTS - JOB SET".

PART 3 - EXECUTION

3.01 MAINTENANCE OF JOB SET

A. Preservation:

1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed devise a suitable method for protecting the "RECORD DOCUMENTS - JOB SET."

2. Do not use the Job Set for any purpose except entry of new data and for review by the Architect.

3. Maintain the Job Set at the job site.

B. Making entries on drawings: Using an erasable colored pencil (not ink or indelible pencil). clearly describe the change by note and by graphic line, as required. Date all entries. Call attention to the entry by a "cloud" around the area or areas affected. In the event of overlapping changes, different colors may be used for each of the changes.

C. Making entries on other documents:

1. Where changes are caused by directives issued by the Architect, clearly indicate the change by note in ink, colored pencil, or rubber stamp.

2. Where changes are caused by Contractor-originated proposals, accepted by the Architect, including errors by the Contractor that have been accepted by the Architect, clearly indicate the change by note in erasable colored pencil.

3. Make entries in the pertinent documents as approved by the Architect.

D. Conversion of schematic layouts:

1. In most cases on the Drawings, arrangement of conduits and circuits, piping, ducts, and other similar items is shown schematically and is not intended to portray precise physical layout. Final physical arrangement is as determined by the Contractor subject to the Architect's approval. However, design of future modifications of the facility may require accurate information as to the final physical arrangement of items that are shown only schematically on the Drawings.

2. Show on the job set of Record Drawings, by dimension accurate to within 1", the centerline of each run of items such as is described in Paragraph 3.01 D.1. above. Clearly identify the item by accurate note such as “CAST-IRON DRAIN," "GALV. WATER," etc. Show, by symbol or note, the vertical location of the item ("under slab," "in ceiling plenum," "exposed," etc.). Make all identification sufficiently descriptive that it may be related reliably to the Specifications.

3. The Architect may waive the requirements for conversion of schematic data where, in the Architect's judgment, such conversion serves no beneficial purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Architect.

4. Timing of entries: Be alert to changes in the work from how it is shown in the Contract Documents. Promptly, and in no case later than 24 hours after the change has occurred and been made known to the Contractor, make the entry or entries required.

E. Accuracy of entries: Use all means necessary, including the proper tools for measurement, to determine actual locations of the installed items.

3.02 FINAL RECORD DOCUMENTS

A. General: The purpose of the Final Record Documents is to provide factual information regarding all aspects of the work, both concealed and visible, to enable future modification of design to proceed without lengthy and expensive site measurement, investigation, and examination.

B. Approval of recorded data prior to xerographic reproduction: Secure a review by the Architect of all recorded data. Make all required revisions.

C. Transfer of data to Drawings: Carefully transfer all change data shown on the Job Set of Record Drawings to the corresponding Final Set, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items described in Paragraph 3.01 E. above. Call attention to each entry by drawing a "cloud" around the area or areas affected. Make all change entries on the final set neatly, consistently, and in ink or crisp black pencil. If Job Set has been maintained legibly throughout, the Final Set may be produced by xerographic reproduction of the Job Set.

D. Review and approval: Submit the completed total set of Record Documents to the Architect as described in Paragraph 1.03 C. above. Participate in review meeting or meetings as required by the Architect, make all required changes in the Record Documents, sign and date Record Documents, and promptly deliver the Final Record Documents to the Architect.

3.03 CHANGES SUBSEQUENT TO ACCEPTANCE:

A. The Contractor shall have no responsibility for recording changes in the work subsequent to acceptance of the work by the District, except for changes resulting from replacements, repairs, and alterations made by the Contractor as part of his guarantee.

END OF SECTION

SECTION 01800

FACILITIES OPERATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:
   1. Starting systems.
   2. Demonstration and instructions.
   3. Testing, adjusting and balancing.

1.02 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner 7 days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence or other conditions that may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for each equipment are complete and tested.

F. Execute start-up under supervision of responsible manufacturer's representative or approved Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual Specification Sections require manufacturer to provide authorized representative to be present as site to inspect, check and approved equipment or system installation prior to start-up and to supervise placing equipment or system in operation.

H. Submit written report that equipment or system has been properly installed and is functioning correctly.

1.03 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Product to Owner's personnel two weeks prior to date of Notice of Completion.

B. Demonstrate Project equipment and provide instruction by qualified manufacturer's representative who is knowledgeable about Project.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance and shutdown of each item of equipment at agreed-upon times at equipment location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. Amount of time required for instruction on each item of equipment and system is that specified in individual Sections.

1.04 TESTING, ADJUSTING AND BALANCING OF EQUIPMENT

A. Refer to Division 15 Heating, Ventilating, and Air Conditioning.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 02010

SUB SURFACE CONDITIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General: Geotechnical Investigation Reports have been prepared as follows:

1. Geotechnical Investigation, Proposed Warehouse Conversion to classrooms, Fitness Center and Restrooms at Del Mar High School, 312 South Del Mar Avenue, City of San Gabriel, California.
2. A copy of this report is included as an appendix to this Specifications Manual.
3. Refer also to Section 02200 and General Notes on the Civil Drawings.

B. Use of data:

1. The soil investigation reports and their recommendations are part of this Contract, but are not a warranty of subsurface conditions.
2. Bidders should visit the site and acquaint themselves with existing conditions.
3. Should the Contractor encounter a discrepancy in the Contract Documents with the recommendations as cited in the aforementioned Soils Report, the Contractor shall notify the Geotechnical Consultant and Architect immediately, prior to commencing with the work, and request formal direction on how to proceed.

1.02 QUALITY ASSURANCE

A. Geotechnical Consultants will be retained by the District to observe performance of work in connection with excavating, trenching, filling, back filling, and grading.

B. Readjust all work performed that does not meet technical (including all standard industry practices) or design requirements. Do not deviate from the Contract Documents without written approval from the District.

PART 2 -

NOT USED

PART 3 -

NOT USED

END OF SECTION

SECTION 02070

SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.01 RELATED SECTIONS

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

1.02 DESCRIPTION

A. The extent of demolition work is as shown on Drawings and as required to install new work, including labor materials, services, insurance, permits and equipment to carry out the work in accordance with applicable federal, state and local regulations.

B. Demolition includes removal and legal disposal of demolished materials, as shown on drawings and herein specified, and as required to connect with the new work.

1.03 SUBMITTALS

A. None required

1.04 JOB CONDITIONS

A. Dust Control: Provide adequate and frequent dust control methods as required to prevent complaints from surrounding area residents, school staff, and as required to prevent contaminating the work area.

1.05 REGULATORY REQUIREMENTS

A. The Contractor shall be fully responsible to perform notification of all federal state and local authorities, including but not limited to:

1. South Coast Air Quality Management District (SCAQMD). Written notification is required 10 days prior to commencement of activities.
2. Federal EPA as required under the National Emission Standard for Hazardous Air Pollutants (NESHAPS) (40 CFR 61,Subpart M).
3. Environmental protection Agency Protection Agency (EPA).
4. Department of Health and Safety (DOHS).
5. California/Occupational Safety and Health Ad ministration (CAL/OSHA).
6. South Coast Air Quality Management District (SCAQMD).
7. National Emission Standard for Hazardous Air Pollutants (NESHAPS).

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Requirements for satisfactory soil materials are specified in Division 2 Section 02200 Earthwork.

1. Obtain approved borrow soil materials off-site when sufficient satisfactory soil materials are not available on-site.

3.01 DEMOLITION

A. Pollution Controls: Use temporary enclosures, watering and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level.

B. Demolition: Demolish items as indicated in the drawings and remove from site.

C. Utilize appropriate tools so edges and surfaces are suitable for new materials attachment. Sawcut asphalt and concrete where adjacent to work that is to remain.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

A. Removal: Work to be salvaged or reinstalled shall be removed to prevent damage. Work to be disposed of becomes the property of the Contractor, who shall remove it from the site for disposal at a legal dumping site. Debris shall be cleaned and disposed of by Contractor promptly and continuously as work progresses. Secure and pay for required hauling permits and pay dumping fees and charges.

3.03 SITE ITEM DEMOLITION

A. Asphaltic concrete paving and ramps. Remove asphalt and base to native soil.

B. Sign poles and walls. Remove entire item above and below grade and related footings.

C. Concrete: Remove slabs, curbs, footings and thickened edges.

D. Raised Planters: Remove planter, shrubbery and soil.

E. Bike Racks, handrails, chainlink fencing and other pipe supported items: Remove item, sleeves, and entire footings.

3.04. IRRIGATION

A. Remove irrigation system and cap lines at the control valves. Reconnect lines, cut off by the work, but needed to irrigate adjacent planting.

B. Install new lines where needed to maintain the existing system.

1 Trench and backfill for lines needed to reconnect the system.

2. Provide PVC water lines of a size sufficient to supply the remaining irrigation heads.

3. Install new control valves and related wiring to supply remaining system.

4. Reroute valve wiring and reprogram irrigation controller.

3.05 UTILITIES

A. Remove utilities that interfere with the work in their entirety. Cut and cap utility at an appropriate location, beyond the extents of the work, and locate on as-built drawings.

B. Where possible, remove utility back to meter or panel board.

C. Remove conductors from conduits that are partially abandoned.

D. Utility pipes and conduits that do not interfere with the work may be abandoned in place if appropriately capped. Remove conductors in all cases.

3.06 CLEARING AND GRUBBING

A. Remove, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain.

2. Completely remove stumps, roots, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.

3. Remove concrete sidewalk or other obstructions in order to remove roots to a sufficient depth. Replace items removed after removal of stumps.

3.07 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

3.08 CLEANING

A. Clean adjacent structures and areas of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition prior to the start of work.

END OF SECTION 02070

SECTION 02080

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:

1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.
2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
3. Division 01 Section "Cutting and Patching" for cutting and patching procedures.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.

4. Locations of proposed dust- and noise-control temporary partitions and means of egress.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
6. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

C. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meeting." Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.06 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

1. Comply with requirements specified in Division 01 Section "Summary of Work."

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

   1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

    a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.

E. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

F. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02080

SECTION 02100

LAYOUT, SURVEYING AND STAKING

PART 1 - GENERAL

1.01 SCOPE

A. Work included:

1. Construction layout through the duration of the project.
2. Surveying, staking and related work for the grading process.

B. Related work described elsewhere:

1. Section 01350: Special Project Procedures
2. Section 01500: Temporary Facilities & Controls
3. Section 01780: Project Record Documents
4. Section 02070: Selective Demolition
6. Section 02200: Earthwork
7. Appendix A: Geotechnical Report

1.02 SURVEY MONUMENTS

A. Coordinate the tagging and protection of existing survey monuments during the course of work. Provide required information to contractors for the replacement of monuments or stakes damaged during course of work.

1.03 SUBMITTALS

A. Certificates: Submit a certificate signed by the land surveyor or professional engineer certifying the location and elevation of improvements made to the site.

B. Final Property Survey: Submit a reproducible copy, 1(one) photographic copy and 2 (two) compact discs (done on PC based AutoCad 2008) of the final property survey.

1.04 QUALITY ASSURANCE

A. Surveyor Qualifications: Engage a land surveyor registered in California, to perform required land-surveying services.

B. Survey shall conform to Section 2-9 of the Standard Specifications for Public Works Construction

1.05 DIGITAL FILES

A. The District's digital files of the site will not be provided.

PART 2 - MATERIALS

NOT USED

PART 3 - EXECUTION

3.01 LAYOUT AND STAKING FOR CONSTRUCTION

A. The work required and defined in this section shall be provided by a registered Civil Engineer or Licensed Surveyor for the purpose of establishing principal lines and grades for site work construction and overall project layout. Submit name of Registered Civil Engineer or Licensed Surveyor to Architect for review. The following work is required:

1. Confirm dimensions between existing buildings, new work, and property lines indicated on the plans.
2. Establish horizontal grid control for site to provide basis for locating building pads, utilities, and other facilities. Confirm locations of existing buildings.
3. Flag limits of construction.
4. Provide stakes for building location and grade.
5. Provide stakes for alignment and grade of utilities, including storm and sanitary sewers.
6. Provide stakes for existing sewer line showing inverts.
7. Provide stakes for alignment and grade of all curbs, header boards, driveways, etcetera, with sufficient additional stakes in pavement surface areas as required, to allow grading contractor to meet the grading tolerances specified.
8. Tracing of site work layout plan with as-staked locations for site work construction.
9. Provide stakes for establishing location of field density tests as requested by the Geotechnical Consultant.
10. Provide stakes for remedial removal excavation as requested by the Geotechnical Consultant.

B. Survey Control Data (both horizontal and vertical), tied to known benchmarks and monuments, will be provided by the Contractor.

C. It is the Contractor's responsibility to review the plans for other concurrent and separate contracts, future on-site construction, Construction Manager's staging requirements, and other similar conditions in order to accurately layout rough grading and utilities work.

D. Final Property Survey: Upon completion of the work, prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey.

1. Survey shall identify and dimension, including depth of capped utilities.

END OF SECTION 02100

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The latest adopted edition of the Standard Specifications for Public Works Construction applies to the work of this section.

B. Geotechnical Report(s) have been prepared for the site. The reports are a part of this contract and are attached.

1.02 DESCRIPTION OF WORK

A. Extent of earthwork is indicated on drawings.

B. Aggregate Base Course and Subgrade Preparation are part of this work.

C. Earthwork shall include unclassified excavation.

D. Unclassified fill and borrow excavation are defined in Section 300 of the Standard Specifications for Public Works Construction.

1.03. RELATED WORK DESCRIBED ELSEWHERE:

1. Section 01350: Special Project Procedures
2. Section 01500: Temporary Facilities and Controls
3. Section 01780: Project Record Documents
5. Section 02100: Layout, Surveying and Staking
6. Geotechnical Report

1.04 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable ordinances of governing authorities having jurisdiction, including but not limited to the Uniform Building Code supplements, Chapter 33, Titles 8, 21 and 24 of the California Code of Regulations and Section 300 of the Standard Specifications for Public Works Construction.

B. Testing and Inspection Service: The Owner will engage a qualified soil testing and inspection service for quality control testing during earthwork operations.

C. Survey: See Section 02100.

D. In order to make provision for minor adjustments required by local conditions, inaccuracies, or discrepancies, the contractor shall, after critical limits of major work areas have been staked out, arrange for on site meetings with the owners before commencing grading operation.

1.05 SUBMITTALS

A. Test Reports-Excavating: Submit the following reports directly to engineer from the testing service, with a copy to the owner:

1. Test reports on borrow material.
2. Verification of each footing subgrade.

3. Field density test reports.
4. One optimum moisture-maximum density curve for each type of soil encountered.
5. Other test reports as required by the Soils Engineer and the local cognizant agency.

1.06 JOB CONDITIONS

A. Site Information: Soil reports or borings were performed at this location and are available in the soils report. The contractor, at no cost, may make additional test borings and other exploratory operations to the owner.

B. Existing Utilities: Utilities shown on the plans are shown pursuant to a search of available records and are shown as a matter of information and not as a matter of fact. The contractor shall locate existing underground utilities in areas of work. At utilities that are to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult District or utility owner immediately for direction. Cooperate with District and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of District or utility owner.
2. Do not interrupt existing utilities serving facilities occupied and used by owner and others, during occupied hours, except when permitted in writing by owner and then only after acceptable temporary utility services have been provided.
3. Provide a minimum of 48-hour notice to owner and receive written notice to proceed before interrupting any utility. Obtain clearance and notify all utility companies in the area and call an underground detector service. Deliver utility clearance ticket number to the Engineer prior to the start of any work.

C. Use of Explosives: The use of explosives is not permitted.

D. Protection of Persons and Property:

1. Protection and restoration of existing improvements shall conform to Section 7-9 of the Standard Specifications for Public Works Construction.
2. Barricade open excavations occurring as part of this work. When excavations are in a public way, post with warning lights.
3. Operate and maintain warning lights as recommended by authorities having jurisdiction.
4. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

E. Trenching: Attention is directed to the provisions of Section 6705 of the Labor Code concerning trench excavation.

F. Air Pollution Control: The contractor shall comply with all air pollution control rules, regulations, ordinances and statutes which apply to work performed pursuant to the contract, including any air pollution control rules, regulations, ordinances and statutes, specified in Section 1107 of the Government Code.

G. Water Pollution and Erosion Control: The contractor shall provide and maintain a SWPPP.

1. Nothing in the terms of the contract nor in these provisions shall relieve the contractor of the responsibility for compliance with Section 5650 and 12015 of the Fish and Game Code, or other applicable statutes relating to prevention or abatement of water pollution.
2. When borrow material is obtained from other than commercially operated sources, erosion of the borrow site during and after completion of the work shall not result in water pollution. The material source shall be finished, where practicable, so that water will not collect or stand therein.

H. The contractor shall also conform to the following provisions:

1. Water containing mud or silt from aggregate washing or other operations shall be treated by filtration, or retention in a settling pond, or ponds, adequate to prevent muddy water from entering the sewer or storm drain system.
2. Oily or greasy substances originating from the contractor's operations shall not be allowed to enter or be placed where they will later enter the sewer or storm drain system.
3. Compliance with the requirements of the section shall in no way relieve the contractor of his responsibility to comply with the other provisions of the contract, in particular the responsibility for damage and for preservation of property.

I. Use of Pesticides: The contractor shall comply with all rules and regulations of the Department of Food and Agriculture, the Department of Health, the Department of Industrial Relations and all other agencies which govern the use of pesticides required in the performance of the work on the contract.

1. Pesticides shall include but shall not be limited to herbicides, insecticides, fungicides, rodenticides, germicides, manatocides, bactericides, inhibitors, fumigants, defoliants, soil sterilants, and repellents.
2. Any substance or mixture of substances intended for preventing, repelling, mitigating or destroying weeds, insects, diseases, rodents, or nematodes and any substance or mixture of substances intended for use as a plant regulator, defoliant shall be considered a pesticide.

J. Sound Control Requirements: The contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the contract.

1. Each combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler.

K. Permits Required: The contractor shall apply for and pay all fees and obtain permits required for the execution of this work, including NPDES permits. The contractor shall provide all licenses, proofs of insurance, security and calculations required to obtain such permits. Where owner approval is needed for a permit, contractor shall complete all application forms, secure owner's signature, and then process the application.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Definitions

1. Satisfactory soil materials are defined as those complying with ASTM D 2487 soil classification groups GW, GP, GM, SM, SW and SP.
2. Unsatisfactory soil materials are defined as those complying with ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

B. Backfill and Fill Materials: Satisfactory soil material free of clay, rock or gravel larger than 2 inch in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter having a minimum sand equivalent of 20.

C. Processed Miscellaneous Base Materials: All processed miscellaneous base materials shall conform to Section 200-2.5 of the Standard Specifications for Public Works Construction.

D. ML soils, that cannot be used, are noted in the soils report to be on the site.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavation is unclassified, and includes overexcavation and excavation to subgrade elevations, regardless of character of materials and obstructions encountered, pursuant to Section 300-2 of the Standard Specifications for Public Works Construction.

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as removal work not directed by engineer, shall be at contractor's expense.
2. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the Architect.
3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Architect.

B. Overexcavation at building pads and footings, including retaining wall footings.

1. The onsite soils should be overexcavated to a minimum depth of 5 feet below finish grade, or 3 feet below the bottom of the lowest footing, whichever is lower. Overexcavation shall extend 5 feet beyond the limits of the foundation. Soil shall be reprocessed in place to 90 percent relative compaction. The Geotechnical Engineer, prior to placing fill during grading, shall observe actual depth of Overexcavation. When excavation has reached required elevations, notify the soils engineer who will make an inspection of the conditions.
2. If unsuitable bearing materials are encountered at required overexcavation elevations bring to the attention of the soils engineer. Carry excavations deeper and replace excavated material as may be directed by soils engineer and in accordance with Section 300-2.2-1 of the Standard Specifications for Public Works Construction.
3. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work if the conditions are not indicated in the contract documents.

C Additional excavation in areas outside the building footprints, or where the soils have been disturbed, overexcavate per the following.

1. The onsite soils should be overexcavated to a minimum depth of 1 foot and the next 8 inches reprocessed in place to 90 percent of ASTM D1557-91. The Geotechnical Engineer, prior to placing fill during grading, shall observe actual depths of overexcavation. When excavation has reached required subgrade elevations, notify the soils engineer who will make an inspection of conditions.
2. If unsuitable bearing materials are encountered at required subgrade elevations bring to the attention of the soils engineer. Carry excavations deeper and replace excavated material as may be directed by soils engineer and in accordance with Section 300-2.2-1 of the Standard Specifications for Public Works Construction.
3. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work if the conditions are not indicated in the contract documents.

D. Stability of Excavation: Slope sides of excavations to comply with local codes and ordinances or the recommendations of the Soils Engineer whichever is more stringent. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Based on drilling for the subsurface investigation, which was done by hollow stem flight auger, no excavation problems were encountered. However, some of the sand materials encountered, if exposed in larger excavations, could be subject to running or caving.

1. Maintain sides and slopes of excavation in safe condition until completion of backfilling.

E. Shoring and Bracing: Trench excavation shall conform to the applicable sections of Section 306, Underground Conduit Construction of the Standard Specifications for Public Works Construction and to the various other sections of this specification. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition as specified in Section 306-1 of the Standard Specifications for Public Works Construction.

1. Establish requirements for trench shoring and bracing to comply with local codes and authorities and Title 8 of the California Code of Regulations having jurisdiction.
2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

F. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavation and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations. Provide sufficient number and size of pumps to dewater all footings within 24 hours.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting run-off areas. Do not use trench excavations as temporary drainage ditches.

G. Material Storage: Stockpile satisfactory excavated materials, until required for backfill or dispose of in accordance with Section 300-2.6 of the Standard Specifications for Public Works Construction. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
2. Dispose of excess soil material and waste materials as herein specified.

H. Excavation for Structures: All excavation for structures shall conform to the minimum standards of Section 300-3 of the Standard Specifications for Public Works Construction and shall conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

1. In excavating for footing and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

I. Grubbing: Remove all roots entirely, under footings and elsewhere two feet below subgrade or new finished earth surface, which interfere with the work.

3.02 COMPACTION

A. General: Refer to Geotechnical Exploration Report for compaction requirements in addition to the following. Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below. All fills should be compacted to at least 90 percent of maximum dry density as determined by ASTM Test Method D1557-91. Fill materials should be placed in loose lifts, not thicker than 8 inches. Material should be moisture-conditioned as processed as necessary to achieve a uniform moisture content that is over optimum and within moisture limits required to achieve adequate bonding between lifts and compaction.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 1557; and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well defined moisture density relationship (cohesionless soils).

1. Steps and Pavement: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90% maximum density in accordance with Section 300-3.5 of Standard Specifications for Public Works Construction.
2. Lawn or Unpaved Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material at 85% maximum density.
3. Walkways: Compact top 12 inches of subgrade and each layer of backfill or fill material at 90% maximum density.
4. Compact utility trench backfill to 90% relative density in accordance with Section 306-1.3 of the Standard Specifications for Public Works Construction.

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material. Apply water in manner to prevent free water from appearing on surface during or subsequent to compaction operations.

1. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to specified density.
2. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.03 BACKFILL AND FILL

A. General: Place acceptable soil material in layers to required subgrade elevations, for each classification listed below:

1. In excavations, use satisfactory excavated or borrow material.
2. Under grassed areas, use satisfactory excavated or borrow material.
3. Under walks and pavements use sub-base material, or satisfactory excavated or borrow material (SE 20), or combination of both exhibiting non-expansive qualities.
4. Under piping and conduit use minimum sand equivalent of 30; shape to fit bottom 90 degrees of cylinder. Backfill in accordance with Section 306-1.3 of the Standard Specifications for Public Works Construction.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and recording locations of underground utilities.
2. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling drive below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
3. Removal of trash and debris.
4. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.

1. When existing ground surface has a density less than that specified under "Compaction" for a particular area classification, break up ground surface, pulverize, moisture condition to optimum moisture content, and compact to required depth and percentage of maximum density, as directed by the soils engineer.

D. Placement and Compaction: Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand operated tampers in accordance with Section 300-4.5 and 300-4.7 of the Standard Specifications for Public Works Construction.

1. Before compaction, moisten and aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification, in accordance with Section 300-4.6 of Standard Specifications for Public Works Construction. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

3.04 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Direct drainage and landscape irrigation towards drainage devices and away from building lines.

C. Finish surfaces free from irregular surface changes, and as follows:

1. Walks: Shape surface of areas under walks to line, grade and cross section, with finish grade surface not more than 0.02 feet above or below required subgrade elevation.
2. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish grade surface not more than 0.02 foot above or below required subgrade elevation.

D. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 0.02 feet above or below when tested with a 10-foot straightedge.

E. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area of classification.

3.05 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve sub-grades and fill layers before further construction work is performed. Fills shall be placed under the direction of the Geotechnical Engineer pursuant to 2007 CBC, Appendix J, Section J107.

1. Perform field density tests in accordance with ASTM C 1556 (sand cone method) and nuclear method.
2. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to the Architect.
3. Paved Areas: Make at least one field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 square foot of overlaying building slab or paved area, but in no case less than 3 tests.

4. If in the opinion of soils engineer, based on testing service reports and inspection, sub-grade or fills that have been placed are below specified density, provide additional compaction and testing at no additional expense.

3.06 MAINTENANCE

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

1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioned Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.07 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash and debris, and dispose of it off of owner's property in a legal manner.

B. Provide written consent of the owner of the property upon which the surplus material is to be deposited, pursuant to Section 300.2.6 of the Standard Specifications for Public Works Construction.

C. Borrow Excavation: Borrow material is required for the work. The soils engineer shall test and approve the source prior to any excavation or import work is performed in accordance with Section 300-5 of the Standard Specifications for Public Works Construction.

END OF SECTION 02200

SECTION 02210

LANDSCAPE FINISH GRADING

PART 1- GENERAL

1.01 SECTION INCLUDES

A. Furnish all labor, materials, equipment, appliances and necessary incidentals for the complete installation of all landscape finish grading as shown on the drawings and as specified herein.

1. Preliminary Grading: Grades in all planting areas will be established to within plus or minus 1/10 foot by others prior to beginning of landscape construction.
2. Weeding: Before and during finish grading, all weeds and grasses shall be dug out by the root and disposed of off the site.
3. Finish Grading: Finish grading shall consist of finishing surfaces by raking smoothly and evenly, removing and disposal of all extraneous matter to facilitate natural run-off water. All extraneous matter shall be disposed of off the site.
4. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction will occur; nor when it is so dry that a dust will form in the air or that clods will not break readily. Water shall be applied, if necessary, to provide ideal moisture content for tilling and for planting.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 02900: Landscape planting

1.03 JOB CONDITIONS

A. Verification of existing conditions

1. Visit the site to determine existing conditions, including access to the site and the nature and extent of existing improvements upon adjacent public and private property, nature of materials to be encountered and other factors that may affect the work of this section.
2. Additional compensation resulting from the alleged ignorance of local conditions and their effect upon the cost of the work will not subsequently be approved.

B. Protection:

1. Protect the Owner's property from injury or loss. All damage to existing property (buildings, utilities, etc.) or planting (trees, shrubs, lawn or ground cover) caused by the Contractor during his operation or as a result of malfunction of installed work during the warranty period shall be repaired at contractor's expense.
2. Cause minimum interference with workers, materials, or other equipment of other trades on the project.

PART 2- PRODUCTS

A. Not Used

PART 3 - EXECUTION

3.01 SURFACE CONDITION

A. Observation

1. Prior to commencing work required by this section, observe the work of other trades and verify that such work has been properly completed and installed to allow for proper installation of all materials and methods required of this section.
2. All landscape finish grading shall be installed in accordance with the requirements of all governing authorities, the original design, and the referenced standards.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 PERFORMANCE

A. Finish Grading

1. General: When preliminary grading and weeding has been completed and the soil has dried sufficiently to be readily worked, all lawn and planting areas shall be graded to the elevations indicated on the drawings. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given. Finish grade shall be smooth, even, and uniform plane with no abrupt change of surface. Soil areas adjacent to building shall slope away from the buildings to allow a natural run-off of water, and surface drainage shall be directed as indicated on the drawings by remodeling surfaces to facilitate the natural run-off water. Low spots and pockets shall be graded to drain properly.
2. Shrubs and Ground Cover: The finish grade of all shrubbery and ground cover areas shall be 1-1/2 inch below the grade of adjacent pavement, walks, curbs, or headers and 3 inches below adjacent walls. An exception to the above requirements shall be made wherever drainage conditions may require flush grades.
3. Lawn Areas: The finish grade of all lawn areas shall be 1/2 inch below the grade of adjacent pavement walks, curbs, or headers. An exception to the above requirements shall be made wherever drainage conditions may require flush grades.
4. Drainage: Finish grade with proper slope to drains. All flow lines, designated or not, shall be graded and maintained to allow free flow of surface water, and shall conform to the intent of all plans and sections after thorough settlement and compaction of the soil.

END OF SECTION 02210

SECTION 02220

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SCOPE

A. Work included: Excavation and backfilling for this work includes, but is not necessarily limited to:

1. Trenching and trench backfilling.

B. Related work described elsewhere:

1. Section 01350: Special Project Procedures
2. Section 01500: Temporary Facilities and Controls
3. Section 01740: Cleaning
4. Section 02200: Earthwork
5. Section 02668: Private Fire Service Mains
6. Section 02720: Storm Drain

1.02 JOB CONDITIONS:

A. Dust control:

1. Use all means necessary to control dust on and near the work.
2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site.

PART 2 - PRODUCTS

2.01 TRENCH AND STRUCTURAL BACKFILL

A. Onsite fill material or imported fill used for trench and structural backfill shall meet the requirements of Section 02200. This will be verified during construction by the Geotechnical Consultant.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that all compaction is complete and approved prior to excavating for trenches.

3.02 EXCAVATION AND TRENCHING

A. General:

1. Perform all trenching required for the installation of items where the trenching is not specifically described in other sections of these Specifications or on the Drawings.
2. Make all excavations and trenches open vertical construction with sufficient width to provide free working space at both sides of the trench and around the installed item as required for joining, backfilling, and compacting.

B. Depth: Excavate trench to sufficient depth to give a minimum of 18-inches of fill above the top of the pipe or conduit, measured from the adjacent finished grade.

1. Excavate to the established lines and grades. Cut off bottom of trenches level, and remove all loose soil. Where soft spots are encountered, remove all defective material and replace with lean 3-sack concrete.
2. Correction of faulty grades: Where trench excavation is inadvertently carried below proper elevations, backfill with material approved by Geotechnical Consultant, and then compact to provide a firm and unyielding subgrade and/or foundation to the approval of the Geotechnical Consultant.

3.03 FOUNDATION FOR PIPES:

A. General: Grade the trench bottoms to provide a smooth, firm, and stable foundation free from rock points throughout the length of the pipe.

B. Foundation material: Place a minimum of 6-inches of cohesionless material in the bottom of the trench. Provide clean, plaster-suitable sand.

C. Shaping:

1. At each joint in pipe, recess the bottom of the trench as required into the firm foundation in such a manner as to relive the bell of the pipe of all load and to ensure continuous bearing of the pipe barrel on the firm foundation.
2. Accurately shape all pipe subgrade and fit the bottom of the trench to the pipe shape. Use a drag template shaped to conform to the outer surface of the pipe if other methods do not produce satisfactory results.

D. Bedding for pipes: Place cohesionless material, with a sand equivalent (SE) greater than or equal to 30, in the trench, simultaneously on each side of the pipe for the full width of the trench, to a maximum depth of 3-feet and a minimum depth of 1-foot above the outside diameter of the pipe barrel.

E. Densification:

1. Take special care to provide firm bedding support on the underside of the pipe and fittings for the full length of the pipe.

3.04 BACKFILL COMPACTION:

A. Backfill over bedding using on-site materials, spread in uniform lifts of not more than 8-inches in uncompacted thickness, and then compact. Repeat the spreading and compacting procedure until adjacent grade level is attained.

B. Trench quality control:

1. Compact cohesive backfill material to a minimum degree of compaction of 90%.
2. Compact the upper 6" of backfill in pavement areas to a minimum degree of compaction of 95%.

END OF SECTION

SECTION 02231

AGGREGATE BASE COURSE AND SUBGRADE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. Base and subgrade preparation under pavers.

B. Grading, fill and placement of subgrade and base.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A Section 02200: Earthwork

B. Section 02500: Paving and Surfacing

C. Section 02751: Cement Concrete Pavement and Site Concrete.

1.03 QUALITY ASSURANCE

A. Subgrade preparation and base materials shall conform to Section 301 of the Standard Specifications for Public Works Construction.

1. Have surveyor verify and obtain written approval of subgrade elevation prior to placement of base.
2. The contractor shall deliver all soil testing reports to the engineer.
3. Submit material certificate signed by the material producer and lab certifying that each material item complies with the specifications required.

PART 2 - PRODUCTS

A. Subgrade is the natural, filled, or excavated, pavement-bed material for the placement of base material and improvements.

B. Unsatisfactory soil materials are defined as those complying with ASTM D 2487 soil classification group GC, SC ML, MH, CL, CH, OL, OH, and PT.

C. Aggregate base course to be crushed aggregate base as defined in Section 200-2.2 of the Standard Specifications for Public Works Construction.

PART 3 - EXECUTION

A. Subgrade shall be prepared to receive sub-base materials in accordance with section 301-1 of the Standard Specifications for Public Works Construction.

B. Backfill depressed areas with native material with minimum sand equivalent 20, or with base.

C. Prepare subgrade to receive base materials.

D. Finish and place base.

E. Where additional backfill is required to reach subgrade elevation, furnish and install imported borrow. Imported borrow shall be obtained only from a site for which prior written approval has been obtained from the soils engineer in conformance with Section 300-5.2 of the Standard Specifications for Public Works Construction and the Earthwork section of these specifications. Preparation of the subgrade surface so

achieved shall be in accordance with Section 301 of the Standard Specifications for Public Works Construction and these specifications.

F. Once subgrade has been achieved; untreated base shall be furnished and installed in accordance with Section 301-2 of the Standard Specifications for Public Works Construction.

END OF SECTION 02231

SECTION 02500

PAVING AND SURFACING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt patching.
2. Asphalt surface treatments.
3. Concrete wheelstops (Section 02751)

B. Related Sections include the following:

1. Section 02231: Aggregate Base Course and Subgrade Preparation
2. Section 02751: Cement Concrete Pavement and Site Concrete

1.03 DEFINITIONS

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.04 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Job-Mix Designs: For each job mix proposed for the Work.

D. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international graphics symbol, spaces dedicated to people with disabilities.

E. Material Certificates: For each paving material, signed by manufacturers.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.

B. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphait materials if subgrade is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C).
2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.5 deg C) at time of placement.

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 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073 sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.

For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO MP 1, PG 64-22.

B. Asphalt Cement: ASTM D 3381 for viscosity-graded material.

C. Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.

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

E. Water: Potable.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Joint Sealant: ASTM D 3405 hot-applied, single-component, polymer-modified bituminous sealant.

2.04 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Provide mixes complying with composition, grading, and tolerance requirements in ASTM D 3515 for the following nominal, maximum aggregate sizes:
   a. Base Course: 1 inch (25 mm).
   b. Surface Course: 1/2 inch (13 mm).

B. Emulsified-Asphalt Slurry: ASTM D 3910, Type 1 consisting of emulsified asphalt, fine aggregate and mineral fillers.

2.05 PAVEMENT SECTIONS

1. Pavement sections are as noted on the Civil Drawings. Sections will vary in traffic lanes and fire department access lanes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

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

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.02 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.03 SURFACE PREPARATION FOR ASPHALT OVER GRADE

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared sub-grade or surface of compacted-aggregate base before applying paving materials.

C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gallons/square yard (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.04 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt surface course in single lift.
2. Spread mix at minimum temperature of 250 deg F (121 deg C).
3. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paving. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.05 JOINTS

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

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.06 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct lay down and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

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

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

3.07 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).

3.08 SLURRY SEAL

A. After the time recommended by the asphalt manufacturer or if no recommendation, 30 days, apply a slurry seal.

B. Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow curing.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.09 WHEEL STOPS

A. Securely attach wheel stops into concrete pavement with not less than two galvanized steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.

b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 DISPOSAL

A. Remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow excavated materials to accumulate on-site

END OF SECTION

SECTION 02515

CONCRETE UNIT PAVERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Furnish all labor, materials, equipment, appliances and necessary incidentals for the complete and proper installation of all concrete pavers as shown on the drawings and as specified herein.

B. Related work described elsewhere:

1. Division 2: Subgrade Preparation and Related Sections
2. Cement Concrete Pavement and Site Concrete: Section 02751
3. Paving and Surfacing: Section 02515
4. Cast-In-Place Concrete: Section 03300
5. Concrete Finishes: Section 03355

1.02 QUALITY ASSURANCE

A Use adequate numbers of skilled workmen who are trained and experienced and who are familiar with the specified requirements and the methods needed for proper performance of the work in this section.

B. Standards: In addition to standards specified herein; refer to the National Concrete Masonry Association "Design and Construction" manual titled "Concrete Block Pavements".

1.03 SUBMITTALS

A. General: Comply with provisions of Section 01300. Include literature indicating material meets standards specified below.

B. Product Data: Submit three (3) full size samples of all colored and/or textured concrete pavers along with manufacturers recommended methods of installation. When approved by the Architect, these will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

C. Provide shop drawings of each separate area for review and approval prior to installation. Plans shall be 1/8-inch minimum scale. Provide details of edge conditions, patterns, conditions at utility boxes and other obstructions, and any deviations from the specified field pattern.

1.04 PRODUCT HANDLING

A. Protection: Take all precautions necessary to protect the materials of this section before, during, and after installation.

B. Replacement: In the event of damage, immediately repair all damaged and defective work.

PART 2 - PRODUCTS

2.01 CONCRETE PAVERS

A. General: Pavers shall have a minimum compressive strength of 8,000 P.S.I. in accordance with testing procedures ASTM C-140.

B. Materials used to manufacture pavers shall conform to the following:

1. Cement - ASTM 150 (Portland Cement).
2. Aggregate - ASTM C-33 (Washed, graded sand and rock, no expanded shale or lightweight aggregates).

C. Design is based on the use of products manufactured by "OLSEN Pavingstone, Inc.", San Juan Capistrano, CA 92693. Telephone: 949-728-0415; Fax: 949-728-0540. Equal products from other manufacturers are acceptable.

1. Paver thickness 2-3/8 inch (60 mm).
2. Size: 8-inches by 4-inches, nominal.
3. Design pattern "Holland Stone".
4. Laying detail "Herringbone"
5. Colors: To be selected by architect from manufacturer's full range of colors.

D. Sand Laying Course: Shall be clean washed sand with 100% passing a Number 4 sieve size and a maximum of 3% passing a number 200 sieve size (commonly known as "Plaster Sand").

E. Base: Class II

2.02 PAVER RESTRAINT EDGING

A. Design is based on the products of Permaloc BrickBlock, 1-3/4 inches (44.5 mm) high, extruded aluminum, 6063 alloy, paver restraint edging for straight-line and curvilinear applications in corrugated L-shaped profile, as manufactured by Permaloc Corporation, Holland MI 49424, telephone (800) 356-9660 or (616) 399-9600. Horizontal base shall have holes spaced 4 inches (102 mm) apart along its length to receive spikes.

1. Edging shall have a 15-year limited material warranty for paver restraint edging from manufacturing defects in workmanship or material.

B. Thickness: .075 inch (1.9 mm) gage section with 0.080 inch (2.03 mm) thick exposed top lip.

C. Length: 8 feet (2.44 meters).

D. Connection Method: Section ends shall connect together over the top edge with 0.030 inch (.76 mm) thick x 1.25 inch (31.8 mm) wide x .75 inches (19 mm) tall steel clip.

E. Spikes: 3/8 inch x 10 inches (9.5 mm x 254 mm) bright spiral steel spike with plastic washers.

F. Finish: Paint finish shall comply with AAMA 2603 for electrostatically baked on paint.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Scarify soil below pavers to six inches below grade and recompact to 95% relative density.

B. Install base and compact. Base shall extend a minimum of 6 inches beyond the edge of the pavers.

1. Base at traffic areas or anywhere a fire truck can access to be twelve inches thick.
2. Base at pedestrian only areas to be four inches thick.

C. Install two-inch layer of sand over base just prior to installation of pavers.

D. Paver Restraint Edging

1. Preparation: Ensure that all underground utility lines are located and will not interfere with the proposed edging installation before beginning work.
2. Locate border line of edging with string or other means to assure border straightness and curves as designed.
3. Edging Installation: Install base of edging resting on compacted level base and facing [away from] [towards and under] paver, drive 3/8" x 10" (9.5 mm x 242 mm) bright spiral steel spikes through edging holes in section base of paver restraint edging at spaces for following applications:
4. Anchor each section end with spike.
5. Patios and Walkways: 12 inches (305 mm) to 24 inches (610 mm) on center.
6. Securely connect sections together in accordance with manufacturer's instructions.

E. Rectangular units shall be laid in a herringbone pattern to prevent "creep" under traffic. Place each block against the adjacent units without disturbing the sand-base or other units. Plan order of laying such that it is never necessary to force a block between those already laid.

F. Paving work shall be laid to the elevations shown on the drawings and plumb, true to line in both vertical and horizontal directions. Maximum deviation from a straight line shall not exceed 1/8 inch in 10 feet.

1. Pavers to be installed hand tight and level on the sand-laying course.
2. Where whole units do not fit at the edges of obstacles (or other such boundary), use cut block to fill spaces. Field cutting shall be neat and true, maintaining the same joint widths as the uncut units. Spaces left around manholes, drainage units and other such civil appurtenances shall be treated in the same manner.
3. A Roller Vibrator or Plate Vibrator shall be used to compact the pavers and to vibrate the sand up into the joints between the pavers. After each area is laid, vibrate blocks to their final level with a plate vibrator. After the initial vibration, brush sand over the surface and vibrate into joints by additional passes with the vibrator. Even out all minor variations in level between units as required. The vibrator should not pass closer than 36-inches from an unrestrained edge.
4. The completed paver installation shall be washed down and cleaned to provide a clean, finished, workmanlike installation.

G. Edges at boundaries, including but not limited to buildings, building columns, obstacles, planters, concrete curbs, gutters, swales and ramps, shall be bound with a sailor course of pavers, running perpendicular to the boundary. Sailor courses are not required at items such as signposts, bollards, area drains, utility boxes and poles.

H. Cutting of any pavers shall be performed using a conventional masonry saw. All cut edges shall be straight and free from visual nicks and holes.

I. Water testing: Perform hose (water) testing to confirm there are no low areas or ponding. All surface drainage shall flow to drains, swales, flow-line or collection systems.

3.03 REPAIR AND CLEAN-UP

A. After four weeks, review installation and remove pavers with voids. Refill joints where sand has washed away or not filled.

B. Water blast entire surface and remove sand, tire marks, and stains.

END OF SECTION

SECTION 02530

PAVEMENT MARKING AND SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The latest adopted edition of the Standard Specifications for Public Works Construction applies to the work of this section.

B. The latest revision to the Cal Trans Traffic Manual applies to the work of this section.

C. The latest adopted edition of the Caltrans Specifications, Manuals and Standard Plans apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. Preparation and painting of surface striping on paving.

1.03 QUALITY ASSURANCE

A. All painted surface striping shall conform to Section 310-5.6 Painting, Traffic Striping, Pavement Markings and Curb Markings of the Standard Specifications for Public Works Construction, latest edition. Where specific items are not addressed in the Standard Specifications, or are required by conditions of a construction permit comply with the State of California Standard Specifications, latest edition, and Caltrans Traffic Manual, latest edition.

B. Submit material list and specifications to engineer for approval.

1.04 RELATED SECTIONS

C. Section 09900: Painting and Coatings

1.04 SUBMITTALS

A. Layout of the proposed striping.

B. Cut sheets of paint and sample of each color to be used.

C. Manufacturer's suggested application methods.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Paint for traffic striping, pavement marking and curb marking shall conform to Section 210.16 of the Standard Specifications for Public Works Construction. Paint shall be vinyl-epoxy emulsion based, water thinned, without glass beads; Dunn Edwards "Vin-L-Stripe Traffic Paint W-801", Sinclair Paint "162 Vinyl Traffic Marking Paint", or equal. Accessibility symbol color shall be Federal Standard 595B "Blue #15090".

B. Paint shall comply with local environmental regulations.

C. Painted traffic striping, pavement markings and curb markings shall comply with Section 301.5.6 of the Standard Specifications for Public Works Construction.

D. Signs: Provide signs complete with posts and braces and sign panel fastening hardware in accordance with Los Angeles County Department of Public Works Standard Plans and the APWA Standard Plans for Public Works Construction, and as shown on the drawings. Posts shall be Qwik Punch or equal.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Preparation of Surfaces: All surfaces to be painted shall be dry and thoroughly free from oil, grease, and loose material.

3.02 PAINTING

A. Any painted traffic striping that is unacceptable shall be removed by wet-type sandblasting and repainted.

B. Application rate shall be in accordance with manufacturers' printed recommendations, but not over 400 square feet per gallon.

C. Protection: Protect the painted surfaces from traffic until thoroughly dry, one-day minimum.

D. Sign installation procedures shall comply with Section 56 of the Caltrans Traffic Manual.

E. Provide templates for stenciled lettering and legend painting.

F. Paint surface striping 3 inches wide, unless otherwise indicated.

3.03 CLEANUP

A. Cleanup: Remove all splash discoloration and other blemishes from adjacent surfaces by wet type sandblasting. Remove excess material, debris, cartons, and containers from premises immediately upon completion of work.

END OF SECTION

SECTION 02545
PERVIOUS CONCRETE PAVING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The work of this Section includes subgrade preparation and installation of Portland Cement Pervious Pavement parking areas.

1.02 SCOPE OF WORK:

A. The Work to be completed under this contract includes the furnishing of all labor, materials and equipment necessary for construction of the proposed improvements in conformance with the plans and specifications.

1.03 REFERENCES:

A. American Society for Testing and Materials:

ASTM C29 "Test for Unit Weight and Voids in Aggregate"
ASTM C33 "Specification for Concrete Aggregates"
ASTM C42 "Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete."
ASTM C117 "Test Method for Material Finer than 75 microns (No. 200) Sieve in Mineral Aggregates by Washing."
ASTM C138 "Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete."
ASTM C150 "Specifications for Portland Cement" (Types I and II only)
ASTM C172 "Practice for Sampling Fresh Concrete"
ASTM C260 "Specification for Air-Entraining Admixtures for Concrete"
ASTM C494 "Specification for Chemical Admixtures for Concrete"
ASTM C595 "Specification for Blended Hydraulic Cements" (Types IP or IS only)
ASTM C618 "Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete."
ASTM C989 "Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars."
ASTM C1077 "Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and criteria for Laboratory Evaluation."
ASTM D448 "Specification for Standard Sizes of Coarse Aggregate for Highway Construction."
ASTM D1557 "Tests for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10 Pound Rammer and 18-inch Drop."
ASTM E329 "Standard Recommended Practice for Inspection and testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction."

B. American Association of State Highway and Transportation Officials (AASHTO):

AASHTO T-180 "Moisture-Density Relations of Soils Using a 101 pound (45.4 kg) Rammer and an 18 in. (457 mm) Drop."

1.04 SUBMITTALS:

A. Concrete Mix Design:

1. Contractor shall furnish a proposed mix design with proportions of materials to Architect/Engineer prior to commencement of work. Cement content shall be a minimum of 580 pounds per cubic yard, with total cementitious content to be a minimum of 630 pounds per cubic yard. Water cement ratio shall be a maximum of 0.30. The data shall include unit weights determined in accordance with ASTM C29 paragraph 11, jigging procedure. Based on the unit weight of the mix, compacted void content of the mix shall be a minimum of 10% and a maximum of 20%.

1.05 QUALITY ASSURANCE:

A. Prior to the awarding of the contract, the placing contractor shall furnish owner/engineer/architect a statement attesting to qualifications, experience, sample of workmanship and installed product (e.g. references and project addresses).

B. If either the Pervious Placing Contractor or the Pervious Concrete Producer have no prior experience with Pervious Concrete Pavement, the Contractor shall retain an experienced Consultant to supervise base preparation, production, placement, finishing and curing. Expense of the consultant shall be the responsibility of the contractor.

C. Test Panels: If so required by the contract, the Pervious Contractor may be required to prepare test panels. Cost of creating and, if necessary, removing such panels shall be covered by a line item in the contract and contract proposal. Test panels shall be of the same thickness and on the same sub-base as the project slab, and shall be identified by a copy of the truck ticket (including batch date, time and truck #).

D. Requirements for acceptance of the test panels:

1. Test panels shall be tested for thickness in accordance with ASTM C 42 and thickness of the slab shall measure no less than 1/4" of the design.

2. Unit weights are to be determined in accordance with ASTM C 29 using a 0.25 cubic foot cylindrical metal measure. The measure is to be filled and compacted in accordance with ASTM C 29 paragraph 11, jigging procedure. Based on the unit weight of the 3 mix, compacted void content of the mix shall be a minimum of 10% and a maximum of 20%.

PART 2 - MATERIALS

2.01 GENERAL:

A. Locally available materials having a record of satisfactory performance shall be used.

2.02 CEMENT:

A. Portland cement Type I or II conforming to ASTM C150 or Portland cement Type IP or IS conforming to ASTM C595.

2.03 AGGREGATE:

A. Use 3/8 coarse aggregate that meets 3/8 to No. 16 per ASTM C33, or meeting 3/8 to No. 50 per ASTM D448. Smooth rock aggregate is recommended and has been found to perform better than crushed rock aggregates. If other gradation of aggregate is to be used, submit data on proposed material to owner for approval. Larger aggregate sizes increase pore size but decrease workability. Aggregates that are well graded reduce porosity, and may require reduction of cementitious content to meet void specifications. Note that reductions below the cement minimums of paragraphs 1.04A & 2.06A require written approval from the Architect/Engineer and Owner's Representative.

2.04 CHEMICAL ADMIXTURES:

A. Air entraining agents shall comply with ASTM C260.

B. Type A Water Reducing Admixtures shall comply with ASTM C494

C. Type B Retarding Admixtures shall comply with ASTM C494

D. Type D Water Reducing/Retarding Admixtures shall comply with ASTM C494

E. Hydration stabilizer shall meet the requirements of ASTM C494 Type B Retarding Admixtures or Type D Water Reducing/Retarding Admixtures.
    a. A hydration stabilizer is recommended in the design and production of pervious concrete.

2.05 MINERAL ADMIXTURES:

A. Fly ash conforming to ASTM C618 may be used in amounts not to exceed 20% of total cementitious material.

B. Ground Iron Blast-Furnace Slag conforming to ASTM C989 may be used in amounts not to exceed 50% by weight of total cementitious material.

2.06 WATER:

A. Potable water shall comply with conventional local good concrete practice.

2.07 PROPORTIONS:

A. Cement Content:

1. For pavement subject to vehicular traffic loading, the total cementitious content shall not be less than 630 pounds per cubic yard. Portland cement content shall be at least 580 pounds per cubic yard.

2.08 WATER CEMENT RATIO:

A. Maximum of 0.30.

2.09 AGGREGATE CONTENT:

A. The volume of aggregate per cubic yard shall be equal to 27 cubic foot when calculated as a function of the unit weight determined in accordance with ASTM C29 jigging procedure. Fine aggregate, if used, shall not exceed 3 cu. ft. and shall be included in the total aggregate volume.

2.010 ADMIXTURES:

A. Shall be used in accordance with the manufacturer's instructions and recommendations.

2.011 MIX WATER:

A. Mix water shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. (Mix water yielding a cement paste with a dull-dry appearance has insufficient water for hydration). NOTE: Insufficient water results in inconsistency in the mix and poor bond strength between aggregate particles. High water content results in the paste reducing or eliminating the void system required for porosity.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION AND FORMWORK:

A. Subgrade Material:

1. The top 6 inches shall be composed of granular or gravelly soil that is predominantly sandy with no more than a moderate amount of silt or clay. Granular sub-base may be placed over the subgrade.

B. Subgrade Permeability:

1. Subgrade shall have a reasonable level of permeability.

C. Subgrade Support:

1. The subgrade shall be scarified to a depth of 12" and compacted by a mechanical vibratory compactor to 92 -95% of a maximum dry density as established by ASTM D1557 or AASHTO T180. Subgrade stabilization shall not be permitted.

2. If fill material (embankment) is required to bring the subgrade to final elevation, it shall be clean and free of deleterious materials. It shall be placed in 8-inch maximum layers, and compacted by a mechanical vibratory compactor to a

minimum density of 92% of a dry density as established by ASTM D1557 or AASHTO T180.

D. Subgrade Moisture:

1. To avoid moisture being absorbed from the concrete mix upon placement, the subgrade shall be in a moist condition.

E. Formwork:

1. Forms may be of wood or steel and shall be the depth of the pavement. Forms shall be of sufficient strength and stability to support mechanical equipment without deformation of plan profiles following spreading, strike-off and compaction operations. Forms shall have a removable spacer of ½" to 5/8" thickness placed above the depth of pavement. The spacers are removed following placement and vibratory strike-off to allow roller compaction. Forms shall allow for tie-in to adjacent concrete via the use of fiberglass reinforced plastic (FRP) reinforcing bar.

3.02 MIXING, HAULING AND PLACING:

A. Mix Time:

1. Truck mixers shall be operated at the speed designated as mixing speed by the manufacturer for 75 to 100 revolutions of the drum.

B. Transportation:

1. The Portland cement aggregate mixture may be transported or mixed on site and shall be used within one (1) hour of the introduction of mix water, unless otherwise approved by an engineer. This time can be increased to 90 minutes when utilizing a hydration stabilizer as specified in section 2.04D.

C. Discharge:

1. Each mixer will be inspected for appearance of concrete uniformity. Water may be added to obtain the required mix consistency. A minimum of 20 revolutions at the manufacturer's designated mixing speed shall be required following the addition of any water to the mix. Discharge shall be a continuous operation and shall be completed as quickly as possible. Concrete shall be deposited as close to its final position as practicable and such that fresh concrete enters the mass of previously placed concrete.

D. Placing and Finishing:

1. The pervious concrete pavement will be placed to the required cross-section and shall not deviate more than +/- 3/8 inch in 10 feet from profile grade.

2. Unless otherwise approved by the Owner or Architect/Engineer in writing, the Contractor shall provide either slip form or form riding equipment to place the concrete. Normal placement procedures involve utilizing a mechanical vibratory screed to strike off the concrete ½" to 5/8" above final height, utilizing the form spacers described in section 3.01E.

3. Following strike-off, the spacers are removed, and the concrete shall be compacted to form level, utilizing a steel roller made from nominal 10" diameter

steel pipe of ¼" thickness. The roller shall have enough weight to provide a minimum of 10 psi vertical force. This compaction secures the surface materials assuring pavement durability. Care shall be taken during compaction that sufficient compactive force is achieved without working the concrete surface enough to seal off the surface porosity.

4. Workers shall avoid stepping on the mix immediately after its placement. Footprints can compress and force cement paste into the voids at the bottom of the slab, forming resistance to the percolation through the slab.

5. Any apparent defects in the surface can be carefully remedied by placing some fresh concrete into any depressions and compacting with a hand tamper.

6. Upon strike-off, a compactive roller will provide a minimum of 10 psi vertical force in order to secure the surface materials and assure durability. The pervious concrete pavement will be placed to the required cross-section and shall not deviate more than +/- 3/8 inch in 10 feet from profile grade.

7. After roller compacting and defect inspection and repair, no further finishing is performed on the concrete. Surface shall be immediately cured.

E. Curing:

1. Curing procedures shall begin immediately after and no longer than 20 minutes after final placement operations. The pavement surface shall be covered with a minimum of six (6) mil thick polyethylene sheet or other approved covering material. Prior to covering, a fog or light mist shall be sprayed above the surface when required due to ambient conditions (temperature, wind and humidity). The cover shall overlap all exposed edges and shall be secured to prevent dislocation due to winds or adjacent traffic conditions.
   a. Due to the moisture required for proper hydration and strength gain, the curing cover shall remain securely in place for the suggested curing periods. The following cure times are ideal:
      1) Portland Cement Type I, II or IS – 7 days minimum
      2) Portland Cement Type I or II with Class F Fly ash (as part of the 630 lbs/cy minimum cementitious) or Type IP – 10 days minimum
   b. No truck traffic shall be allowed for 10 days (no passenger car/light trucks for 7 days).

3.03 TESTING AND ACCEPTANCE:

A. A minimum of one test for each day's placement of pervious concrete in accordance with ASTM C 172 and ASTM C 29 to verify unit weight shall be conducted. Delivered unit weights are to be determined in accordance with ASTM C 29 using a 0.25 cubic foot cylindrical metal measure. The measure is to be filled and compacted in accordance with ASTM C 29 paragraph 11, jigging procedure. The unit weight of the delivered concrete shall be +/- 5 pcf of the design unit weight. Based on the unit weight of the mix, compacted void content of the mix shall be a minimum of 10% and a maximum of 20%.

END OF SECTION

SECTION 02668

PRIVATE FIRE SERVICE MAINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Section 02200: Earthwork for excavation and backfill required for fire water systems; not work of this section, and section 306, Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Section 02751: Cement Concrete Pavement and Site Concrete for concrete work required for fire-service water systems.

C. Section 15300: Fire Protection System for interior building systems including sprinklers and standpipes; not work of this section.

1.02 DESCRIPTION OF WORK:

A. Fire water systems work on drawings and by requirements of this section, including detector checks and PIV valves, fittings and pipe.

1.03 QUALITY ASSURANCE:

A. Manufacturers Qualifications: Firms regularly engaged in manufacture of fire water system's materials or types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with fire water work similar to that required for project. Contractors shall have proper licenses for the installation of the required fire water system.

C. Codes and Standards:

1. NFPA Compliance: Install fire water systems in accordance with NFPA 24 "Standard for Installation of Private Fire Service Mains and Their Appurtenances", including but not limited to the following:

   a. Plans shall be designed by the "installing" licensed contractor (C-16, C-34, C-36 or General Engineering Contractor Class A or by a Registered Professional Engineer (Civil, Mechanical, or Fire Protection), licensed by the State of California (Board of Professional Engineers).

   b. Installation work shall be performed by fully experienced and responsible persons. (NFPA-24, 1-5).

   c. Piping shall be "listed" for fire protection service and comply with AWWA Standards, where applicable. (NFPA-24, 7-1.1).

   d. Fittings shall be of an "approved" type. (NFPA-24, 7-4).

   e. Control valves shall be "listed" indicating type. (NFPA-24, 3-1.1)

   f. All tees, plugs, caps, bends, and hydrant branches on pipe-installed underground shall be restrained (pipe clamps and tie-rods, thrust blocks, locked mechanical or push-on

joints, mechanical joints utilizing set screw retainer glands, or other approved methods) against movement. (NFPA-24, 8-6.1 & 8-6.2.1)

g. Depth of cover of piping shall be 36-inches minimum. (NFPA-24, 8-7.1)

h. The trench shall be backfilled between joints before pressure testing. (NFPA-24, 8-9.2)

i. Backfill shall be well tamped in layers. No ashes, cinders, refuse, organic, or other corrosive material shall be used as backfill material (NFPA-24, 8-7.1).

j. All underground piping shall be flushed at the minimum water demand rate of the system, or when such rate is not verified or met, piping shall be flushed at the maximum flow rate available to the system under fire conditions. (NFPA-24, 8-8.2)

k. Lines shall be hydrostatically tested at not less than 200-PSI pressure for two hours, or at 50 PSI in excess of the maximum status pressure when the maximum static pressure is in excess of the 150-PSI. (NFPA-24, 8-9.3.1)

l. Tests shall be made by the installing contractor in the presence of the Authority Having Jurisdiction or the representative of the owner (NFPA-24, 8-9.3.4)

2. Local Fire Marshall Regulations: Comply with governing regulations pertaining to hydrants, including hose unit threading and similar matching of connections.

D. UL Compliance: Provide fire hydrants that comply with UL 246 "Hydrants for Fire-Protection Service", and are listed by UL and conform to local purveyor requirements.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for fire water system materials and products and comply with provisions of Division 1.

B. Shop Drawings: Submit shop drawings for fire water systems, showing piping materials, size, locations, and elevations. Include details of underground structures, connections, thrust blocks, and anchors. Show interface and spatial relationship between piping and proximate structures. Submit pressure tests and hydraulic calculations.

C. The work of this Section is part of a deferred submittal to DSA. Refer to DSA publication "AFSS Plan Review Submittal Guidelines" for submittal criteria and requirements.

D. Record Drawings: At project closeout, submit record drawings of installed fire water system piping and products.

E. Maintenance Data: Submit maintenance data and parts list for fire water system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.

PART 2 - PRODUCTS

2.01 PIPES AND PIPE FITTINGS:

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with NFPA 24 where applicable. Provide sizes and types matching piping and equipment connections; provide fittings of materials that match pipe materials used in firewater piping systems.

B. Piping:

1. Polyvinyl Chloride Pipe: AWWA C900, with bell and spigot joints, SDR 18 unless otherwise indicated.
2. Joints may be made with approved flange or mechanical or griper joints for use on C-900 PVC, EBAA Products or approved equal.

2.02 PIPING SPECIALTIES:

A. Pipe Line Strainers: Provide pipeline strainers, UL-listed, 175-PSI working pressure, Y-type or basket type, with ends to suit piping connections.

1. Available Manufacturers:
   a. "Automatic" Sprinkler Corp. of America; Div. A-T-O Inc.
   b. Cleveland Gear Co.; Sub of Vesper Corp.
   c. Grinnel Fire Protection Systems Co., Inc.
   d. Hersey Products Inc., Hersey Div.
   e. Mueller Steam Specialty; Div. of Core Industries Inc.
   f. Neptune Water Meter Co.
   g. Rockwell International Corp.; Municipal & Utility Div.
   h. Rockwood Systems Corp.
   i. Zurn Industries Inc.; Fluid Handling Div.

2.03 VALVES:

A. Gate Valves: Provide gate valves, UL-listed, 175 PSI working pressure for 12 inch and smaller, 150 PSI for sizes larger than 12 inch. Provide threaded, flanged, hub, end configurations to suit size of valve and piping connection. Provide inside screw type for use with indicator post, iron body bronze mounted, non-rising stem, and solid waste wedge disc.

1. Available manufacturers:
   a. American Valve Mfg. Co.
   b. American-Darling Valve; Div. of American Cast Iron Pipe Co.
   c. Clow Corp.; Valve Div.
   d. Fairbanks Co.
   e. Kennedy Valve; Div. of ITT Grinnel Valve Co., Inc.
   f. Stockham Valves & Fittings Inc.
   g. United Brass Works Inc.
   h. United States Pipe and Foundry Co.
   i. Waterous Co.

B. Fire Hydrants and Post-Indicator Valves (PIV): Provide per the City of San Gabriel Standard and conforming to the drawings. Color: Blue

C. Butterfly Valves: Provide butterfly valves, UL listed, 175 PSI working pressure for 2 inches through 12 inches. Provide gear actuator and position indicator.

1. Available Manufacturers:
   a. Demco; Div. of Cooper Industries Inc.
   b. ITT Grinnel; Div. of ITT Industries of Canada Ltd.
   c. Kennedy Valve; Div. of ITT Grinnel Valve Co., Inc.
   d. Keystone Valve; Div. of Keystone International Inc.

e. Nibco Inc.
f. Powell (Wm.) Co.
g. Pratt (Henry) Co.
h. Tomoe Valve Co. Ltd.

D. Check Valves: Provide check valves as indicated, UL-listed, 175 PSI working pressure for 2 inches through 12 inches. Provide swing type, iron body bronze mounted with metal-to-metal or rubber-faced checks. Provide threaded, flanged, or hub end, to suit size and piping connections.

1. Available manufacturers:
   a. American-Darling Valve; Div. of American Cast Iron Pipe Co.
   b. Clow Corp.; Valve Div.
   c. Fairbanks Co.
   d. Kennedy Valve; Div. of ITT Grinnel Valve Co., Inc.
   e. Mueller Co.
   f. Nibco Inc
   g. Stockham Valves & Fittings Inc.
   h. Walworth Co.
   i Waterous Co.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPE AND PIPE FITTINGS:

A. Polyvinyl Chloride Pipe: Install in accordance with manufacturer's recommendations.

B. Depth of Cover: Provide minimum depth of cover over underground piping in accordance with NFPA 24, Figure A-8-11 "Recommended Depth of Cover Above Top of Underground Yard Mains".

C. Examination of Area and Conditions: Make arrangements for and obtain verification of water supply and pressure available. Submit tests results to Architect. Do not proceed if available water in inadequate for the design.

3.02 FIELD QUALITY CONTROL:

A. Piping Tests: Conduct piping tests before joints are covered, and after thrust blocks have sufficiently hardened. Fill pipeline with water 24 hours prior to testing, and apply test pressure to stabilize system.

B. Hydraulic Tests: Test at not less than 200 PSI for 2 hours or at 50 PSI above maximum static pressure if it is greater than 150 PSI.

1. Test fails if leakage exceeds 2 quarts per hour per 100 gaskets or joints irrespective of pipe diameter.
2. Increase pressure in 50-PSI increments and inspect each joint between increments. Hold at test temperature for one hour, decrease to 0 PSI. Slowly increase again to test pressure and hold for one more hour.

C. Operating Tests: Open and close all valves and hydrants under system water pressure. Check dry barrel hydrants for proper drainage. For systems with fire pumps, run pumps during operating tests.

3.03 ADJUSTING AND CLEANING:

A. Flushing: Flush underground mains and lead-in connections to sprinkler risers before connection is made to sprinklers, standpipes, or other fire protection system piping.

1. Flush at flow rate not less than that indicated in NFPA 24, or at hydraulically calculated water demand rate of the system, whichever is greater.
2. Control the discharge of spoil water in an approved manner.

END OF SECTION

SECTION 02720

STORM DRAIN

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Section 02200: Earthwork for excavation and backfill.

1.02 SUMMARY

A. This Section includes storm sewerage system piping, trench drains, and appurtenances, as well as, cleaning and repair to existing storm sewerage systems.

1.03 SUBMITTALS

A. Product data for drainage piping and trench drains.

B. Shop drawings for precast concrete storm drainage structures, catch basins, frames, covers, and grates. Show profile of trench drain system.

C. Coordination drawings showing pipe sizes, materials, manholes and catch basins locations and elevations. Include details of existing underground structures and connections.

B. Coordination profile drawings showing storm sewerage system piping in elevation. Verify the existing join invert elevations of the existing drains or flow line to be joined.

G. The Contractor shall pot hole and verify the existence, location and elevation of utilities to be joined prior to the start of the work, as well as, any utility that may conflict with the proposed connection. The Contractor shall be responsible for the coordination of the work with that of the various trades in the construction of underground utilities.

H. The Contractor shall clean by vacuuming up debris in each existing catch basin, trench drain and junction structure. Upon determination of pipeline existence and elevation, he shall thoroughly clean existing pipes and appurtenances.

1.04 QUALITY ASSURANCE

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to storm sewerage systems.

B. Utility Compliance: Comply with local utility regulations and standards pertaining to storm sewerage systems.

1.05 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that storm sewerage system piping may be installed in compliance with original design and referenced standards.

B. Utility Note: Approval of the plans does not constitute a representation as to the accuracy of the location or the existence, or non-existence of any underground utility pipe or structure

within the limits of this project. The Contractor is required to make due precautionary measures to protect the utility lines shown or any other line not on record or not shown on these plans. All utility lines and structures that may be damaged on account of the Contractor's operations shall be repaired at the Contractor's expense, whether or not the line is shown on the drawings.

1.06 SEQUENCING AND SCHEDULING

A. Verify inverts of existing storm drains and flow lines.

B. Pot hole where necessary to find connection points.

C. Coordinate with other utility work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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

1. Cleanouts:
   a. Alhambra Foundry Co.
   b. Josam Co.
   c. Smith (Jay R.) Mfg. Co.
   d. Zurn Industries, Inc.; Hydromechanics Division
2. Trench Drain System:
   a. Aco Drain, K 100S system with QuickLock®
   b. Polydrain, 600 system with Duraguard Channel Frame System.
3. Grate Inlets:
   a. Brooks
   b. Associated Concrete Products
   c. Christy

2.02 PIPE AND FITTINGS

A. General: Provide pipe and pipe fitting materials compatible with each other and existing pipes and fittings.

B. PVC PIPE

1. (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM F 679, T-1 wall thickness, bell and spigot, for elastomeric gasket joints.
   a. Gaskets: ASTM F 477, elastomeric seal.

C. Couplings: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub, and adjoining pipe outside diameter.

1. Gaskets: ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Gaskets for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

2.03 CATCH BASINS

A. Precast Concrete Catch Basins: ASTM C 478 or ASTM C 858, precast reinforced concrete, at depth indicated. Base section slab shall have minimum thickness of 6 inches, riser sections shall have minimum thickness of 4 inches, and top section and grade rings shall match frame and grate, unless otherwise indicated.

1. Base Section: Base riser section and separate base slab, or base riser section with integral floor.
2. Riser Sections: Sections shall be of lengths to provide depth indicated.
3. Top Section: Flat slab type with opening to match grade rings.
4. Provide opening of the size, shape, and elevation as noted on the plans or as required.
5. Channel: Concrete

B. Catch Basin Frames and Grates: ASTM A536 Grade 60-40-18, heavy-duty, ductile iron, sized as indicated on the plans by 2 inch riser with anchor studs, and flat grate having ½ inch maximum slotted drainage openings, Alhambra Foundry or equal.

2.04 TRENCH DRAINS

A. Precast concrete or polymer concrete, with sloping bottom.

B. Catch Basins, outlet boxes and connections as required attaching to storm drain.

C. Grates: Perforated, heel-proof galvanized steel, medium duty.

D. Accessories to include end plates, strainers, locking devices, and sealants.

2.05 CONCRETE AND REINFORCEMENT

A. Concrete: Portland cement mix, 2,500 PSI.

1. Cement: ASTM C150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable

B. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

PART 3 - EXECUTION

3.01 PREPARATION OF FOUNDATION FOR BURIED STORM DRAIN SYSTEMS

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with bedding material to indicated level.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped bedding. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.02 INSTALLATION GENERAL

A. General Locations and Arrangements: Drawings indicate the general location and arrangement of the underground storm sewerage system piping.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes, cleanouts or catch basins for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing drain is indicated.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow.

F. Extend storm sewerage system piping to connect to existing storm drains, of sizes and in locations indicated on the plans.

3.03 PIPE AND HUB JOINT CONSTRUCTION AND INSTALLATION

A. Join and install hub and spigot pipe and fittings, with compression gaskets in accordance with CISPI "Cast Iron Soil Pipe and Fittings Handbook, Volume I." Use "Service" or "Extra Heavy" class gaskets to match class of pipe and fittings.

3.04 MANHOLES AND VAULT COVERS

A. General: Set tops of frames and covers flush with finish surface where cleanouts or manholes occur in pavements.

B. Provide rubber joint gasket complying with ASTM C 443 at joints of sections.

C. Apply bituminous mastic coating at joints of sections.

3.05 CATCH BASINS

A. Construct catch basins to sizes and shapes indicated on the plans.

B. Set frames and grates to elevations indicated.

C. Set area drains in planter areas ½ inch below finished elevation.

3.06 TRENCH DRAIN SYSTEM

A. Install drains as indicated and in accordance with the manufacturer's installation instructions.

B. Set drains in a six-inch, minimum, bed of sand. Excavate to allow concrete placement and setting.

C. Begin channel placement at deepest end. Place channels in numerical sequence with the flow arrows correctly oriented.

D. Clean out channels and grates then cover to protect until the work is complete.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.08 FIELD QUALITY CONTROL

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
3. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

D. Make inspections after pipe between manholes and manhole locations have been installed and approximately 2 feet of backfill is in place, and again at completion of project.

E. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects and reinspect.

END OF SECTION

SECTION 02730

STABILIZED DECOMPOSED GRANITE SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes: Stabilized decomposed granite surfacing, intended for landscape areas.

1.02 RELATED SECTIONS

A. Section 02200: Earthwork

B. Section 02231: Aggregate Base Course and Subgrade Preparation

1.03 REFERENCES

A. ASTM C136 Sieve Analysis of Fine and Course Aggregates.

B. ASTM D2419 Sand Equivalent Value of Soils and fine Aggregates.

C. "Greenbook" Standard specifications for Public Works Construction.

1.04 SEQUENCING

A. Do not install work specified in this Section prior to acceptance of earth work.

B. Coordinate work specified in this Section with work specified in other Sections to minimize cutting of and operation of heavy equipment over installed stabilized decomposed granite surfacing.

1.05 SUBMITTALS

A. Submit in accordance with Section 01330 Submittal Procedures:

1. Manufacturer's product data sheet and installation instructions indicating that product complies with specifications.
2. One-quart samples of stabilized decomposed granite material in manufacturer's standard colors for selection.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect stabilized decomposed granite mix from contamination. Store under cover.

1.07 FIELD CONDITIONS

A. Do not install stabilized decomposed granite surfacing when sub-base is wet at saturated field capacity.

PART 2 - PRODUCTS

2.01 STABILIZED DECOMPOSED GRANITE MATERIALS

A. Acceptable Manufacturer

1. Specification is based on products by Gail Materials, Corona CA, 951-279-1095, www.gailmaterials.net.
2. Substitutions: Products by other manufacturers that comply with specifications will be considered in accordance with Section 01250. Substitution Procedures.

B. Decomposed Granite

1. Produce from naturally friable granite. Blends of coarse sand and rock dust are not acceptable.
2. Gradation, in accordance with ASTM C136:

3. Sieve Size	4. Percent Passing
5. 1/2"	6. 100
7. 3/8"	8. 90 - 100
9. No. 4	10. 50 – 100
11. No. 30	12. 25 – 55
13. No. 100	14. 10 – 20
15. No. 200	16. 5 - 18

17. Sand Equivalent: 30 minimum in accordance with ASTM D2419.
18. Color to be selected by Architect from manufacturer's standard colors.

C. Binder: Provide Natracil by Gail Materials and complying with the following requirements:

1. Swell Volume: 35 ml/gm minimum in accordance with USP procedures.
2. 90 percent minimum shall pass a No. 40 mesh screen.

D. Factory Blending:

1. Mix decomposed granite and Natracil with a pug mill that includes a weigh-belt feeder.
2. Mix 14 pounds of binder per 2000 pounds of aggregate.

2.02 BASE COURSE MATERIAL

A. Comply with Greenbook Section 200-2 "Untreated Base Materials" for sub base.

2.03 ACCESSORIES

A. Water: Free from contaminants that would discolor or be deleterious to stabilized decomposed granite surfacing.

B. Steel Edging:

1. 1/4 inch thick by 4 inches deep, with overlapping joints.
2. Stakes: 3/16 inch by 16 inches long by 1 3/4 inches wide at top tapering to a point at the bottom, located at 36 inches on center maximum.
3. Finish: Galvanized.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine grading and subsoil conditions. Do not proceed until conditions are acceptable.

3.02 PREPARATION

A. Excavation: Excavate to the depth required to allow edges of stabilized decomposed granite surfacing to match the adjacent grades and obtain the necessary cross slopes.

B. Subgrade Preparation: Comply with Greenbook Section 301-1 Subgrade Preparation, and with Section 02231 Aggregate Base Course and Subgrade Preparation.

C. Base Course Installation: Comply with Greenbook Section 301-2 Untreated Base, and with Section 02231 Aggregate Base Course and Subgrade Preparation.

D. Edging: Install flush with stabilized decomposed granite surfacing. Provide sufficient stakes to secure in place.

3.03 INSTALLATION

A. Prior to installation, thoroughly pre-soak surface on which stabilized decomposed granite surfacing is to be placed.

B. Install in 2 inch maximum lifts and soak with sufficient water to activate the stabilizer through the entire depth of the lift.

C. Grade and smooth to required elevation.

D. After plus or minus 4 hours, compact the final lift with a three to five ton double or single static drum roller.

E. Minimum compacted thickness is 4 inches.

F. Surface shall follow the overall contours of the landscape. Flat areas shall be crowned for drainage. Slope 1 percent minimum away from benches and other structures.

G. Completed surface shall be of consistent quality and free of deleterious materials such as organic materials, nails, stones and loose material. Surface shall not have depression or humps greater than 1/4 inch in 10 feet.

3.04 FIELD QUALITY CONTROL

A. Material shall comply with manufacturer's specifications.

3.05 PROTECTION

A. Do not allow traffic on stabilized decomposed granite surfacing for 4 days after placement, or until compacted stabilized decomposed granite has fully cured.

B. Protect stabilized decomposed granite surfacing from damage until project completion. Repair damaged areas to match specified requirements.

END OF SECTION02730

SECTION 02751

CEMENT CONCRETE PAVEMENT AND SITE CONCRETE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Driveways.
   2. Parking lots.
   3. Curbs and gutters.
   4. Walkways and Courtyards.

B. Related Sections include the following:
   1. Section 02200: Earthwork
   2. Section 03300: Cast-in-Place Concrete
   3. Section 03355: Concrete Finishes

1.03 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.

1.04 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Qualification Data for manufacturer

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Admixtures.

4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or epoxy adhesive.
7. Joint fillers.

E. Field quality-control test reports.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who 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."

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

C. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Build mockups of slabs on grade in a five foot square in a convenient location.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Obtain Architect's review of mockups before starting construction.
4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
5. Demolish and remove mockups from the site after installation is complete.
6. Accepted mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities and access to the public way.

PART 2 – PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. 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.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

B. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

C. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

D. 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 pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

E. 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, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

F. Zinc Repair Material: ASTM A 780.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type II

a. Fly Ash: ASTM C618 Class N or F (Class C is not permitted). Not more than 15 percent by weight of fly ash or other pozzolan shall be substituted for ASTM C150 Portland Cement.

2. Normal-Weight Aggregates: Per Section 03300.

B. 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: 3/8 to 5/8 inch (10 to 16 mm) nominal.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide 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 and Retarding Admixture: ASTM C 494/C 494M, Type D.

2. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.04 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

2.05 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber. Top Form: ½-inch wide x ½-inch depth PVC removable joint form as manufactured by White Cap or approved equal.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).

1. Products:

a. Burke by Edeco; True Etch Surface Retarder.

b. ChemMasters; Exposee.

c. Scofield, L. M. Company; Lithotex.

2.06 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or AASHTO M 248, Type N.

1. Color: White, red, blue, and yellow, as noted on the Drawings.

2.07 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) diameter, 10-inch (254-mm) minimum length.

2.08 UNIT PAVERS

A. Refer to Section 02515.

2.09 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 2500 PSI. Class 520-C-2500-P as a standard.

2. Maximum Water-Cementitious Materials Ratio at Point of Placement: .45

3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).

C. Limit water-soluble, chloride-ion content in hardened concrete to .15 percent by weight of cement.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements:

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with mockup. Refer also to Section 03555.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph (5 km/h).

2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) require correction.

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 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. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.05 JOINTS

A. General: Form construction, isolation, and control joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. Install joints at vertical and horizontal concrete, including benches and retaining walls. Align horizontal and vertical joints where practical.

2. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

2. Provide tie bars at sides of pavement 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 asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals as shown on the drawings or if not shown 30 feet on center.

2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface.

4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

5. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap as referenced in Part 2.05-A. Remove protective cap after concrete has been placed on both sides of joint.

6. Fill top of joint with sealant.

D. Control Joints: Form weakened-plane control joints, sectioning concrete into areas as indicated or at 10 feet on center each way if not noted. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. 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.

2. Doweled Contraction 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.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. 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.

C. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

D. Do not add water to concrete during delivery or at Project site.

E. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

I. Screed pavement surfaces with a straightedge and strike off.

J. 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.

K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

L. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

M. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

N. 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 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.

O. Hot-Weather Placement: Comply with ACI 301 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 to 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.

3.07 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.

3.08 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. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.

b. Continuous water-fog spray.

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 (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.09 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).

2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).

3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).

4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).

5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).

6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).

8. Joint Spacing: 3 inches (75 mm).

9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.

10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement 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).

3.11 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Strength of each concrete mix will be satisfactory if average of any 3 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).

C. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 02830

CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: The work includes, but is not limited to, labor, materials, equipment, and services required to complete chain-link fencing, and related work as shown on the drawings and specified herein.

B. Related work described elsewhere:

1. Section 01500: Temporary Facilities and Controls
2. Section 02751: Cement Concrete Paving and Site Concrete
3. Section 03300: Cast-In-Place Concrete
4. Section 08710: Finish Hardware
5. Section 09900: Painting and Coatings

1.02 REFERENCES AND STANDARDS

A. The following references and standards are hereby made a part of this section. Chain-link fencing material and installation shall conform to the applicable requirements therein except as otherwise specified herein or shown on the drawings.

1. Chain Link Fence Manufacturer's Institute's (CLFMI) "Steel Chain Link Galvanized Fence Fabric" (CS 246); "Industrial Steel Specifications for Fence-Posts, Gates and Accessories;" "Standards for Chain Link Fence Installation."

1.03 SUBMITTALS

A. Manufacturer's literature describing products or materials.

B. Shop Drawings:

1. Include cross-sectional dimensions of posts, braces, rails, fittings, accessories, and gate frames; design of gates; and details of gate hardware.
2. Include a layout drawing showing the spacing of posts and locations of gates; abrupt changes in grade; and corner, gate, anchor, end, and pull posts.

1.04 QUALITY ASSURANCE

A. Provide chain-link fences and gates as complete units produced by a single manufacturer, including necessary erection accessories, fittings, and fastenings.

B. Installation of fencing shall be by the manufacturer or his authorized representative in accordance with CLF-II "Standards for Chain-Link Fence Installation" and the manufacturer's detailed installation drawings, instructions, and recommendations.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver and handle in a manner to prevent damage.

B. Discharge materials carefully and store on raised platform pallets. Do not dump onto ground.

1.06 FIELD MEASUREMENTS AND TEMPLATES

A. Contractor shall secure all field measurements required for proper and adequate fabrication and installation of the work covered by this section. Exact measurements are the Contractor's responsibility. Furnish templates for exact location of all items to be embedded in concrete and any setting instructions required for installation.

PART 2 - PRODUCTS

2.01 FENCING

A. Fencing shall include fabric, framework, concrete footings, gates, hardware, and all appurtenances and accessories as required for a complete installation. All members shall conform to CLFMI Standards, FS RR-F-191G/GEN, and as specified below.

2.02 FABRIC

A. Standard Mesh:

1. Galvanized steel PVC coated chain-link fabric.
2. Base metal shall be 9-gauge carbon-steel wire, tensile strength 90,000 PSI, helically wound and interwoven to form chain-link fabric with a 1-inch diamond-shaped mesh.
3. Fabric Finish: Knuckle-loop selvage top and bottom.
4. Fabric Height: As indicated on the drawings; dimensions are to top of fabric, or six feet high if not noted.

2.02 FENCE FRAMEWORK

A. Pipe framework shall be PVC coated, standard-weight steel pipe. All parts shall be galvanized after fabrication.

B. Schedule of Pipe Sizes for fences over 8 feet high and up to 16 feet high.

	MEMBER	O.D.	WEIGHT
1.	End. Corner. and Pull Posts	4.00 inches	6.56 pounds per linear foot.
2.	Intermediate or Line Posts	2.875 inches	5.79 pounds per linear foot.
3.	Gate Posts: See Drawings	4.00 inches	6.56 pounds per linear foot.
4.	Top and Bottom Rail & Braces	2.375 inches	3.65 pounds per linear foot.

2.03 FITTINGS AND APPURTENANCES

A. Tension Wire: 6-gauge galvanized steel wire.

1. Turnbuckles, eye and eye-type: galvanized drop-forged steel with 5/16 inch screws and not less than 4-1/2 inch take-up and 14-gauge galvanized steel wires.

B. Tie Wire: 9-gauge galvanized steel wire.

C. Stretcher-Bar Bands: PVC coated, 1/8 inch x 1 inch galvanized steel.

D. Stretcher Bars: PVC coated, ¼ inch x 3/4inch flat galvanized steel bar.

E. Brace Rods: PVC coated, 3/8 inch round galvanized steel bars with turnbuckle adjustment.

F. Post Tops: PVC coated, heavy-duty malleable iron caps; galvanized; designed as a weatherproof closure for pipe posts.

2.04 SWING GATES

A. Gates shall be swing type as indicated on the drawings, furnished complete with all hardware and accessories, and conforming to FS RR-F-191-2A.

B. Gate frames shall be fabricated from galvanized steel pipe and PVC coated.

1. Minimum outside diameter of steel pipe shall be 1.90 inches, with a minimum weight of 2.70 pounds per linear foot.

C. Gate Hardware: Provide the following hardware and accessories for each gate, as well as all necessary fittings and appurtenances required for the operation of the gate. **Note that this project does not include gates in the accessible path of travel.**

1. Hinges: Galvanized pressed steel or malleable iron to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide three hinges for each leaf of each gate.
2. Latch Assembly for Double Gates: Provide center-dropped type latch assembly to permit operation from either side of gate. Provide padlock eye as integral part of the latch assembly requiring one padlock for locking both gate leaves.
3. Gate Stops: Provide gate stops consisting of mushroom type or flush plate type with anchors, to be set in a concrete footing, twelve inches square, to engage the center drop-rod.
4. Keeper: Provide keeper for all gate leaves that automatically engages the gate leaf and holds it in the open position until it is manually released.
5. Padlock: Provide one padlock for each gate. Padlocks shall conform to FS FF-P-101E(I) and as follows: Best Lock Co., 2 nickel-chrome-plated keys per padlock. KEY TO BUILDING MASTER-KEY SYSTEM.
6. Kickplate: Provide 10 inch high stainless steel kickplate, screwed to frame with number 10 sheet metal screws at 12 inches on center. Bottom of kickplate to be flush with bottom of gate.

2.05 BOLTS

A. 3/8 inch minimum diameter, cadmium-plated

2.06 COLOR

A. PVC coating to be selected from manufacturer's standard colors.

2.07 CONCRETE

A. 3000 PSI, 28-day strength. Footing diameter and depth to be as shown in the drawings or three feet deep and twelve inches round if not noted. All posts shall have a minimum of 3-inches of concrete coverage on all sides.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the substrate where fencing is to be installed. Notify the Architect, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 FENCING

A. Line posts shall be ten feet on center, or equally spaced in runs less than twenty feet. Fabric shall be supported at top and bottom by a rail.

B. Drill or dig holes for posts and other footings in firm undisturbed or compacted soil. Footing holes and post embedment shall be per fence manufacturer's standards, but not less than those shown on the drawings or specified.

C. Set all posts plumb and true to line and grade, in concrete footings. Center and align posts in holes 3 inches above bottom of excavation. Slope top of footing away from posts. Posts not set plumb and true shall be removed and replaced; bending posts to make them plumb will not be permitted.

D. Provide couplings in top rail approximately every 20 feet. Couplings shall be outside-sleeve type and at least 7 inches long. One coupling in every five shall contain a heavy spring to take up expansion and contraction. Top rail shall pass through base of line-post tops and form a continuous brace from end to end at each stretch of fence. Top rail shall be securely fastened to terminal posts by pressed-steel connections.

E. Fabric shall be fastened to line posts with galvanized fabric bands spaced approximately 14 inches apart and to top and bottom rails with galvanized tie wires spaced 24 inches apart. Set fabric 1/2 inch above paving.

F. Fabric shall be fastened to end, corner, and gateposts by means of stretcher bars threaded through the fabric. Stretcher bars shall be fastened to posts with stretcher-bar bands every 14-inches.

G. Apply fabric on property line side of fence, outside of posts. Stretch fabric taut, securely fasten, cut, and attach independently at terminal posts. Do not splice fabric.

H. Tension wire shall have turnbuckles every 150 feet, maximum. Secure tension wire to fabric with 14-gauge tie wire at 18 inches on center, double- wrapped.

I. Bolts shall not protrude more than 1/4 inch beyond nuts after tightening. File rough edges smooth wherever bolts are cut or minor breaks in film occur renew galvanizing and coating with approved cold galvanizing preparation applied according to manufacturer's printed instructions.

J. All posts shall be plumb and rigid after installation. Rails shall be straight and tight. Chain-link fabric shall be smooth and uniformly stretched tight and straight.

3.03 GATES

A. Shop assemble gate frames by welding. Use same fabric as for fence. Install fabric with tension bars at vertical edges, and tie wires at top and bottom edges. Attach tension bars to gate frame at not more than 15 inches on center. Attach hardware with rivets or by other means that will provide security against removal or breakage.

B. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories.

C. All welds in the gate frame shall be galvanized after fabrication.

D. Gates shall be installed plumb, level, and secure for full opening, without interferences. Install ground-set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricate. Gates shall operate smoothly and easily without sag, noise or hinge bind. Gates shall swing with a maximum amount of resistance as allowed per applicable ADA and CBC codes.

END OF SECTION

SECTION 02900
LANDSCAPE PLANTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnish all labor, materials, equipment, appliances and necessary incidentals for the complete installation of all landscape planting as shown on the drawings and as specified herein. Work includes, but is not limited to, the following:

1. Furnish and install import soil, backfill mix and raised planter mix in planting areas indicated on plans and in specifications.
2. Apply pre-emergent to planting areas as specified herein.
3. Fine grading
4. Soil preparation and fertilization.
5. Furnish trees and shrubs.
6. Install trees and shrubs.
7. Guy trees.
8. Plant new lawn (hydraulic seeding).
9. Mulching
10. Protect, maintain and warranty as specified.
11. All work of every description mentioned in the specification and/or amendments thereto, and all other satisfactory completion of the work including clean-up of the site.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 02200, Earthwork.

1.03 QUALITY ASSURANCE

A. Soil testing for planting areas shall be performed by Soil & Plant Lab, P.O. Box 6566, Orange, CA 992863; 714/282-8777 or FAX: 714/282-8575. Tests shall be paid for by the Contractor.

B. The testing laboratory for soils analysis shall use the following criteria for soil testing:

1. USDA Agricultural Suitability test per Handbook-60.
2. University of California Soil Fertility test.
3. Interpretation, recommendations, and comments regarding these tests are required.

C. A soils analysis of existing on-site soils shall be required.

1. There shall be 2 areas throughout the site. At each sampling area there shall be 2 core samples taken. Suitability and fertility analyses with comments and recommendations shall be required for each sample.

D. The Contractor shall perform all the soil testing of the existing on-site soil after the completion of rough grading and submit the testing laboratory's interpretation, recommendations, and comments to the Landscape Architect within 14 days.

E. A soils analysis of import soil, raised planter mix and fir sawdust shall be required prior to backfill.

1. One quart of import soil, without specified amendments, shall be submitted for particle size, suitability and fertility analyses. Two quarts of nitrogen stabilized fir sawdust for backfill mix and on-grade plantings shall be submitted for organic and particle size analyses. Do not mix.

F. After the completion of planting in the soil preparation areas and on-grade backfill mix areas, soil testing shall be conducted for organic suitability. The Contractor shall submit to the testing laboratory the original amendment specification with all issued bulletins for soil amendments and installation procedures along with 2 random samples of soil preparation areas and 2 random samples of backfill mix areas for analysis. Fertility analyses, recommendations, and interpretation shall be required from the testing laboratory to assure all specified amendments have been provided.

G. The Contractor shall perform all soil testing of the backfill mix and raised planter mix and submit the soil testing laboratory's findings to the Landscape Architect within a minimum of 5 days prior to backfilling.

H. Samples of materials shall be submitted for observation. Delivery may begin upon approval of samples. Material samples shall include fertilizers and soil conditioners, plants and any other materials indicated herein.

I. The Contractor shall furnish a certificate of delivery slip with each delivery of material in containers or in bulk. Certificate shall state source, quantity, or weight, type and analysis and date of delivery. Deliver all certificates to the Landscape Architect.

J. No substitutions will be permitted without the approval of the Owner's authorized Representative. Rejected materials shall be removed from the site by the Contractor.

K. The Contractor shall warranty shrubs and lawn for a period of six months and trees for one year from date of final acceptance.

1.04 SUBMITTALS

A. The Contractor shall furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Landscape Architect.

B. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials to be used.

C. Materials installed or furnished without prior approval of the Landscape Architect may be rejected and the Contractor required to remove such materials from the site at his own expense.

D. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.

E. Manufacturer's warranties shall not relieve the Contractor of his liability under the warranty. Such warranties shall only supplement the warranty.

1.05 JOB CONDITIONS

A. Visit the site to determine existing conditions, including access to the site and the nature and extent of existing improvements upon adjacent public and private property, as well as materials and other factors to be encountered that may affect the work of this section.

B. Additional compensation resulting from the alleged ignorance of local conditions, and their effect upon the cost of the work will not subsequently be approved.

C. Protect the Owner's property from injury or loss. All damage to existing property (buildings, utilities, plantings, etc.) caused by the Contractor during his operation or as a result of malfunction of installed work during the warranty period shall be repaired at Contractor's expense.

D. Cause minimum interference with workmen, materials, or other equipment of other trades on the project.

E. Landscape work shall not begin until all construction adjacent to the planting areas has been completed and until the irrigation systems have been installed and approved by the Landscape Architect and the Owner's designated representative.

F. Contractor shall apply for and secure all required permits.

PART 2 - PRODUCTS

2.01 MANUFACTURER:

A. It is the intent of this specification that all materials herein specified and shown on the drawings shall be of the highest quality available and meet the requirements specified.

2.02 SOIL MATERIALS

A. Import Soil: Furnish all import soil necessary to complete the required planting of on-grade planting areas and for backfill and raised planter mix as indicated:

1. Silt plus clay content of the import soil shall not exceed 15% by weight with a minimum 95% passing the 2.0 millimeter sieve.

2. The sodium absorption ratio (SAR) shall not exceed 6.

B. The electrical conductivity (EC) of the saturation extract of this soil shall not exceed 3.0 millimhos per centimeter at 25 degrees centigrade.

C. The boron content of this soil shall be no greater than one part per million as measured on the saturation extract.

D. Samples of the import soil shall be submitted to the soils testing laboratory for analysis, interpretation, and recommendations prior to blending or backfilling.

E. Fir sawdust shall be standard quality impregnated with 1% nitrogen.

1. Particle size, dry weight basis:

Percent Passing	Sieve Size
95-100	6.35 mm (1/4")
80-100	2.38 mm (no. 8, 8 mesh)
0-30	500 micron no. 35, 32 mesh)

2. Organic content as determined by ash analysis:

3. Minimum 94% based on dry weight.

4. Chemistry:
   a. Minimum 0.8% nitrogen based on dry weight.
   b. Minimum 0.08% dilute acid soluble iron based on dry weight.
   c. Salinity shall not exceed 3.5 millimhos per centimeter as measured in the saturation extract.

5. Samples of the fir sawdust shall be submitted to the soils testing laboratory for analysis, interpretation, and recommendations prior to blending or backfilling, as outlined in 1.03 Quality Assurance in this Section.

F. Commercial fertilizer: As specified by soils testing laboratory. Deliver in sacks, with a manufacturer's label attached to each sack, which lists weight and analysis.

G. Soil sulphur shall be agricultural grade, containing a minimum 99% sulphur.

H. Ferrous iron sulfate shall be first quality commercial grade; ground ferrous sulphate containing a minimum 18.5% iron expressed as metallic.

I. Root hormone shall be "Super Thrive."

J. Planting tablets shall be NPK 20-10-5, 21 gram and 5 gram fertilizer tablets.

K. Gro-Power materials shall be first quality commercial grade as manufactured by Gro-Power, Inc., 15065 Telephone Avenue, Chino, CA 91710-9614. 800/473-1307 or 909/393-3744. FAX: 909/393-2773.

2.03 PRE-EMERGENT WEED CONTROL

A. Pre-emergent herbicide shall be as recommended by a licensed pest control advisor and as accepted by the Owner's agricultural testing laboratory.

1. Pre-emergent herbicide products include: Ronstar, Treflan, Eptam, Vegitex or equal.
2. Fungicide/Insecticides include Subdue 2-E and Bayleton.

2.04 LAWN MATERIALS

A. Hydraulic Seeding

1. Seed shall be fresh, clean, new crop seed, premixed by mechanical mixer to proportions specified. Minimum purity and germination as follows:

		Proportion	Purity	Germination
a.	Medallion Dwarf w/Bonsai	100%	98%	90%

2. Hydraulic mulch shall be 'Turfiber.'
3. Soil stabilizer shall be Ecology Controls M-Binder. Spread at a rate of 80 lbs. per one acre.
4. Fertilizer shall be 17-13-5 urea formaldehyde first quality commercial grade.
5. For those areas that have been soil prepped, apply 320 lbs. of Gro-Power Hi-Nitrogen 14-4-9 per acre in slurry.
6. Seed shall be mixed by dealer and furnished with dealer's warrantied statement of composition and percent of purity, which shall be delivered to the Landscape Architect.

2.05 PLANT MATERIALS

A. Plant materials shall be furnished where applicable (except for Owner-supplied trees) by the Contractor in quantities, sizes, and/or spacing as indicated or noted for each location and shall be of species, types, etc., as symbolized and described in the plant list.

B. Plants shall be protected in transit and after delivery to the project site. Plants in broken containers will not be accepted, and plants with broken branches or injured trunks will be rejected.

C. Plants that are specified by container size shall be first class material equal to the size of similar material in local retail nurseries.

D. All plant materials shall be healthy, vigorous, with a good root system, and shall be free from pests or disease. All plant material shall have been observed and released by the County Agricultural Inspector prior to delivery to the job.

E. Plant material shall be observed and approved by Landscape Architect prior to their placement for planting. Materials not up to specifications will be rejected.

F. The Contractor shall warranty shrubs and lawn for a period of six months and trees for one year from date of final acceptance.

2.06 MULCH

A. Mulch shall be Walk-on-Bark as supplied by Sequoia Horticultural Products, Dinuba, CA. 559/591-1177.

2.07 TREE GUYING MATERIAL (ON-GRADE)

A. Tree Guys: Tree guys shall be white vinyl-coated galvanized wire with galvanized cable clamps and galvanized turnbuckle, eye-to-eye type with welded eyes; number of guys shall be per details. Where guy ties to tree, tie to be covered with hose as specified to protect the tree. Sizes for vinyl-coated wire are as follows:

1. For trees less than 3" caliper: 1/16 (7x7) white vinyl-coated galvanized wire with 1/16 galvanized cable clamps and 3/8" x 6" galvanized turnbuckle.
2. For trees 3" caliper to less than 6" caliper: 1/8 (7x7) white vinyl-coated galvanized wire with 1/8 galvanized cable clamps and 3/8" x 6" galvanized turnbuckle.
3. For trees 6" caliper to less than 10" caliper: 3/16 (7x7) white vinyl-coated galvanized Aircraft cable with 3/16 galvanized cable clamps and 3/8" x 6" galvanized turnbuckle.
4. For trees with 10" caliper or larger caliper: 5/16 (7x9) galvanized wire with 5/16 galvanized cable clamps and ½" x 6" galvanized turnbuckle.

B. Anchors (deadmen): Shall be aluminum anchors as manufactured by Duckbill (800/325-5360). All connections for the Duckbill aluminum earth system to be factory assembled. Follow manufacturer's recommendations for installation of anchors with hand drive rods and power equipment drive rods (where applicable). Sizes are as follows by tree caliper:

Less than 3" caliper:	Model No. 40-Db1
3" to less than 6" caliper:	Model No. 68-Db1
6" to less than 10" caliper	Model No. 88-Db1
10" caliper and larger caliper:	Model No. 138-Db1

C. Hose for covering wires shall be 3/4" reinforced black rubber garden hose and a minimum 12" length.

D. Flags shall consist of ½" diameter, white semi-rigid plastic tubing, 5' long.

PART 3 - EXECUTION

3.01 SOIL PREPARATION

A. Soil for planting shall be free of rocks over ½" in diameter, and free of foreign debris, refuse, plants or roots, clods, weeds, sticks, solvents, petroleum products, concrete, base rock, or other deleterious or undesirable and unwanted materials. Soil shall be free of soil-borne diseases and capable of sustaining healthy plant life. Materials not meeting such requirements shall be removed, including all temporary road bases or pavement already in place.

B. All on-grade planting areas with a slope gradient of less than 2-1/2:1 shall be cross-ripped to a depth of 10" to 12" in two directions and receive per 1,000 square feet of area the following:

Fir sawdust	6 cu. yds.
12-12-12 commercial fertilizer	15 lbs.
Soil sulphur	10 lbs.
Gro-Power Plus with soil penetrant	200 lbs.

Note: Areas to be planted that are densely compacted, 85% to 90%, shall be cross-ripped to 12" depth. Areas over 90% compacted shall be cross-ripped to 24" depth, and all unacceptable materials removed.

C. Broadcast uniformly and rototill into upper 4-6 inches of soil.

D. Samples of the native soil shall be submitted to the soils testing laboratory after rough grading and prior to soil preparation. On receipt of a soils analysis and recommendations, an addendum or bulletin to these specifications shall be issued if revision to the soil treatment is necessary. Refer to 1.03 Quality Assurance in this section for soil testing procedure.

E. EUpon completion of soil preparation, an additional soil testing shall be conducted as outlined in 1.03 Quality Assurance in this section.

3.02 RAISED PLANTER MIX

A. Backfill mix for raised planters and tree pits in raised planters shall be of the following material per 10 cu. yds.:

Import Soil	6 cu.yds.
Fir sawdust	4 cu.yds.
Iron sulfate	20 lbs.
Gro-Power Plus	180 lbs.

B. A soils analysis, interpretation and recommendations of the raised planter mix shall be required prior to backfilling as outlined in 1.03 Quality Assurance, in this section.

3.03 ON-GRADE BACKFILL MIX

A. Backfill mix for plant pits shall be of the following material per ten yards:

B. Native Soil (leach thoroughly before use) 6 cu.yds.

Fir sawdust	4 cu.yds.
Iron sulfate	20 lbs.
Gro-Power Plus	180 lbs.

C. Samples of the native soil shall be submitted to the soils testing laboratory prior to blending of backfill mix. On receipt of a soils analysis and interpretation, and recommendations, an addendum or bulletin to these specifications shall be issued if revisions to the soil treatment are necessary. Refer to 1.03 Quality Assurance in this section for soil testing procedure.

D. Upon completion of backfill mix blending and prior to installation, an additional soil testing shall be conducted as outlined in 1.03 Quality Assurance in this section.

E. The above material should be uniformly blended prior to use. Incorporate as specified under "tree, shrub and vine planting" herein.

3.04 PRE-PLANT WEED CONTROL

A. Clear and remove existing weeds by mowing or grubbing to at least 1/4" below the soil surface.

B. Pre-emergence herbicide shall be applied to all planting areas except lawn and hydroseeded areas. Apply in accordance with manufacturer's recommendation. After this application, apply 1-2" of water.

C. Contact herbicides shall be applied as per manufacturer's recommendation to areas to receive lawn or hydroseed. Apply in accordance with manufacturer's recommendation. After this application, apply water as if just seeded for period of one month to stimulate weed growth. Reapply contact herbicide and water for period of one week. Remove all remaining weeds manually.

3.05 GENERAL PLANTING

A. Finish grade shall be as specified in Section 02210.

B. The Landscape Architect shall approve all planting areas prior to the installation of any materials. Placement of plant materials shall be approved before holes are dug. Stake plant locations and secure approval from Landscape Architect before excavating pits making necessary adjustments as directed.

C. Inspect and accept all landscape irrigation work and finish grading prior to start of shrub planting as specified. Trees may be planted in advance of irrigation system installation, provided adequate provision is made for interim watering.

D. All on-grade plant pits shall be excavated to a minimum of two times the diameter and height of the container to permit handling. Excavate pits with vertical sides for all plants. Scarify sides of plant pit with spade, trowel or other tool so that the sides are pocked and uneven. When hardpan, muck, or unsuitable soil is encountered, break through to clean soil and backfill with prepared backfill as directed.

E. In a centralized area, mix all backfill soil to achieve a uniform blend of amendments. The intent is to achieve well-blended soil and not amend each planting hole at the plant pit. Clean up unused excavated soil and dispose of off-site. Protect mix from water until it has been placed in backfill around plants.

F. All plants shall be planted immediately after containers are cut and containers shall be regularly removed so as not to present a hazard to those persons using the areas.

G. Planting tablets are to be placed in all planting pits as follows:

1. During backfilling, place NPK 10-10-5, 21 gram fertilizer tablets near, but not in direct contact with, the bottom half of the root balls at the following rates:
   One tablet per 1 gallon plant
   Two tablets per 5 gallon plant
   Three tablets per 15 gallon plant
   Five tablets per 24" and larger boxes
   Ten tablets per 36" box
   Twelve tablets per 42" and larger boxes

H. Remove each plant from its container, cut out all broken, frayed or circular root systems. Scarify root ball and place each plant in center of pit and backfill, unless specified otherwise, with prepared soil. Plants to be set in a vertical position in such a manner that when settled, it

will bear the same relation to constructed finish grade as it bore to grade in its container or soil surface at place of growth before being transplanted.

I. Backfill with specified soil mix and tamp firm. No soil in a muddy condition shall be used for backfilling. Water jet plant when hole is two-thirds full to remove all air pockets. After watering, continue to backfill and tamp soil until the surface of the backfill is level with the surrounding grade. No filling shall be permitted around the trunk or stem of the plants.

J. After backfilling, construct an earthen basin around each plant. Each basin shall be of a depth sufficient to hold at least 4" of water. Basins shall be constructed of amended backfill materials. Remove basin in all turf areas after initial watering and prior to sodding. If erosion occurs, reconstruct water basin until final acceptance.

K. Water thoroughly immediately following planting. Backfill all voids which develop with additional prepared soil to bring to finish grade.

L. Upon completion of all planting operations and again as a requirement just prior to final observation, all soil between plants shall be lightly cultivated, weeded, and neatly raked.

3.06 PLANTING TREES

A. Prepare tree pits as specified above, unless otherwise noted in details, plans or specifications.

B. Specimen trees to be planted prior to construction of finished grades shall be located by surveyor for position and finish-grade relationship to top of root ball. Adjust or replant all plant materials that do not meet final grades at no cost to Owner.

C. Handle each tree in such a manner as not to cause injury or damage to material during digging or planting. Any tree damaged as a result of Contractor's operation shall be rejected and replaced at Contractor's expense.

1. NOTE: The "choke" strapping method of lifting is strictly forbidden (except of single trunk palms), any trees hoisted in this manner shall not be accepted.

D. Box Removal:

1. Remove bottom of plant boxes before planting. If it is not possible to remove box bottom because of size or soil type, remove every other bottom board, or other method accepted by Owner.

2. Remove sides of box without damage to root ball after positioning plant and partially backfilling.

E. Stake or guy trees as detailed on the drawings.

F. Keep guy wires out of general pedestrian traffic areas whenever possible.

G. All transplanted trees shall be set 2" minimum above finish grades.

H. Apply root hormone to each tree as follows:

1. Construct tree basins at rim or outer edges of tree ball so that applied water will remain on the top of the ball.

I. Apply root hormone at the rate as recommended by the manufacturer.

1. Tree balls shall be set before application of root hormone, and shall be mulched in conformance with specifications immediately after completion of root hormone and its irrigation into the ball.

J. Fungicide: Contractor shall apply as per manufacturer's recommendation a root ball drench containing 4 ounces of "Subdue 2-E" per 100 gallons of water to all trees prior to installation of the mulch.

3.07 PLANTING SHRUBS

A. Prepare shrub and vine pits as specified under "General Planting."

B. Planting procedures and practices shall be the same as those indicated under "Planting Trees."

3.08 LAWN PLANTING

A. Hydraulic Seeded Lawn:

1. Plant seed in areas indicated on plans.
2. Prepare lawn areas as specified in "Soil Preparation."
3. Fine grade seed areas to a smooth uniform grade. Roll lawn areas with 300 lb. roller until a uniformly compact and even surface is obtained in compliance with required finished grades and as directed by Landscape Architect. All finish grades shall meet approval of the Landscape Architect before seeding.
4. Method of seeding - hydraulic seeding:
   a. Moisten area prior to seeding.
   b. Apply hydraulic seeding material at a rate of 1500 lbs. per acre, mixed with commercial fertilizer 17-13-5 at 600 lbs. per acre. Mix with specified seed material to be mixed with water in 1500 gallon capacity agitator mixer and spray resulting slump under high pressure evenly and uniformly over area to be seeded.
   c. Quantities of seed to be mixed with hydromulch: Seed to be 12 lbs. per 1,000 square feet.

3.09 MULCHING

A. All planting areas, that do not exceed a 10% slope, except lawns, shall receive a prepared mulch spread evenly over the surface to a depth of 1".

3.010 FERTILIZING AFTER PLANTING

A. All planting areas shall receive an application of Gro-Power Hi-Nitrogen 14-4-9 commercial fertilizer at the rate of 7-1/2 lbs. per 1,000 sq. ft. thirty days after planting.

B. Fertilizer applications shall be repeated at 30-day intervals until the end of maintenance period.

3.011 TREE GUYING

A. Guys shall be anchored with either Duckbill aluminum anchors for on-grade conditions, or to stainless steel eye bolts for raised planter applications. Refer to planting details and manufacturer's installation instructions.

B. Guy trees immediately after planting. Guys should be placed so as to give equal support to the tree from any direction. To each guy install specified signal. Protect bark of tree by covering wire with hose.

C. Guy lines to be tightened to a firm but not overly tight tension. Should tree growth be of such a manner that the tree guys do not give the required equal support from all directions, install additional deadmen and guy wires.

3.012 PRUNING

A. Pruning shall be limited to the minimum necessary to remove injured twigs and branches and to shape tree for design intent as directed by Owner to include, but not be limited to: lifting of branch structure, thinning of canopy, and elimination of cross-branching. Pruning may not be done prior to delivery of plants and only as directed by Owner by an experienced and Owner-accepted Arborist. Pruning paint shall not be used.

3.013 MAINTENANCE

A. Continuously maintain all areas included under this section during the progress of the work, the 60-day maintenance period, and until final acceptance of this work.

B. If plantings are not acceptable at the completion of this work for entire work, due to defective maintenance, maintenance shall be continued until all work meets specifications and can be approved.

C. Maintenance shall include continuous operations of watering, weeding, mowing, rolling, trimming, edging, cultivation, fertilizing, spraying insect and pest control, reseeding, replacement and/or any other operations necessary to assure good normal growth. Apply lawn moth control sprays or other materials, as often as my be required to protect lawns and turfs until final acceptance of this work.

D. All planted areas shall be kept free of debris and shall be cultivated and weeded at no more than 10-day intervals.

E. Grass shall be cut to not less than 1-1/4" and during the period of maintenance, it will not be allowed to exceed 2" in height.

F. During installation period and during maintenance period, the Contractor shall be responsible for maintaining adequate protection of all areas. Any damaged plantings shall be repaired at Contractor's expense.

G. At termination of maintenance period, all plant materials shall be live, healthy, undamaged and free of infestations. Inferior planting shall be replaced and brought to a satisfactory condition before final acceptance of work will be made. All areas shall be neatly raked and free of weeds.

H. Replacements: Immediately replace any and all plant materials and grass that die or are damaged. Replacements shall be made to the same specifications as required for original plants.

I. Two observations shall be made that affect the maintenance period. The first after all planting has been completely installed in order to approve the beginning of the maintenance period of not less than 60 calendar days, and the second at the end of the 60-day maintenance period. If plantings are not acceptable at the end of the 60-day period due to defective maintenance, then maintenance shall be continued by the Contractor until all work meets with the specifications and can be approved. Written notice, requesting observations shall be submitted by the Contractor at least 7 calendar days before anticipated date of observation.

3.014 OBSERVATIONS

A. All observations herein specified shall be made by the Landscape Architect. The Contractor shall request observation at least 24 hours in advance of the time observation is required. Observations are required as follows:

1. When fine grading is completed.
2. When plant material has been delivered to the site.
3. When plant material has been spotted for planting but before planting pits are excavated.
4. After planting pits have been excavated but prior to backfill.
5. The Contractor shall be required to have a complete observation and approval of all landscape construction items at the end of the landscape construction period in order to establish the time for beginning of the 60-day maintenance period. Notify Landscape Architect at least seven (7) days in advance of observation.
6. At the completion of the 60-day maintenance period, an observation shall be required by the Contractor to obtain final approval. Notify the Landscape Architect at least seven (7) days in advance of observation.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Furnish, install and remove forms for cast-in-place concrete and including shoring and form supports.
2. Installation of inserts, anchors or other items.

B. Related Work Specified Elsewhere:

1. Section 02751: Cement Concrete Pavement and Site Concrete
2. Section 03200: Concrete Reinforcement
3. Section 03250: Concrete Accessories
4. Section 03300: Cast-In-Place Concrete
5. Section 03355: Concrete Finishes

1.02 CODES AND STANDARDS

A. ACI 301, Specifications for Structural Concrete for Buildings, Chapter 4.

B. 2007 California Building Code.

1.03 ALLOWABLE TOLERANCES

A. Tolerance limits as specified in ACI-347, Section 3.3. See Concrete Finishes Section for traffic surface tolerances of slabs.

1.04 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring, reshoring and bracing to conform to Code requirements; resultant concrete to conform to required shape, line and dimensions.

B. Form, shoring and re-shoring design shall be the sole responsibility of the Contractor. All forms and shoring shall be designed by a Civil Engineer licensed in the State of California.

1.05 SUBMITTALS

A. Submit Shop Drawings to showing location and layout of construction joints, reveals, form joints, textures, locations of tie holes or plugs, and location of embedded items, and other items which will be exposed on the finish wall.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Earth Forms: Unless otherwise indicated or required by the Structural Drawings, concrete for foundations may be placed directly against vertical excavated surfaces provided the material will stand without caving and provided that minimum reinforcing steel clearances indicated on Drawings are maintained and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as detailed on Drawings.

B. Forming Materials:

1. It is the contractor's option to use any type of forms, except use only one type throughout.
2. It is intended that forms shall impart a smooth uniform appearance to the concrete without mottles and color variations caused by non-uniform absorption of moisture or chemical reaction.
3. Chamfer Strips: Clear Douglas fir or pine, selected straight, milled on all faces or extruded polyvinylchloride specially produced for concrete work; Vinylex Corp., Preco Industries, Vulcan Metal Products, or equal. Material usage shall be consistent for each application.
4. Chamfer strips rigid PVC; 3/4-inch by 3/4-inch size; maximum possible length; manufactured by Burke, Greenstreak or Vulco.

2.02 FORM HARDWARE

A. All form ties shall be a type which does not leave an open hole through the concrete and which permits neat and solid patching at every hole.

B. When forms are removed, all metal shall be not less than one inch from the surface.

C. Do not use wire ties and wood spreaders.

D. Where wall is exposed to view in final structure use form ties with cones.

2.03 FORM RELEASE AGENTS AND SEALERS

A. Form release agents and sealers shall not harmfully affect the appearance, discolor or change texture of finished concrete surface or inhibit proper application of any surface finishes, coatings or bonding agents.

B. Form sealer shall prevent the development of bond or adhesion to concrete.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that such Work is completed to the point where this installation may properly commence.
2. Verify that forms are constructed in accordance with all applicable codes and regulations, the referenced standards, and the design documents.

B. Discrepancies:

1. In the event of discrepancy or conflict, immediately notify the Architect.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 CONSTRUCTION OF FORMS

A. Construct all required forms to be substantial, sufficiently tight to prevent leakage of mortar, and able to withstand excessive deflection when filled with wet concrete.

B. Provide temporary holes in formwork to facilitate cleaning and inspection.

C. Layout:

1. Form all required cast-in-place concrete to the shapes, sizes, lines, and dimensions indicated on the Drawings.

2. Exercise particular care in the layout of forms to avoid necessity for cutting of concrete after it is in place.
3. Make proper provision for all openings, offsets, sleeves, recesses, anchorage, blocking, reglets, chases and other features of the Work as shown or required. Provide openings as required for vibrators and concrete placing.
4. Where walls are to be exposed to view in final structure, form ties shall be used and laid out in a regular pattern.

D. Construction:

1. Tape all joints at forms for concrete exposed in the finished structure and for sandblasted finished concrete, including joints between form panels and trim strips.
2. Provide 3/4-inch chamfers at all vertical edges unless shown or noted otherwise.
3. Make all form panel joints, tight butt joints with all edges true and square.
4. Do not install inside forms until reinforcing installation has been reviewed.

E. Finishes:

1. Textures: Except as noted, the forms will be smooth and impart no texture to surface of concrete.
2. Vertical form joints are to be plumb and horizontal joints level.
3. Form ties to be aligned vertically and horizontally.
4. At inside corners miter plywood forms.

F. Architectural Concrete:

1. Conform to ACI 301 paragraph 13.3.
2. Seal joints to prevent leakage.
3. Arrange form joints and ties as shown on drawings or as reviewed by the Architect.

G. Embedded Items:

1. Prior to placement of concrete securely attach all required steel frames, angles, plates, bolts, inserts, and other similar items to the forms.
3. Install concrete accessories in accordance with manufacturer's recommendations: straight, level, and plumb.
3. Provide pipe sleeves when pipes pass through concrete. Install sleeves only as allowed on structural drawings.
4. Ensure that embedded items are placed and held, during placing of concrete, to tolerances consistent with other items that will be attached to them.

H. Conduits and Pipes in Concrete:

1. Do not run conduits, wires and pipes in concrete, unless noted otherwise.

I. Tolerances:

1. Forms shall be designed to the tolerances as specified in ACI 347. Tolerances for formed surfaces exposed to view in completed structure shall conform to Section 03355 - - Concrete Finishes. All other surfaces shall conform to Class C, Table 3.3.8 of ACI 347.
2. Forms shall have sufficient rigidity so as not to deflect more than 1/8-inch between supports after the concrete has been placed.

J. Form Release Agents:

1. Apply form release agent on form work in accordance with manufacturer's recommendations.
2. Apply form release agents prior to placing reinforcing steel, anchoring devices, and embedded items.

3. Keep form release agents away from concrete against which fresh concrete will be placed.

K. Earth Forms: Where earth will stand without caving, side forms may be omitted provided concrete cover on reinforcing steel on each side that the forms are omitted is at least 3 inches.

L. Adjustment of Forms: When a concrete pour has been stopped for a sufficient length of time so that shrinkage or warp has separated the forms and the concrete, provisions shall be made to draw the forms into firm contact with the concrete before placing additional concrete. Care shall be taken to prevent any shoulder or ledge formed at a cold joint.

3.03 CLEANING

A. All dirt, chips, sawdust, rubbish, water, etc., shall be completely removed from the forms before any concrete is deposited therein.

B. Holes shall be provided in the forms at the bottom for cleaning purposes and shall be left open until just before the concrete is poured.

C. Keep forms sufficiently wet to prevent joints from opening up before the concrete is placed.

D. When using earth forms remove loose dirt prior to placing concrete.

3.04 REMOVAL OF FORMS

A. Time of form removal shall depend on the strength of the concrete and the curing. When concrete has been exposed to cold weather, curing has not been effective, or concrete strengths are lower than expected, defer form removal. The following time periods shall be considered a minimum which may be extended if deemed necessary by the Architect.

1. Forms and shoring in formwork used to support the weight of concrete in beams, slabs and other structural members shall remain in place until the concrete has reached the minimum concrete strength specified. Forms may be removed at an earlier time if acceptable justification is provided.
2. Side forms of walls and slab on grade: 2 days
3. Side forms of foundation: 2 days

B. Forms shall be removed without damage to the concrete.

C. All forms below ground surface, with all shores and braces, shall be removed before backfilling.

D. Bolts, wires, clamps, rods, etc., not necessary to the Work, shall be removed to a minimum of one inch from the surface. Use care to eliminate any danger of rust stains from unprotected materials embedded in or adjacent to exposed concrete surface.

E. Provide shoring or re-shoring until the structural system is substantially completed and has obtained its design strength.

3.05 RE-USE OF FORMS

A. Except as specifically accepted in advance by the Architect, re-use of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtained if all forms were new, nor shall quality, appearance, or performance of the final structure be reduced.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SCOPE

A. Work included: Furnish and install

1. Reinforcing steel for cast-in-place concrete
2. Steel wire, spacers, supports, and accessories

B. Related work in other sections:

1. Section 02751: Cement Concrete Pavement and Site Concrete
2. Section 03100: Concrete Formwork
3. Section 03300: Cast-in-Place Concrete
4. Section 03355: Concrete Finishes

1.02 CODES AND STANDARDS:

A. The following codes and standards are hereby made a direct part of this Specification and all concrete reinforcement included in the Contract shall conform to the requirements therein.

Title 24	2007 California Building Code
ACI 315	Manual of Standard Practice for Detailing Reinforced Concrete
ACI 318	Building Code Requirements for Reinforced Concrete
CRSI	Manual of Standard Practice, Concrete Reinforcing Steel Institute, Latest Edition
ASTM A615	Specifications for Deformed Billet-Steel Bars for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A82	Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement
ASTM A185	Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement
AWS D1.4	Structural Welding Code - Reinforcing Steel

1.03 QUALITY ASSURANCE

A. Do not place reinforcing steel for footings until trenches and excavations have been inspected by the Soils Engineer.

1.04 SUBMITTALS

A. Test reports: Prior to delivery of the reinforcing steel to the site, the Contractor shall provide certified mill test reports of steel reinforcement, indicating compliance with the referenced specifications.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Steel reinforcement shall be transported to the building site, stored, and covered in a manner that will ensure that no damage will occur to it from moisture, dirt, grease, or any other cause that might impair bond to concrete. A sufficient supply of approved reinforcing steel shall be stored on the building site at all times to ensure that there will be no delay of the work. Identification of steel shall be maintained after bundles are broken.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Deformed bars: ASTM A 615 Grade 60 and Grade 40, ASTM A706 Grade 60, for bars requiring welding.

B. Bar supports: CRSI, Class C, Plastic-Protected.

C. Wire: Plain, cold-drawn, conforming to ASTM A S2.

D. Welded deformed-wire fabric conforming to ASTM A185.

PART 3 - EXECUTION

3.01 PLACEMENT

A. General: Reinforcing shall be placed in accordance with the Drawings and the applicable requirements specified herein. Reinforcing steel shall be accurately located in the forms within the specified tolerances and adequately tied and supported to prevent displacement during concrete placement.

B. Surface conditions: All reinforcement, at the time concrete is placed, shall be free of mud, oil or other materials that may adversely affect or reduce bond. Reinforcement with rust, mill scale, or a combination of both will be accepted as being satisfactory without cleaning or brushing provided the dimensions and weights, including height of deformations, of a cleaned sample shall not be less than required by the applicable ASTM specification. Turn tie wires after cutting to inside of section and bend in manner so that concrete placement will not force wire ends to exposed concrete surfaces.

C. Bending: Reinforcing bars shall not be bent or straightened in a manner that will injure the material. Bars with kinks or improper bends shall not be used. No bars partially embedded in concrete shall be field-bent except as shown on the Drawings.

D. Placing tolerances: Reinforcing steel shall be placed within the tolerances specified by ACI 318.

E. Protective concrete cover: Unless otherwise shown on the drawings, the minimum concrete coverage for reinforcing steel shall be as follows.

1. Cast against and permanently exposed to earth: 3 inch
2. Exposed to earth or weather, and formed surfaces: Bars No. 6 and larger, 2 inch; bars No. 5 and smaller, l-1/2 inch
3. Not exposed to earth or weather: Slabs, walls, and joists (No. 11 and smaller), ¾ inch; beams, girders, and columns (ties, stirrups, spirals, and principal reinforcement), 1-1/2 inch

F. Reinforcing Supports: Bars shall be supported on metal chairs or spacers on metal hangers accurately placed and securely fastened to steel reinforcement in place. Additional bars shall be supplied, whether specifically shown on the Drawings or not, where necessary to securely fasten reinforcement in place. Support legs of accessories in forms without embedding in form surface. Spacing of chairs and accessories shall conform to CRSI "Recommended Practice for Placing Bar Supports". Hooping and stirrups shall be accurately spaced and wired to the reinforcing. No wood will be permitted inside forms.

G. Wherever anchor bolts, inserts, sleeves, and the like interfere with placing of reinforcing steel, obtain District review. Bending of bars around openings or sleeves is not permitted.

H. Splices in reinforcing steel:

1. General: Splices shall be made only as indicated on the Drawings. All splices shall he in accordance with that shown on drawings. Splices in adjacent bars shall be staggered wherever possible.

2. Welding: When required or approved, welding of reinforcing steel shall conform to "Structural Welding Code - Reinforcing Steel" (AWS D1.4) and comply with ASW Code for workmanship and quality of welds. No welding shall be done at the bend in a bar. Welding shall not be permitted except as approved by the Architect. All welding shall comply with requirements of 2007 CBC, Section 1903A.4.

I. Field quality control:

1. All reinforcing steel shall be subject to the inspection of the Division of State Architect before placing concrete.
2. Welding:
   a. Weld reinforcing steel only where indicated on Drawings.
   b. Perform welding in accordance with AWS D1.4.
   c. Employ experienced certified welders, qualified as prescribed in AWS.
   d. All welding shall be done in the presence of a representative of the District and approved by the Architect.
   e. Inspection of welded reinforcing bars shall comply with requirements of 2007 CBC, Section 1704A.4.2.
3. Testing: Testing of reinforcing bars shall comply with 2007 CBC, Section 1916A.2.

END OF SECTION

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SECTION 03250

CONCRETE ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

A. Work included: Provide and install all concrete accessories as shown on the Drawings and specified herein. Principle work shall include but not be limited to the following:

1. Under-slab membrane.
2. Expansion joints.
3. Expansion joint forms.
4. Control joint forms.

B. Related work described elsewhere:

1. Section 02751: Cement Concrete Pavement and Site Concrete
2. Section 03100: Concrete Formwork
3. Section 03200: Concrete Reinforcement
4. Section 03300: Cast-In-Place Concrete
5. Section 03355: Concrete Finishes

1.02 SUBMITTALS

A. General: Comply with provisions of Section 01300.

B. Provide manufacturers specifications and other data to demonstrate compliance with the specified requirements.

C. Provide manufacturers recommended methods of installation. The manufacturers materials and recommended methods of installation, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work of this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Underslab membrane:

1. Type: Polyethylene film, 10 mils thick minimum; with manufacturer's recommended self-adhesive joint tape.
2. Acceptable manufacturer's and products: Visqueen, Noistop, Durathene.

B. Control and expansion joint form:

1. Type: Keyed metal joint.
2. Acceptable manufacturers and products: Burbank Concrete Accessories "Keyed Kold" 24 gauge galvanized steel joint form will steel "Keyed Kold" stakes.

C. Expansion joints; asphalt impregnated fiber:

1. Type: Cane fiber, preformed, waterproof asphalt impregnated; 1/2" thick x slab depth; per AASHO M213.
2. Acceptable manufacturers: Celotex Corporation.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine the areas and conditions under which the Work of this Section will be installed. Notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install accessories in accordance with manufacturer's recommendation and in the pattern(s) and/or location(s) as shown on the Drawings and specified herein.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide concrete work complete, including all cast-in-place work, mix designs, equipment bases, sample panels, installation of items in concrete work, grouting and dry packing, and application of sealers and hardeners. Provide vapor barrier and sand bed beneath building slabs on grade as detailed.

B. Related work in other sections:

1. Section 01400: Quality Control
2. Section 02500: Paving and Surfacing
3. Section 03100: Concrete Formwork
4. Section 03200: Concrete Reinforcement
5. Section 03350: Concrete Finishes
6. Section 07120: Waterproofing
7. Geotechnical Report: Appendix A

1.02 DEFINITIONS

A. Architectural Grade: All concrete exposed to view on exterior faces including walls, columns, curbs, beams, parapets, slabs, benches, or stairs, and as indicated on the Drawings, as well as interior faces of similar elements where indicated on Drawings or scheduled.

B. Standard Grade: All other areas.

1.03 QUALITY ASSURANCE

A. Reference Standards

1. 2007 California Building Code - Volume 2, Title 24, CCR.
2. American Concrete Institute (ACI).
   a. ACI 214 - "Recommendation for Evaluation of Compression Test Results of Field Concrete."
   b. ACI 301- "Specification for Structural Concrete for Buildings."
   c. ACI 304 - "Recommended Practice for Measuring, Mixing and Placing Concrete."
   d. ACI 305 - "Recommended Practice for Hot Weather Concreting."
   e. ACI 306 - "Recommended Practice for Cold Weather Concreting."
   f. ACI 308 - "Recommended Practice for Curing Concrete."
   g. ACI 309 - "Recommended Practice for Consolidation of Concrete."
   h. ACI 318 - "Building Code Requirements for Reinforced Concrete."
   i. ACI 613 - "Recommended Practice for Selecting Proportions for Concrete."
2. American Society for Testing and Materials (ASTM).
   a. C 31 - "Standard Method of Making and Curing Concrete Test Specimens in the Field."
   b. C 33 - "Standard Specification for Concrete Aggregates."

c. C 39 - "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens."
d. C 88 - "Standard Specification for Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate."
e. C 94 - "Standard Specification for Ready-Mixed Concrete."
f. C 143 - "Standard Method of Test for Slump of Portland Cement Concrete."
g. C 150 - "Standard Specification for Portland Cement."
h. C 157 - "Standard Method of Test for Length Change of Hardened Cement Mortar and Concrete."
i. C 171 - "Standard Specification for Sheet Materials for Curing Concrete."
j. C 172 - "Standard Method of Sampling Fresh Concrete."
k. C 173 - "Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method."
l. C 233 - "Testing Air-Entraining Admixtures for Concrete."
m. C 260 - "Standard Specification for Air-Entraining Admixtures for Concrete."
n. C 309 - "Standard Specification for Liquid Membrane - Forming Compounds for Curing Concrete."
o. C 330 - "Standard Specification for Lightweight Concrete Aggregate for Structural Concrete."
p. C 494 - "Standard Specifications for Chemical Admixtures for Concrete."
q. D 1751 - "Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-Extruding and Resilient Bituminous Types)."
r. D 2000 - "Rubber Products in Automotive Application, Classification System."
s. D 2419 - "Standard Specification for Method of Test for Sand -- Equivalent Value of Soil and Fine Aggregate."
t. E 329 - "Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction."

3. Structural Engineers Association of California, Supplementary Recommendations for Control of Shrinkage of Concrete.

B. Foreman's Qualifications: Contractor shall ensure that the concrete Work shall be done under the supervision of an experienced concrete foreman, having at least 5-years of foreman experience with 'As-cast' Architectural Grade concrete.

C. Material Testing: The following tests will be performed by District's Testing Laboratory.

1. Aggregate: Test of one sample for every 200 cubic yards of aggregate. Aggregates from a known source of supply which have shown by actual service to produce concrete of the required quality will be tested for soundness (ASTM C88), for gradation (See the following table) and deleterious substances (ASTM C33).

Table – Grading of Combined Aggregate

Sieve Number or Size in Inches	Percentage by Weight		
	1-1/2 inch maximum	1 inch maximum	3/4 inch maximum
Passing a 2 inch	-	-	-
Passing a 1-1/2 inch	95 -100	-	-
Passing a 1 inch	70-90	90-100	-
Passing a 3/4 inch	50-80	70-95	90-100

Passing a 3/8 inch	40-60	45-70	55-75
Passing a No. 4	35-55	35-55	40-60
Passing a No. 8	25-40	27-45	30-46
Passing a No. 16	16-34	20-38	23-40
Passing a No. 30	12-25	12-27	13-28
Passing a No. 50	1-12	5-15	5-15
Passing a No. 100	0-3	0-5	0-5

2. Concrete Tests: Test of three concrete test cylinders for every 50 cubic yards or less of each class of concrete placed each day, or not less than one test cylinder for each 2000 square feet of surface area of slabs or walls.
3. Contractor shall pay for and submit proposed mix proportions for each class of concrete. Mix designs shall be signed and approved by a California registered civil engineer.
   a. Limits of Quality
      1) The strength used as the basis for selecting proportions in the design of the concrete mix shall exceed the required f'c by the amount stated in ACI 318, Section 5.3.2.
      2) The strength level of the concrete will be acceptable if the averages of all sets of three consecutive laboratory-cured strength test results equal or exceed the required f'c. Comply with CBC Section 1905A.6.5 if strength tests fall below f'c specified.
      3) Field cured cylinders at the test age designated for measuring shall achieve 85% of the strength of the companion laboratory cured cylinders.
      4) If the above test standards are not achieved, the Contractor shall justify that the load carrying capacity of the structure has not been reduced. Carry out tests of cores drilled from the area in question as directed by the Inspector and Structural Engineer in accordance with "Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete" (ASTM C 42) and CBC Section 1905A.6.6.5.
      5) If the compressive tests of the core specimens fail to show the compressive strength specified, the concrete shall be deemed defective and shall be replaced or adequately strengthened in a manner acceptable to the Structural Engineer. Perform load tests as outlined in CBC Sections 1713A, 1917A and ACI 318 Chapter 20, as approved by the Inspector of Record, on the questionable portion of the Work.

D. Job Mock-Up for Architectural Grade Concrete: Provide a sample representative of the concrete for approval by the Architect. The location shall be as approved by the Architect. This shall be a sample of conditions to be encountered in the building and site walls, including a 8' x 8' section of wall with 5' return, and a freestanding 8' high circular column with sandblasted finish. Each item of the representative area shall be approved by the Architect prior to its use in the remainder of the building. Remove sample at completion of Work. Include in the area the following typical items:

1. Forming, including form joints and rustications.
2. Form ties.
3. Reinforcing.
4. Form coating and its application.
5. Concrete mix, including placing techniques, i.e., pumping.
6. Method of placing concrete.

7. Curing of concrete.
8. Form removal.
9. Precast concrete tie hole plugs.
10. Surface Finish and Color.

1.04 SUBMITTALS

A. Mix Designs

1. Prepare design mixes for each type and strength of concrete. Comply with Title 24, Part 2, Chapter 19A, Section 1905 A.1. Submit copies of mix designs for all types and strengths of concrete and final batch test results for strength (ASTM 39) and shrinkage (ASTM C157) at 7 and 28 days, for review by the Structural Engineer and Architect prior to commencement of work. All mix designs shall be prepared by an independent laboratory approved by the DSA and Architect, and stamped with a California State Civil License.
2. The mix design shall list:
   a. All materials and admixtures and their proportions.
   b. Water cement content, slump, and aggregate grading.
   c. Compressive strength and method used to determine strength.
   d. Sources of all materials.
   e. Whether it is appropriate for pumping.
3. The Contractor, in conjunction with the selected ready-mix manufacturer, shall submit the mix design(s) to the District's testing laboratory for review, acceptance and certification (stamp and signature). The Civil Engineer, responsible for testing compliance, shall prepare the proper format for acceptance by the Architect and Structural Engineer. Acceptance of the mix designs is subject to trial-batch test results for compressive strength and drying-shrinkage by the District's testing laboratory. The Contractor shall submit mix designs, cement and aggregates sufficiently in advance of concrete placement to allow for trial-batch testing (Note: Test data shall be acceptable as acceptable by the Structural Engineer). The costs of trial batch tests will be paid for by the Contractor. Refer to Supplementary General Conditions for specific requirements for approval of the concrete mix design(s) as relates to the processing of Payment Requests. Allow for 7 days in the construction schedule for review and acceptance by the Architect once the mix design is deemed acceptable for review.

B. Mix Design Sample: Submit three 1-foot by 1-foot by 3-inch samples of Architectural concrete poured face down against forms material.

C. Submit plan and schedule of concrete placement operations before commencing Work. Show construction, contraction and expansion joints.

D. Provide shop drawings detailing all construction joints, etc., affecting Architectural Grade finish.

E. Submit qualifications of concrete foremen, showing 5 years experience with this type of concrete installation.

F. Records: Keep a record and make available for inspection at the Site, showing the date and time of placing concrete in each portion of the structure.

G. Submit tickets for each batch of concrete delivered to jobsite.

H. Furnish cement mill tests.

I. Provide shop drawing detailing Mock-up.

J. Test Reports: Testing Agency will report all results of tests as noted on the Tests and Inspection List, who will approve or disapprove Contractor's work.

K. Admixtures: Provide manufacturer's data of proposed admixtures, and written procedure for use and control. Conform to CBC 1903A and ACI 318, Section 3.6.

L. Placement record upon completion of the job. Include date, time, mix design, yards placed, weather and location of placement.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect cement from moisture and rotate stock to ensure fresh materials.

B. Protect aggregates as necessary to maintain saturated condition when batched.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cement

1. Type II, ASTM C 150, with use of at least 2 years with proposed aggregates without detrimental reaction. Use for all concrete in contact with soil. Type IIA where air entrainment is required. Not more than 15 percent by weight of fly ash or other possolan may be substituted for portland cement.
2. One brand from the same source shall be used throughout the project.

B. Standard Weight Aggregates: ASTM C 33. Aggregates shall consist mainly of calcium or magnesium carbonate, e.g., limestone or dolomite, and containing 40 percent or less quartz, chert or flint. The maximum size used in a particular location shall be consistent with the form and dimensions of the section being placed, with the location and spacing of the reinforcing steel and with the method of vibration. The aggregate sizes shall be such as will produce dense, uniform concrete, free of rock pockets, honeycombs, or other irregularities. Aggregates for stone concrete shall conform to Title 24, Part 2, Section 1903A.3. Grading of coarse aggregates shall conform to "Grading of Combined Aggregate" shown in Section 03300, 1.03, C.1.

1. Coarse Aggregate for Stone Concrete: Clean, hard, fine grained, sound crushed rock or washed gravel or a combination of both, free from oil, organic matter, or other deleterious substances containing not more than 2 percent by weight of shale or cherty material. Uniformly graded from 1/4-inch size to maximum size.

C. Water: Clean and free of deleterious materials such as acids, alkalies, salts, oils, or organic substances.

D. Water Reducing Admixtures: ASTM C 494, Type A; Grace Construction Materials "WRDA"; Master Builders "Pozzolith"; Sonneborn-Contech "Trimix" or equal.

E. Admixtures: Only if accepted by the Structural Engineer in accordance with Title 24, Part 2, Section 1903A and ACI 318, Section 3.6. Where more than one is used, admixtures shall be compatible. Accelerating admixtures are not permitted. Use of admixtures shall be at Contractor's option and as approved by the Structural Engineer. They shall be present in the approved sample panel and shall present a consistent appearance with areas of concrete which do not contain the admixtures. Admixtures containing chlorides may not be used. Only class N or F fly ash may be used at a maximum 15% of the total cementitious weight.

F. Epoxy Materials

1. Epoxy Adhesive: Ceilcote No. 348, Adhesive Engineering's LPN 1001, or equal.
2. Epoxy Grout: Ceilcote No. 648, Grace "Vibro-Foil Grout," Master Builders' "Masterflow No. 713" Grout, or equal.
3. Epoxys must be fire rated in fire rated areas.

4. Epoxy adhesive type anchor systems shall be Hilti-Hit HY-I50 (ICBO ER-5193) unless noted otherwise.

G. Hardener: Sonneborn "Lapidolith," Stonhard "Stontop HD1," or equal.

H. Curing Materials

1. Fiber reinforced asphaltic vapor barrier building paper.
2. Polyethylene sheet 4-mil thickness.
3. All resin based curing compound ASTM C 309, Type-I-D, Class A and B. Verify compound compatible with finish floor material.
4. For Architectural Grade surfaces use materials having no effect on concrete color.

I. Premolded Joint Filler: ASTM D 1751.

J. Sand: Uniformly graded, clean sand free from excessive fines, organic materials, or other deleterious substances.

K. Resilient Pad: Closed cell Polystyrene foam, 1/4-inch as approved by the Owner's Representative for uses as indicated.

L. High Range Water Reducing Admixtures (Superplasticizers): ASTM C494, Type F, Grace Construction Materials "WRDA," Sika Chemical Corp. "Sikament," or equal.

M. Drypack for Base Plates: Master builders' "Embeco 636 Grout" Conrad Sovig "Perma Grout"; Master Builders' "Master flow No. 713," or equal.

N. Drypack Mortar for Form Holes at Non-Architectural Grade Surfaces: Composed of 1 part Portland cement and 2 parts of fine aggregate and water. Match color of adjacent surfaces.

2.02 MIXES

A. The various concrete mixes to be used shall be as follows and as shown on the Drawings:

Class	Location	28-day Strength (PSI)	Cement Type	Maximum Slump (inches)	Maximum Aggregate Size (inches)	Shrinkage Limit at 28 days
A	Foundations	3000	II	4	1-1/2	0.065
B	Site Walls and Retaining Walls	3000	II	4	1	0.065
C	Slabs on Grade	3500	II	4	1	0.065
D	Civil Concrete	Per Section 02751 and Civil Drawings				

* per recommendation of Soils Report

** At point of placement.

B. Concrete mixes shall comply with ASTM C 94. Mixing and transporting shall comply with requirements for Truck-Mixed Concrete.

1. Proportioning shall be by weight of loose, dry material, 94 pounds of cement shall be considered 1 cubic foot. Fine aggregate volume shall be at least 35 percent, with a maximum of 50 percent, of the sum of the separate fine and course aggregate volumes. Weighing equipment shall be accurate to within 1 pound and be adjustable for varying aggregate moisture content. A beam auxiliary shall register any part of the last 100 pounds of each aggregate. The aggregate hopper shall have a volume adjustment.

C. Maximum slump may vary ± 1.

D. Maximum water cement ratio shall be 0.50 unless noted otherwise.

E. Bonding grout: Approximately 1 part Portland cement to 1 part fine sand passing a No. 30 sieve, mixed to a creamy consistency.

F. Patching mortar shall be made of the same material and of approximately the same proportions as used for concrete, except that coarse aggregate shall be omitted and mortar shall consist of not more than 1 part Portland cement to 2-1/2 parts damp loose sand by volume.

1. Combine white and gray Portland cement as necessary to match color of surrounding concrete. Use no more mixing water than necessary for handling and placing.
2. Mix patching mortar in advance and allow to stand with frequent mixing with trowel without adding water until it has reached the stiffest consistency that will permit placing.
3. Remove honeycombed and other defective concrete down to sound concrete.
4. Dampen area to be patched and at least 6 inches surrounding the area.
5. After water has evaporated from surface, brush coat of bonding grout into surface.
6. When bonding grout begins to lose water sheen, apply patching mortar, thoroughly consolidate and strike off slightly higher than surrounding surface.
7. Patching mortar shall set undisturbed for at least 1 hour before final finishing.
8. Do not finish patches on exposed surfaces with metal tools. Damp cure patches for 7 days.

PART 3 - EXECUTION

3.01 ALTERNATIVE PROCEDURES

A. Concrete may be placed by pumping provided that pumping equipment is manufactured specifically for proposed use and provided that pump is compatible with approved concrete mix. When a pump is used there must be an alternative acceptable placing technique immediately available in the event of pump failure.

3.02 PREPARATION

A. Prior to placement of concrete, Contractor shall be responsible for examination of all conditions affecting installation of Work and shall not proceed until the following conditions have been met.

1. Acceptance of compaction tests of fill and backfill in accordance with requirements of Section 02200.
2. Completion of placement of drainage fills or slab base in accordance with requirements of Section 02200.
3. Completion of formwork in accordance with requirements of Section 03100.
4. Placement of reinforcement in accordance with requirements of Section 03200.
5. Placement of embedded items.
6. Completion of inspection of formwork, and reinforcing in accordance with the requirements of Title 24, Part 2, Chapter 17A.
7. Notify the Inspector of Record, Structural Engineer and DSA at least 48 hours prior to placement of any concrete.

B. Clean and roughen all construction joint surfaces by removing laitance and exposing sound aggregate by sandblasting or chipping. Thoroughly clean and moisten contact surfaces before placing fresh concrete.

C. Cleaning and Wetting Forms and Subgrade: Remove foreign matter accumulated in forms, rigidly close ports and openings left in formwork immediately prior to starting concrete placing. Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce suction and maintain workability of concrete mix. Thoroughly clean tools used in transporting,

placing, and consolidating concrete immediately after each use. Wet subgrade surfaces immediately prior to placing slabs on grade.

3.03 PLACING CONCRETE

A. Quality: Concrete shall be placed with the intent to leave the Architectural Grade concrete as specified in Section 03100 exposed exactly as formed and complying with sample panel.

B. Place concrete in presence of the Inspector of Record. Presence of the DSA and Structural Engineer shall be at their respective discretion based on Contractor's notification of time of placement.

C. Transport concrete from batching plant to place of final deposit as rapidly as practicable. Place concrete before initial set has occurred and in no event after it has contained water for more than 90 minutes. Convey concrete from mixer to forms as rapidly as possible and deposit in its final position by methods which will prevent segregation or loss of ingredients. Concrete for any pour shall be placed in one continuous operation. Thoroughly vibrate and tamp concrete so that all parts of forms are filled and so that no voids remain in mass or on surface. Work concrete through and around reinforcing steel.

D. Place each formed unit of structure in one continuous operation. Pour all walls and columns full height to designated cold joints. Pour all beams, and horizontal structures to designated cold joints. Cold joints are to be made in walls only where indicated on the Drawings.

E. Deposit concrete in walls in horizontal layers not over 18 inches deep and 30 feet maximum in length. Use spouts, elephant trunks or other means as approved by the Structural Engineer as necessary to prevent segregation when dropping concrete. Free fall shall not exceed 6 feet.

F. Use as many vibrators and tampers as necessary to secure required results for different parts of structure. All concrete is to be mechanically consolidated by internal vibration. Make extra vibrators available during placing of concrete, ready for service in case any vibrator in use fails.

G. For vibrating of concrete, use a mechanical internal vibrator having a frequency of not less than 4,000 impulses per minute. Place vibrating element directly in concrete and not attached to either inside or outside of forms or to reinforcing steel. Do not over-vibrate concrete.

H. Provide runways for buggies or other means of conveying concrete into place to prevent displacement of forms of reinforcement. Do not run biggies directly over reinforcing steel or on planks supported directly by reinforcing steel. Do not displace reinforcement, anchor bolts or other materials that are to be embedded in concrete.

I. Bring surfaces to be finished to specified grade, strike off, and finish in a workmanlike manner. Provide smooth level surfaces in compliance with specified tolerances. Refer to Section 03100.

3.04 FINISHING CONCRETE

A. Refer to Section 03355.

B. Stairs: Apply non-slip aggregate finish to concrete, ramps, stair treads and platforms when not covered with finish flooring materials.

C. Cast-in-Place Concrete Walls, Columns, and Slabs: Exposed concrete shall be Architectural Grade where indicated.

D. All finished floors which will be left exposed shall be treated with a hardener to prevent cement dusting.

E. Interior Floor Slabs

1. Vibrate to compact, screed, level, and tamp with a grid tamper to raise a thin mortar bed to the surface. Trowel after concrete has hardened sufficiently to prevent drawing moisture to the surface. Do not dust with dry materials.
   a. Slabs under resilient flooring require wood float and single pass with steel trowel.
   b. Slabs under ceramic tile require finish as required for setting method.
   c. Slabs and topping slabs exposed as finished surface require wood float, then three troweling operations: First, hand trowel; second, troweling machine; and third, steel trowel until a smooth , dense, even surface is obtained.
   d. Slabs under topping slabs require wood float.
2. Tool all joints in slabs exposed as a finished surface to a 1/2-inch radius, and as shown. Keep mortar fines from filling tooled joints. Maintain 1-1/2-inch tool joint depth.

F. Exterior Flatwork: Exterior flatwork with a slope of less than 6 percent gradient shall be at least as slip resistant as that described as a medium broom finish. Exterior flatwork with a slope of 6 percent gradient shall be at least as slip resistant as that described as a heavy broom finish

3.05 CURING CONCRETE

A. Interior slabs to receive resilient flooring: Cover with fiber-reinforced asphaltic vapor barrier building paper or polyethylene film, and maintain free moisture on the surface for 7 days after pouring, or cure as exterior flatwork.

B. Interior slabs exposed or to receive tile: Do not cure with curing compound. Cover with fiber-reinforced asphaltic vapor barrier building paper or polyethylene film, and maintain free moisture on the surface for 7 days after placing.

C. Exterior Flatwork: Apply 1 coat of curing compound as soon as possible after finishing. Apply a second coat 24 hours after pouring, then cover as specified above.

D. Architectural Grade Concrete: Leave forms in place for a minimum of 4 days, keeping them moist. Maintain a moist surface for 7 days during hot weather.

E. Curing shall comply with 2007 CBC, Section 1905A.11.

F. Protect the concrete from damage by mechanical disturbances, load stresses, shock and vibration, damage by construction equipment and materials.

G. Contractor shall provide, at Contractor's expense, security to ensure that the concrete surface shall remain free of graffiti until sufficiently hardened.

H. Surface Tolerances: Class AA surface finish tolerance. Depressions in floors between high spots shall not be greater than 1/8" below a 10-foot long straight edge.

3.06 WEATHER PROTECTION

A. Cold-Weather Requirements: When the temperature of the surrounding air is below 40 degrees F, concrete work shall be carried out in accordance with ACI-306 "Cold Weather Concreting."

B. Hot-Weather Requirements:

1. In hot weather concrete work shall be carried out in accordance with ACI-305 "Hot Weather Concreting."
2. In hot weather prevent drying of concrete prior to finishing operations. Provide windbreaks, sun shades, fog sprays, or other devices as required.
3. Concrete deposited in hot weather shall not have a placing temperature that will cause difficulty from loss of slump, flash set, or cold joints. Concrete temperature shall be less than 90 degrees F.

3.07 DEFECTIVE WORK

A. Any concrete work not in accordance with the Specification and Drawings will be deemed to be defective, including but not limited to, Work not formed as shown or not true to alignment or not plumb or level, or Work not true to the grades and levels, or that has voids, rock pockets, or finish defects, that has any sawdust, wood, or debris embedded in it, or does not fully conform to the Specifications. Concrete finish which is not true to line and plane, or which is not thoroughly troweled and surfaces as specified, or which does not meet specified tolerances, or which has any roughened top surfaces, or which does not connect accurately to the adjoining Work will be deemed to be defective. Remove and replace defective Work with workmanship and materials complying with requirements of Contract Documents at Contractor's expense.

3.08 PATCHING AND GRINDING

A. Standard Formed Surfaces: Patch tie holes and defective areas immediately after form removal.

B. Architectural Grade Surfaces: Exposed concrete shall be left exactly as it is formed, wash only. No patching, cutting, wire brushing, sandblasting, bush hammering, acid etch, will be allowed. Rock pockets, leakage of mortar paste, voids, discoloration, sanding, or deviations from specified surface will be considered defective work.

C. Slabs on Grade: After entire slab is finished, shrinkage cracks may appear which shall be patched as follows:

1. As approved by the Architect, fill cracks larger than 1/32 inch wide with cement grout and strike off level with surface.

3.09 CLEANUP

A. Wash and mop clean interior finished surfaces and sweep and hose clean exterior surfaces after removal of protective covering. Leave finish surfaces clean and free from oil, paint, plaster, stain and foreign substances and in condition acceptable to the Architect.

END OF SECTION

SECTION 03355

CONCRETE FINISHES

PART 1 - GENERAL

1.01 SCOPE

A. Work included: All concrete surfacing and finishes or treatment including, but not necessarily limited to:

1 Steel trowel finish.

2. Float finish.

3. Broom finish.

4. Chemical hardener (Non-slip) finish.

5. Integral Colored Concrete

B. Related work in other sections:

1. Section 02751: Cement Concrete Pavement and Site Concrete

2. Section 03100: Concrete Formwork

3. Section 03300: Cast-in-Place Concrete

C. Nothing in this section shall be construed in any way as a modification to the requirements for concrete composition, placement, curing, or testing, as specified under Section 03300, Cast-in-Place Concrete.

1.02 SAMPLES

A. For each finish, field install a sample portion of the work, 3-foot square minimum, using the mix and finishing technique specified for the final products.

B. Notify Architect at least 24 hours before surfacing is to be accomplished on samples. After review, samples may be incorporated into the work. Unacceptable samples shall be removed and re-poured.

PART 2 - PRODUCTS

2.01 NON-SLIP GRIT:

A. Aluminum-oxide 12-30 grit unaffected by freezing, moisture or cleaning compounds. Use Consov Futsur, Conrad Sovig Co., Regular Non-slip, Frank D. Davis Co. or equal.

2.02 INTEGRAL-COLORED CONCRETE

A. Coloring admixture: Chromix as manufactured by L.M. Scofield Company, Los Angeles, CA, or equal. Colors, any from Groups 1-4.

B. Sealer: Colorcure Concrete Sealer by L.M. Scofield, or equal.

2.03 CONCRETE PRIMER SYSTEM

A. CS2000 2 Day System as manufactured by Creteseal, Santa Ana, CA, or equal.

1. CS2000 Sealer

2. CS1000 Primer

3. Portland cement polymerized topping for smoothing, leveling, or resurfacing.

PART 3 - EXECUTION

3.01 FINISHES

A General for Exposed Concrete

1. Remove fins and other projections.

2. Apply light sandblasting. Finish shall be uniform, without visible start and stop points.

B. Steel-trowel: Horizontal planes floated and troweled to a hard, smooth surface without tool marks. Tolerance shall be 1/8 inch in 10 feet. Slab shall be finished monolithically. Strike-off and screed slab to a true surface at required elevations and, as soon as surface water has disappeared, thoroughly compact concrete with floats or tampers to force coarse aggregate below surface. Finish slab on same day that concrete is placed. In areas where floor drains occur, slope finished slab to floor drains from the extreme corners of the area being drained. Coordinate curing and friction coefficients with flooring manufacturer where flooring is to be placed over the slab.

C. Broom Finish on Floated (or machine-troweled) Concrete

1. Submerge coarse aggregates; eliminate irregularities, dips, and valleys. Make smooth transitions to previous work. Water brought to surface by float used for rough finishing shall be allowed to evaporate before surface is again floated or troweled. Sprinkling dry cement on surface to absorb water is prohibited. Review manufacturer's recommendations for additional information as required for adhesives and other installation requirements.

2. After first troweling or floating, use street-type broom; brush perpendicular to direction of traffic flow.

D. Architectural Finish

1. Remove fins and other projections and fill voids.

2. Fill form tie holes flush with the finish surface.

3. Grind patchwork to be flush with adjacent surfaces.

4. Sack and patch to a smooth even finish to match similar concrete on existing buildings to remain on the site. Note that the finish must match the extremely high quality finish installed under previous contracts for this campus.

1. Color shall be uniform.

2. Finish shall be smooth, with no voids or ridges visible.

E. Non-slip finish: Provide medium broom finish on all surfaces less than 5% slope and a heavy broom finish on all surfaces greater than 5% slope. Apply finish as described above and apply grit in quantity and as recommended by manufacturer.

F. Colored Concrete:

1. Apply coloring admixture, in the plant, in the quantity and as recommended by manufacturer.

2. Apply sealer per manufacturers recommendations as soon as slab is cleaned with water and dried.

G. Concrete Primer System: Apply CS2000 2 Day System per the manufacturers' recommendations.

3.02 PATCHING

A. Unexposed concrete: Eliminate rock pockets and honeycomb, but do not sack.

B. Exposed concrete (other than architectural finish):

1. Pocketed areas shall not exceed 2 square feet in each 1,000 square feet of surface area. Architectural concrete requiring repair in excess of the above standard shall be removed and replaced at no additional cost to the District.

2. All honeycombed and other defective areas shall be removed down to sound concrete or 2 inches, whichever is greater. A mixture of 1 part bonding agent and 1 part water shall be brushed on to the area to be patched.

3. The patching mixture shall be made of the same material and of approximately the same proportions as used for the concrete, except the mortar shall consist of not more than 1 Part cement to 2-1/2 parts sand by damp, loose volume. White Portland cement shall be substituted for a part of the gray Portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch.

4. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand, with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing. A mixture of 1 part bonding agent and 4 parts water shall be used as mixing water.

5. The patch mix shall be consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface to permit initial shrinkage. Patches shall be textured to match the surrounding areas. The patched area shall be kept damp for seven days. Sponge or wood floats shall be used in finishing patches to be left exposed.

6. Sack and patch entire surface or provide specified finish after patch has dried, to provide uniform texture and appearance.

7. Fill tie-holes with 1/4 inch recessed precast concrete plugs set in epoxy adhesive to cover the exposed metal and prevent rusting.

3.03 CLEANING

A. Thoroughly wet and immediately scrub with a 5% to 10% solution of commercial muriatic acid, using stiff-bristle brushes, all exposed surfaces of concrete. Immediately after cleaning, wash off all traces of acid with clean water. In lieu of cleaning with muriatic acid, a light sandblasting may be used. Do not start cleaning of walls until all walls of the building are completed. Start cleaning at top and continue progressively down the face of the wall.

3.04 CONCRETE FINISH SCHEDULE

A. Provide the finishes as indicated below and as indicated on the drawings.

Finish	Location
Architectural Finish	Above grade portions of retaining and site walls, concrete planters, exposed stem walls, vertical portions of ramps, and where indicated on the plans.
Steel Trowel, Concrete Primer System	Floor slabs to receive flooring.
Light Broom Finish	Interior slabs on grade, not covered by flooring.
Slip Resistant, Medium broom finish	Steps and Ramps.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Includes:

1. Structural steel work as indicated on the Structural Drawings and includes but is not necessarily limited to:
2. Structural steel as defined in the AISC "Code of Standard Practice".
3. Field Bolts and other structural steel accessories.
4. Grouting of base plates.
5. Steel assemblies that are attached to concrete shown in the Structural Drawings.

B. Related Work Specified Elsewhere:

1. Section 03200: Concrete Reinforcement
2. Section 03300: Cast-In-Place Concrete for grouting of base and setting plates
3. Section 09900: Painting for finish painting of exposed structural steel

1.02 QUALITY ASSURANCE

A. Qualification of Welders:

1. All welding shall be performed by operators who are qualified for the types of welds used. Each operator shall have been qualified as prescribed by AWS and shall be approved by DSA. Welder qualification shall include passing the bend test and Charpy tests when specified for electrode.
2. Require welders to retake qualification test if, as determined by the Architect, there is a reasonable doubt as to the proficiency of the welder. If the welder does not re-qualify, they shall not be employed on this Project.
3. Pay all costs associated with welder qualification.
4. All weld joints shall be qualified on this project even if they are pre-qualified. This qualification will be with the same electrodes, processes and procedures that will be used on this project. The welders doing the welding of these tests will be actual welders who will be working on this project.
5. Each welder working on the project will be qualified for each process and position as a result of having performed a weld qualification test using the consumables and procedures to be used on this project.

B. Owner's Quality Assurance: Shop fabrication and field erection of steel indicated on the Structural Drawings will be inspected by an independent testing laboratory retained by the Owner and approved by DSA.

1. Seam weld quality of hollow structural sections (HSS) shall be monitored as recommended in DSA Bulletin 07-03, update #2.

C. Furnish testing agency with the following:

1. One complete set of fabrication and erection drawings.
2. Material bills and mill test reports.
3. Information regarding time, place of rolling and shipment of materials to shop.
4. If requested, representative sample pieces for testing.

5. Full and ample means and assistance for testing materials.

D. Source Quality Control:

1. General: Materials delivered with certificates are classified as identifiable; those without certificates are classified as unidentifiable.
2. Testing of Unidentifiable Material: By testing agency; paid for by Contractor.
   a. General: Test material not identifiable by heat number and mill test or other acceptable manufacturer's identification per ASTM A370 as follows.
   b. Structural Shapes and Plates: From coupons taken from material; one tensile test and one bend test per 5 tons of each shape.
   c. Other Materials: Test as directed.

1.03 REFERENCES

A. "Specification for Structural Steel Buildings," ANSI/AISC 360-05, dated March 9, 2005, and as Modified by 2007 CBC, Section 2205A.

B. "Code of Standard Practice for Steel Buildings and Bridges" of American Institute of Steel Construction, [latest edition]. When reference is made to this document, reference is made only to technical issues and excludes as a minimum all issues related to schedule, Owner's responsibilities, approvals, commercial terms, and relationships between the subcontractors and the General Contractor.

C. "Structural Welding Code of American Welding Society AWS D 1.1", latest edition, with current supplements, revisions, and addenda.

D. Steel Structural Painting Council (SSPC) Steel Structures Painting Manual Vol. 2 Systems and Specifications, latest edition.

E. 2007 California Building Code, Chapter 22A.

1.04 SUBMITTALS

A. General:

1. Review of submittals is of a general nature only, and responsibility for conformance with intent of contract documents shall remain with the Contractor. Review does not imply or state that fabricator has correctly interpreted the contract documents.
2. Submittals to clearly indicate substitutions or other deviations from the drawings and specifications.
3. Provisions of AISC Code of Standard Practice related to shop and erection drawings are not applicable.

B. Shop Drawings:

1. Prepare complete shop drawing showing anchor bolt setting plans, and details of layout, fabrication, and erection. Identify details by reference to Drawings and detail numbers on the Drawings. Indicate where welds are to be finished and ground smooth reference architecturally exposed steel.
2. Submit shop drawings to Architect for review and obtain Architect's acceptance prior to start of fabrication.
3. Direct copies of the Contract Documents (i.e. xerox) are not acceptable as a submission from the Contractor.
4. A maximum submission of 50 structural steel shop drawings will be reviewed in any 10-working day period. If larger packages are submitted, review time will increase proportionally.

C. Mill Reports:

1. Submit the mill report for each heat of steel used, and for all fasteners provided prior to the start of fabrication.
2. Mill reports shall show chemical content and mechanical properties of the materials provided.
3. Along with mill reports provide Charpy V-notch test results when Charpy V-notch criteria is specified.
4. Mill reports shall be traceable to individual pieces of steel used.
5. Provide mill reports for all welding consumables used on this project.
6. Certification of inspection test reports for early production lot indicating proof load, tensile strength and hardness of high strength bolts.

D. Welding Procedure:

1. Submit for use by the Testing Laboratory written welding procedures for all welding on the project.
2. The welding sequence and procedures are to minimize the effect of weld shrinkage, residual stresses and to maintain erection tolerances.

E. Fabricators identification mark system shall be submitted prior to fabrication.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Use all means necessary to protect the structural steel and paint before, during, and after installation and to protect the installed Work and materials of other trades.

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

C. Storage:

1. Material shall be stored in a manner to preclude damage and to permit ready access for inspection and identification of each shipment and piece. Material showing evidence of damage will be rejected and shall be immediately removed from the Site.
2. Steel materials either plain or fabricated shall be stored above the ground. Material shall be kept free from dirt, grease, and other foreign matter, and shall be protected from corrosion.

D. All fasteners and washers shall be delivered to site in unopened containers.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes, Bars, and Plates:

1. ASTM A992 and ASTM A36, unless otherwise noted.
2. ASTM A6 Group 4 or 5 rolled shapes or plates more than 2 inches thick that are part of braced frames, or spliced in tension shall conform with Section A3.1.c of "Specification for Structural Steel Buildings", June 1, 1989.

B. Structural Tubing: ASTM A 500 (cold-formed), Grade B, welded or seamless.

C. Pipe Columns (Structural Pipe): ASTM A 53, Type E or S, Grade B.

D. Standard Threaded Fasteners:

1. Machine Bolts and Nuts: ASTM A307, Grade A.
2. High strength bolts: ASTM A325SC (Slip Critical)
3. Plain Washers: ASTM F844.

4. Beveled Washers: ANSI B.27.4, Type B.

E. Threaded Rod: ASTM A36.

F. Anchor Bolts: ASTM F1445 Grade 36 unless noted otherwise and ASTM A307, Grade A and A325, where shown.

G. Welding Electrodes:

1. As required by AISC "Specification for Structural Steel Buildings" and the AWS Code. Base selection of electrode on the actual properties of the metal connected.
2. As a minimum use E70XX electrodes.
3. Use low hydrogen electrodes unless noted otherwise.

H. All steel to be welded shall conform to chemical and metallurgical limitations specified in AWS D1.1.

2.02 PAINT

A. Standard Primer Paint for Non-exposed Steel: SSPC Paint 13 or SSPC-Paint 2.

B. Primer Paint for Exposed Steel: Where Structural steel is exposed to weather, use paint as specified by SSPC, Paint 20, Type I, Inorganic, or Type II, Organic.

C. Primer Paints shall be compatible with finish paints specified elsewhere.

2.03 CONNECTORS

A. Expansion Anchors: Kwik-Bolt TZ (ICC-ES ESR-1917) as manufactured by Hilti Inc., or approved equal.

B. Adhesive Anchors: HILTI HIT-RE500-SD (ICC-ESR 2322) as manufactured by Hilti Inc. or approved equal.

2.04 FABRICATION

A. General:

1. Fabrication will be performed in accordance with Chapter M of AISC "Specification for Structural Steel Buildings" and the Drawings and Specifications.
2. Provide holes and accessories required for securing other Work to the Structural steel.
3. Where thickness of plate exceeds 1 inch or the diameter of hole, drill or ream holes after punching. Flame cut holes for fasteners are not acceptable.
4. Fabricate beams and girders with natural camber upward, unless otherwise shown or indicated on the Drawings.
5, Mill columns and base plates when noted on drawings.

B. Welding:

1. Comply with the AWS D1.1.
   a. Contractor is responsible for selection of specific materials and procedures except as specifically noted in contract documents.
   b. The need for pre-heat and other procedures are to be based on the actual chemistry and mechanical properties and not solely on the grade for which the steel was certified.
   c. When selecting materials and procedures as a minimum consideration shall be given to the need for materials and procedures in excess of code requirements. Special consideration shall be given to the need for pre and post heat.
   d. When selecting materials and procedures as a minimum consider the actual restraint in the structure.

e. Weld variables shall be consistent with the recommendations of the electrode manufacturer.

2. No tack welds not incorporated into a weld will be allowed on the finished structure with the exception of backing plates.
3. All groove or butt welds shall be full penetration unless noted otherwise on the Drawings.
4. Use stringer beads only (no weaving).
5. Do not weld into column flange to column web intersection.
6. Where structural steel members are to remain exposed in the finished work, welds exposed to view shall be uniformly made and ground smooth.
7. Sequence the Work as necessary for testing.
8. Remove run-off tabs and backup plates and grind surfaces smooth as required for inspection and where the tabs interfere with architectural treatment.
9. Splices of members in tension and members of braced frames that are made from ASTM A6 Group 4 of 5 rolled shapes, and or plates more than 2 inches thick shall be made in conformance with Section J1.7 of "Specification for Structural Steel Buildings", 9th Edition.
10. Headed studs shall be installed in accordance with AWS D1.1.
11. Welding Procedures: Consider toughness and notch sensitivity of steel in formation of the welding procedures to prevent brittle and premature fracture during fabrication and erection. Weld in a manner to minimize accumulation and concentration of through-thickness strains due to weld shrinkage. Sequence welds in a manner to reduce residual stresses (caused by welding) to a minimum value.

C. Machine Bolts:

1. Machine bolts shall be brought to a snug tight condition so as to prevent play in the connection materials.

D. Bolts, General:

1. Bolts shall be of a length that will extend entirely through but not more than 1/4-inch beyond the nuts unless otherwise shown on the Drawings.
2. Washers shall be used on Bolts. Use beveled washers where bolts bear on sloping surface.
3. Bolts shall be installed such that no threads occur in the shear plane.
4. Manufacturer's symbol and grade markings shall appear on all bolts and nuts.
5. Product containers must be marked so that correspondence with mill reports can be established.
6. Holes in column base plates shall be no more than 1/16 inch larger than the nominal bolt size, unless otherwise shown on the structural drawings.
7. Slotted holes shall be as per AISC, Part 5.
8. When bolt holes are subject to welding shrinkage stresses the holes shall be drilled.

E. Shop Painting:

1. Exterior exposed steel, not receiving a finish coat shall be galvanized . Other steel shall not be painted unless specified elsewhere.
2. Use special care if steel is fabricated, cleaned, and painted in damp weather to remove moisture from mill scale cracks.
3. Paint applied in consecutive coats shall be of different tints.
4. The following surfaces shall receive a second shop coat:
   a. Surfaces inaccessible after construction but not in direct contact with concrete or fireproofing.

5. Do not paint the following surfaces in the shop:
   a. Reinforcing steel.
   b. Welded shear studs.
   c. Machined surfaces.
   d. 4-inches on each side of field welds.
   e. Surfaces encased in concrete or cementitious fireproofing.

2.05 SOURCE QUALITY ASSURANCE

A. As a minimum, all testing and inspection as per requirements of California Code of Regulations, Title 24, Chapter 17A and Chapter 22A, Section 2212A.

B. Inspections: Inspection of shop and field welding operations during welding performance, as follows:
   1. Verify that welders are certified
   2. Inspect every weld for quality and conformance. As a minimum visually inspect all welds. Visual inspection of multi-pass welds shall be continuous.
   3. Make systematic record of all welds, including:
      a. Location and type of weld.
      b. Identification marks of welders.
      c. List of defective welds.
      d. Manner of correction of defects.
   4. Check materials, equipment and procedures.
   5. Visually inspect welds at least 72 hours after completion of welding for the presence of cracks, lamination and non-metal inclusions. Determine extent of laminations ultrasonically.

C. Take samples of all welding consumables and store in sealed containers.

D. Non-Destructive Testing:
   1. Test 100 percent of full penetration butt welds. Do not reduce testing frequency unless permission is obtained from Architect.
   2. Test 20 percent of total length of all welds joining web plates to flanges. Locations as directed by Architect.
   3. Base metal thicker than 1-1/2 inches, when subjected to through-thickness weld shrinkage strains, shall be ultrasonically inspected for discontinuities directly behind such welds after joint completion. Any material discontinuities shall be accepted or rejected on the basis of the defect rating in accordance with flaw severity, Class B criteria in Table 8.15.3 in AWS D1.1.
   4. Test 100 percent of partial penetration groove welds used in column splices. Do not reduce testing frequency unless permission is obtained from Architect.
   5. Test all column sections to ASTM A435 requirements prior to welding and to AWS requirements in welded areas.
   6. Ultrasonically, inspect column flanges 6" above and below paint where girder is welded to column flange.
   7. Type of tests:
      a. Full penetration welds to plates and shapes to be ultrasonic tested.
      b. Full penetration welds to pipes and tubes to be tested using magnetic partial tests.
      c. Partial penetration welds to be ultrasonic tested.
      d. Use magnetic partial test methods for fillet welds.

e. At inspector's option, magnetic particle or dye penetrant testing will be used.

E. Mill Reports:

1. Testing laboratory will review all mill reports for conformance to referenced standard.

PART 3 – EXECUTION

3.01 CONDITION OF SURFACES

A. Prior to commencing with the erection of structural steel inspect the job site and verify that the structural steel may be erected in accordance with the Drawings and Specifications.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect in writing.
2. Do not proceed with construction in the region of the discrepancy until all such discrepancies have been resolved.

3.02 PREPARATION

A. Secure field measurements required for proper and adequate fabrication and installation of the work covered in this Section. Assume responsibility for exact measurements.

B. Furnish templates for exact locations of items to be embedded in concrete and any setting instructions required for installation.

3.03 ERECTION

A. General:

1. Structural steel shall be erected in accordance with AISC Specifications and the Drawings and Specifications.
2. Care shall be taken to protect work already installed from damages resulting from structural steel erection.
3. Erection of architecturally exposed structural steel shall be in accordance with AISC specifications.

B. Temporary Shoring and Bracing:

1. Provide temporary bracing and shoring adequate to protect the structure against damage due to construction loads and other loads such as wind and seismic forces.
2. Provide temporary works as necessary to erect the structure.
3. Items installed before concrete is placed shall be properly braced to prevent distortion by pressure of concrete. Watch and maintain bracing during concrete operations.
4. Contractor is responsible for identifying need for temporary construction.

C. Field Assembly:

1. Set structural members to the lines and elevations indicated. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
2. Before assembly clean bearing surfaces and other surfaces which will be in permanent contact after assembly.
3. Splice members only where indicated on Structural Drawings or where accepted by the Architect.
4. Do not enlarge unfair holes in members by burning or by the use of drift pins. Ream holes that need to be enlarged to admit bolts. When a hole is required to be enlarged by more than a 3/32-inch ream, use the next larger bolt size.

5. Do not use gas cutting torches in the field for correcting fabricating errors in the structural framing unless accepted by the Architect. Finish gas cut sections equal to a sheared appearance when permitted.
6. The quality of field welds or bolting shall be the same as that performed in the shop.
7. Erection bolts for welded connection shall be tightened securely and left in place.

D. Setting Base Plates:

1. Clean concrete bearing surfaces and roughen to improve bond. Clean the bottom surface of base plates.
2. Tighten anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the base plate prior to packing with grout.
3. Grout shall be installed and cured according to the manufacturer's recommendations such that no voids remain. All exposed surfaces shall be finished neat.

E. Expansion Bolts and Adhesive Anchors:

1. Install in accordance with the manufacturer's recommendations.
2. Use washers on all bolts.
3. Use care to avoid cutting or damaging reinforcing bars.
4. When exposed to view in the final structure, bolts shall be of a length that will extend entirely through but not more than 1/4-inch beyond the nuts unless otherwise shown on the Drawings. All such bolts are to be identified in the construction documents.

F. Welding:

1. General: Weld per AWS procedure. Preheat per AWS where required.
2. Welding: Weld in manner to prevent warping or distortion of finished product. Use jigs which will not restrain piece from moving during welding or cooling after welding. Sequence weld passes at a joint to prevent excessive heat build-up or cause shrinkage cracks to form. Adequately peen and brush joint after successive passes to prevent slag inclusions, open pockets, and inadequate fusion.
3. Auxiliary Member Connections and Temporary Welds: Per AWS provided that preheating may be omitted on ASTM A36 steel for single pass fillet welds with low hydrogen electrodes under following condition. Air temperature is 60° F. or over, steel is dry, and welds to structural base material are more than 1" away from corners or ends of plates.

G. Bolting: Refer to 2.04 and comply with AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings".

H. Erection Tolerances: Per AISC Code of Standard Practice for steel buildings and bridges.

3.04 TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint, and paint all surfaces exposed to the weather in the complete structure.

B. Use same materials and standards as for shop painting.

3.05 FIELD QUALITY ASSURANCE

A. All field welding shall be inspected by a full time inspector employed by an independent testing laboratory approved by DSA.

B. Bolting:

1. Observe all Direct Tension Indicators to see if proper tightness was achieved.

2. Confirm that the faying surfaces have been properly prepared before connections are assembled.

C. Field quality control shall, as a minimum, conform to the requirements specified under Source Quality Control.

D. Expansion and adhesive anchors to be proof tested after installation in accordance with requirements of California Building Code, Section 1916A.8.

E. Field Welds:

1. Test all other per fabrication inspection.

END OF SECTION

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SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SCOPE

A. Miscellaneous metal and metal fabrications. Work shall be complete, in place, as shown on the drawings, specified herein, or needed for a complete and proper installation, and includes, but not limited to:

1. Steel ladders.
2. Metal perimeter fencing.
3. Miscellaneous custom fabrications as shown on the Drawings.
4. Miscellaneous connections for concrete-to-metal and metal-to-metal members.

B. Related work described elsewhere:

1. Section 01400: Quality Requirements
2. Section 02751: Cement Concrete Pavement and Site Concrete
3. Section 03200: Concrete Reinforcing
4. Section 05120: Structural Steel
5. Section 07410: Manufactured Sheet Metal Panels (metal perimeter fencing)

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein as listed in Section 01400.

B. Qualifications of personnel: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

C. Welding:

1. Perform all shop and field welding required in connection with the work of this section, adhering to the current pertinent recommendations of the American Welding Society.
2. Welding to be done by certified welders.
3. Welder qualifications and welding procedures: Conform to AWS welding codes.
4. Welding Inspection: See section 01400.

D. Codes and standards: Comply with provisions of following:

1. American Institute of Steel Construction: (AISC) "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including the "Commentary" and Supplements thereto as issued.
2. American Welding Society (AWS): Structural Welding Codes, latest edition.
3. 2007 California Building Code
4. California Administrative Code, Title 24, Building Standards.

E. Testing:

1. Comply with Section 01400.

F. Welding:

1. Welder Qualifications and Welding Procedures: 2204A.1.

2. Welding Inspection: 1704A.3.1.1 and refer to Section 01400

1.03 FIELD QUALITY CONTROL

A. District will engage in independent testing and inspection agency to inspect shop and field welded connections and to perform tests and prepare test reports.

B. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations.

C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

D. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance to reject material not complying with specified requirements.

E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

1.04 SUBMITTALS

A. General: Comply with provisions of Section 01300.

B. Submit:

1. Complete materials list of all items proposed to be furnished and installed under this section.

2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

3. Shop drawings of items proposed to be furnished and installed under this section; include plans, sections, elevations, and details.

4. Templates for anchor and bolt installation by other trades.

1.05 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make repairs and replacements at no additional cost to the District.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Metal surfaces, general: Metal, exposed to view, use only those materials that are smooth and free from surface blemishes including pitting, seam marks, roller marks, rolled trade names, roughness.

B. Standards: All materials shall comply with the following standards.

1. Steel plates, shapes, and bars: ASTM A992 and ASTM A36.
2. Steel plates to be bent or cold-formed: ASTM A283, Grade C.
3. Steel bars and bar-size shapes: ASTM A306, Grade 65, or ASTM A36.
4. Concrete inserts: Threaded or wedge-type galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized, ASTM A153.

2.02 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use and where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Standards: All fasteners shall comply with the following standards.

1. Bolts and nuts: Regular hexagon-head type, ASTM A307, Grade A.
2. Machine screws: Cadmium-plated steel, Federal Specification FF-S-92.
3. Plain washers: Round carbon steel, Federal Specification FF-W-92.
4. Lock washers: Helical-spring-type carbon steel, Federal Specification FF-W-84.
5. Toggle Bolts: Not allowed.
6. Plastic Anchors: Not allowed
7. Stainless steel fasteners: As noted on the Drawings.

2.03 PAINT

A. Metal primer paint: Tnemec 10-1009 Gray, Metal Primer in accordance with the manufacturer's recommendations and local regulations for items not to receive finish coats.

B. Galvanizing repair paint: Use a high-zinc-dust-content paint for regalvanizing welds in galvanized steel, complying with MIL SPEC MIL-P-21035.

2.04 FABRICATION

A. Workmanship:

1. Form exposed work true to line and level, with accurate angles and surfaces, and with straight, sharp edges.
2. Ease the exposed edges to a radius of approximately 1/16" unless otherwise shown.
3. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
4. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush; match and blend with adjoining surfaces.
5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, use Phillips flathead (countersunk) screws or bolts.
6. Fabricate and space the anchoring devices to provide adequate support for intended use.
7. Cut, reinforce, drill, and tap miscellaneous metalwork as indicated to receive finish hardware and similar items.

B. Galvanizing: Provide zinc coating, hot dipped, galvanizing at locations where shown on Drawings and at exterior, exposed metal. Provide wash primer pretreatment of galvanized items at locations to receive painted finish after cleaning and prior to painting.

1. ASTM A123 for galvanizing rolled, pressed, and forged steel shapes, plates, bars, and strip 1/8" thick and heavier.

2. ASTM A386 for galvanizing assembled steel products. Galvanize items used on the exterior after fabrication.

2.05 METAL FABRICATIONS

A. Steel Ladders:

1. Fabricate per steel shapes and sizes as shown in the Drawings.

2. Finish: Hot-dipped galvanized no other finish. Properly refinish field-welded connections for rustproof installation at all exposed to weather locations.

a. Install no-slip tape on ladder rungs after assembly.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine the areas and conditions under which miscellaneous metal items are to be installed; correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

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

3.03 INSTALLATION OF STEEL LADDERS

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

B. Cutting, fitting, and placement:

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

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

3. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations.

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

D. Touchup painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint; paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide minimum dry-film thickness of 2 mils.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART I - GENERAL

1.01 SCOPE

A. Work included: Furnish and install all work necessary and required for the project as shown on the Drawings and specified herein. Such work includes, but is not limited to:

1. Exterior plywood.
2. Wood nailers and blocking.
3. Plywood backing panels for electrical or telephone equipment
4. Wood wall, ceiling and soffit framing
5. Misc. wood framing for roof equipment and skylights

B. Related work in other sections:

1. Section 05120: Structural Steel
2. Section 05500: Metal Fabrications
3. Section 06402: Casework

1.02 CODES AND STANDARDS

A. Lumber: Current grading rules or standards of West Coast Lumber Inspection Bureau (WCLIB) Rule 17, Western Wood Products Association (WWPA). All lumber shall be grade-stamped at the mill.

B. Plywood: U.S. Product Standard PS 1-83.

C. Pressure treatment: Federal Specification TT-WL549 or AWPA Standard LP-2 "Chemonite", or equal.

D. Plywood design specification by the American Plywood Association.

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01330, Submittal Procedures

B. Certification

1. Pressure Treated Wood: Submit certification by treating plant stating chemicals and process used, net amount of preservative retained, and conformance with applicable standards.
2. Preservation Treated Wood: Submit certification for water-borne preservative that moisture content was reduced to 19% maximum, after treatment.
3. Fire-retarding Treatment: Submit certification by treating plant that fire-retarding treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.
4. Hardware: submit certification that hardware used in treated wood will not corrode or fail.

1.04 STORAGE AND PROTECTION

A. Store lumber and plywood off the ground in a manner to ensure proper ventilation and protection from weather and to prevent damage by decay or insects. Store plywood under cover and cover lumber as required to avoid twisting and warping.

1.05 JOB CONDITIONS

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work. Cooperate with other trades, especially Concrete, Masonry, and Metal Fabrications to prevent duplication of rough hardware furnished.

PART 2 - PRODUCTS

2.01 LUMBER

A. General: For selective custom fabrications:

1. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by the California Code of Regulations, Title 24, Part 2, Chapter 23, for moisture content specified for each use.
2. Provide dressed lumber, S4S, unless otherwise indicated.
3. Provide seasoned lumber with 19% maximum moisture content. Lumber to arrive on site with a stamp indicating it is dry.

B. Framing Lumber: Comply with WCLIB, "Standard Grading Rules for West Coast Lumber", No. 17. Grade Number 2 or better.

2.02 PLYWOOD

A. Backing Panels for Electrical or Telephone Equipment: Provide fire-retarding plywood with exterior glue.

B. Plywood that has any edge or surface permanently exposed to weather shall be exterior type.

C. Plywood to be ¾ inch thick, unless noted otherwise.

2.03 WOOD TREATMENT

A. Where lumber or plywood is indicated or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and AWPB standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.

B. Pressure Treated Wood Products: Pressure-treat aboveground items with water-borne preservatives complying with AWPB LP-21.

C. Fire-Retarding Treated Products:

1. Lumber: AWPA C20.
2. Plywood: AWPA C27.
3. Use fire-retarding treatment that will not bleed through or adversely affect type of finish indicated and which does not require brush treatment of field made end cuts to maintain fire-hazard classification.

D. Re-dry treated items to maximum moisture content of 19%, stamped "DRY".

E. Rough hardware: Nails, bolts, nuts, washers, lag bolts, screws, anchors, and other fastenings as shown or as required for complete installation. Galvanize or cadmium-plate for exterior work. Comply with following Federal Specifications.

1. Furnish bolts and attachments to other trades for installation in masonry and concrete work.
2. Screws: Standard Commercial grade steel.
3. Nails: Common wire, galvanized for exterior use.
4. Bolts and Lag Bolts and Washers: American Standard, ASTM A307 (Bolts). Exposed fasteners shall be galvanized.
5. Fasteners used in treated wood shall be compatible with the materials used to treat the wood.

PART 3 - EXECUTION

3.01 LAYING OUT WORK

A. Coordinate work of this section with work by others. Check lines and levels indicated and such other work as has been completed before commencing work of this section.

3.02 CONSTRUCTION AND WORKMANSHIP

A. Provide furring, stripping, blocking, and backing where indicated or where necessary to support or to furnish suitable spacing for finish materials and accessories. Do cutting of concrete and other construction as required for plumbing and electrical fixtures and other miscellaneous equipment.

B. Use such fastenings and connections as required to connect members securely together or to structure. Nailing shall conform to 2007 CBC, title 24, Part 2, Section 2303.6, Section 2304.9 and Table 2304.9.1, and ANSI/AF & PA NDS-2005. Use common nails only for structural application.

C. Space nails and spikes in accordance with Title 24, Section 2-2311. Place nails, bolts, and other connectors without splitting wood. Pre-drill holes whenever nailing tends to split wood or plywood. Replace split members.

D. Provide bolts and lag screws bearing on wood with malleable-iron or steel-plate washers under heads and nuts, except use cut washers where shown.

3.03 TERMITE CONTROL AND DECAY PREVENTION

A. Remove wood, including form lumber, casual lumber, shavings, and sawdust, on or in contact with ground. Do not bury or leave wood in or on any fill or backfill.

3.04 TREATED WOOD PRODUCTS

A. Pressure-treat aboveground items. After treatment, kiln-dry to a maximum moisture content of 19%. Pressure treat indicated items and the following:

1. Wood cants, nailers, curbs, blocking, stripping, plywood and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
   a. Oil base preservatives such as creosote, are not acceptable.
2. Wood sills, plates, sleepers, blocking, furring, stripping and similar concealed members in contact with or embedded in, masonry or concrete.

B. Fire-Retarding Treatment: For electrical backboards and where lumber or plywood is specified or otherwise indicated to be fire-retarding treated, provide materials which comply with AWPA standards for pressure impregnation with fire-retarding chemicals,

and which have a flame spread rating of not more than 25 when tested in accordance with UL Test 723 or ASTM E 84.

3.05 PLYWOOD INSTALLATION

A. Plywood edge screws shall be 3/8 inch, minimum, from edge of plywood panel.

B. Screws that miss studs, joists, or blocking are to be removed and re-driven.

END OF SECTION

SECTION 06402

CASEWORK

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Laminate-clad cabinets (plastic-covered casework).
2. Plastic-laminate countertops.

1.02 RELATED WORK SPECIFIED ELSEWHERE

1. Section 06100: Rough Carpentry

1.03 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details to scale.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
4. Provide schedule of shelf spans and materials used for each span.
5. Apply AWI Certified Compliance Label to first page of shop drawings.

D. Samples for initial selection of manufacturer's color chips consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for plastic laminates.

E. Samples for verification of the following:

1. Cabinet hardware, one unit for each type and finish.

F. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified. Also include date of initial WIC membership.

1.05 CLOSE-OUT SUBMITTALS

A. AWI certificates for installation.

B. Keys to cabinets, four sets per room.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance. Firm must be a member of the Architectural Woodwork Institute (AWI) for no less than three years and have sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and qualify to those required for this Project.

C. Quality Standard:

1. AWI Quality Standard: "Architectural Woodwork Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.

a. Provide AWI Certified Compliance Certificate indicating that woodwork meets requirements of grades specified.

b. Provide AWI Certified Compliance Certificate for Installation.

c. Mark one unit of each elevation of casework and plastic-laminate countertop with AWI Certified Compliance Label indicating quality grade provided.

D. Inspection

1. Request an inspection of the installed cabinets from AWI at completion of the work.

2. Provide written report from AWI staff member stating the project has been properly certified.

a. Self certified, AWI firms, are not exempt from obtaining an independent AWI inspection.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Obtain and comply with woodwork fabricator's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork will be within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.

2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.09 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cabinets shall be laminate clad and wood as shown on the Drawings and Schedules.

B. Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated, unless otherwise indicated.

1. Hardboard: AHA A135.4

2. Medium-Density Fiberboard: ANSI A208.2.

3. Wood and board shall be free of formaldehyde.

C. High-pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates from the premium (most expensive) line, by one of the following:

a. Formica Corporation.

b. Nevamar Corp.

c. Wilson Art Co.

2. Cabinets shall be made from up to three different colors and patterns of laminate, as selected by the architect.

D. Adhesive for Bonding Plastic Laminate: Contact cement, complying with Southern California AQMD restrictions.

E. Wood and Plastic Laminate Cabinetwork: Sections 10 and 11, AWI, Custom Grade.

2.02 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.

C. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

E. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

2.03 INSTALLATION MATERIALS

A. Furring, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Confirm, select, size, and finish required for each use. Comply with ASME B18.6.1 and AWI for applicable requirements.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized fasteners on inside face of exterior walls and where required for corrosion resistance. Provide wedge type expansion devices for drilled-in-place anchors. Plastic anchors and toggle bolts are not permitted.

2.04 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid-wood (lumber) members and rails: 1/16 inch (1.5 mm).

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.06 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 10, "Casework."

1. Grade: Custom.

B. AWI Construction Style: Style 1, Type A Frameless.

C. AWI Door and Drawer Front Style: Flush overlay.

D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other than Countertops: GP-50, 0.050-inch (1.270-mm) nominal thickness.

2. Postformed Surfaces: PF-42, 0.042-inch (1.067-mm) nominal thickness.

3. Vertical Surfaces: GP-28, 0.050-inch (1.270-mm) nominal thickness.

4. Edges: PVC tape, 0.018-inch (0.460-mm) minimum thickness matching laminate in color, pattern, and finish. If tape is not available in the finish selected, use laminate strips.

E. Materials for Semi-exposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other than Drawer Bodies: High-pressure decorative laminate, Grade GP-28.

2. Drawer Sides and Backs: Solid hardwood lumber, three-coat clear varnish finish.

3. Drawer Bottoms: Hardwood plywood, three-coat clear varnish finish.
4. Cabinet Shelving: low pressure laminate.
5. Backs of doors: high-pressure laminate.
6. Open cabinet shelving, back and interior sides, high-pressure laminate.

F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Provide Architect's selections from laminate manufacturer's full range of colors and finishes in the following categories:
   a. Solid colors.
   b. Patterns.

G. Locks

1. Provide locks on each cabinet and drawer. Locks to be keyed the same throughout the campus. Match keying in existing facility. File and sand smooth, lock-catches when located near a door catch.

2.07 COUNTERTOPS

A. Quality Standard: Comply with applicable WIC section indicated below:

1. AWI Section 11, "Countertops."
2. Grade: Custom.

B. Type of Top: High-pressure decorative laminate complying with the following:

1. Grade: PF-42, 0.042-inch (1.270-mm) nominal thickness.
   a. Provide Architect's selections from manufacturer's full range of colors and finishes in the following categories:
      1) Solid colors.
      2) Patterns.
2. Edge Treatment: Same as laminate cladding on horizontal surfaces.
3. Core Material: Exterior-grade plywood.
4. Nose treatment, waterfall edge.
5. Ledger and supports: laminate clad.

C. Backsplashes

1. Four inches high, unless noted otherwise.
2. Bullnose tops.
3. Coved bottom at wet areas.

D. Side splashes

1. ¾ inches shorter than adjoining backsplash
2. Bullnose top
3. Straight bottom, sealed at countertop.

E. Counter Supports:

1. Where counters are not supported on cabinets or steel tubes, use intermediate supports of laminate clad, panels, anchored to walls, unless noted otherwise. Use full, side-panels at each end and at counter height changes.

PART 3 - EXECUTION

3.01 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing the work, examine shop-fabricated work for completion and complete the work as required, including back priming and removal of packing.

3.02 INSTALLATION

A. Quality Standard: Install woodwork to comply with WIC Section 26 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor work to blocking built-in to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Exposed nailing is not allowed.

E. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

F. Tops: Anchor securely to base units and other support systems as indicated. Caulk space between backsplash and wall with sealant.

1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) on center.

G. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean work on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.04 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and installer that insure the work is without damage or deterioration at the time of Substantial Completion.

3.05 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.

B. Hinges: Blum 120 degree B01602.

C. Pulls: Wire pulls, 5 inches (127 mm) long, 1-1/2 inches (62 mm) deep, and 5/16 inches (8 mm) in diameter.

D. Catches:

1. Heavy Duty Magnetic Catches: B03171.

2. Fixed Leave Catch: Touch or Secret Panel B03363.

E. Adjustable Shelf Standards: B04071.

1. Shelf Rests for Standards: B04081.

F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, complying with BHMA A156.9, Grade 1, B05051, and rated for the following loads:

1. Box Drawer Slides: 100 lbf (440 N).

2. File Drawer Slides: 200 lbf (890 N).

G. Door Locks: National D4291 Keyway and 100DR body, E07121. All cabinet doors are to receive locks.

H. Drawer Locks: National 200DW, E07041. All drawers are to receive locks.

END OF SECTION 06402

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SECTION 07120

WATERPROOFING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide labor, materials, tools and equipment; and perform waterproofing, as shown on drawings, specified herein, and required for a complete and proper installation. The work includes, but is not limited to, backfilled locations to concrete and waterproofing at concrete walls and planters.

B. Related work described elsewhere:

1. Section 02220: Trenching and Backfilling
2. Section 03100: Concrete Formwork
3. Section 03300: Cast-in-Place Concrete
4. Division 7: Roofing assemblies and Sheet Metal Flashings

1.02 QUALITY ASSURANCE

A. 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 acceptable to the Architect.

B. Use adequate numbers of skilled workers who are trained and experienced in the necessary crafts, who are approved by the materials manufacturer, and who are familiar with the specified requirements and the methods needed for proper performance of the work of this section. Installers shall have a minimum of five years of experience in installation of specified products.

C. Make all required notifications and secure all required inspections by the manufacturer of the approved materials to facilitate issuance of the specified waterproofing guarantees.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01330, Submittal Procedures.

B. Manufacturer's data: Submit a complete materials list of all items proposed to be furnished and installed under this Section:

1. Manufacturer's data required to demonstrate compliance with the specified requirements.
2. Certified statement, in triplicate, signed by the Contractor and the waterproofing manufacturer, attesting that the materials furnished conform to the specified requirements and that all fluid components are manufactured by a single company. Certificates shall be accompanied by laboratory test reports for the physical properties specified.
3. A 2-year warranty against leaks from defects of material or workmanship. Upon notification of such defects, within the warranty period, make the necessary repairs at the convenience of the District. The manufacturer and the installer shall sign warranty.
4. A certified statement, issued by the applicator, attesting that all areas and surfaces into which waterproofing will be applied have been inspected and found satisfactory to receive the coating. Application of coating shall imply acceptance of surfaces.

5. Two copies of manufacturer's standard 5-year guarantee for waterproofing; including manufacturers recommended installation procedures.

C. Submit samples of waterproofing on plywood, not less than 6 inch by 6 inch in size, showing the approximate applied thickness, texture, and color.

D. The manufacturer's details and installation procedures will become the basis for inspecting and accepting or rejecting actual installation procedures actually used on the Work.

1.04 PRODUCT HANDLING

A. Use all means necessary to protect materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.

B. In the event of damage, immediately make all repairs and replacements necessary.

C. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in accordance with the manufacturer's recommendations.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Sheet Membrane Waterproofing: Bituthene 3000, Low Temperature Membrane by Grace Construction Products or equal. Self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm (0.056 in.) of rubberized asphalt and 0.1 mm (0.004 in.) of cross-laminated, high-density polyethylene film.

1. Surface primer, Bituthene System 3000. The VOC content of the surface conditioner shall not exceed 350 g/l for solvent-based primers. Primers containing 1-1-1 trichloroethane (methylchloroform) are expressly prohibited.
2. Expanded Polystyrene Protection Board: 1 inch (25 mm.) thick, with the following characteristics.
   a. Normal Density: 1.0 lb/ft^3 (16 kg/m^3).
   b. Thermal Conductivity, K factor: 0.24 at 5°C (40°F), 0.26 at 24°C (75°F).
   c. Thermal Resistance, R-Value: 4 per inch of thickness.
   d. Adhesive for protection board per manufacturer.

B. Water Repellent

1. Saline based, clear, breathable, water repellent, Aqua Trete® or equal.
2. Water absorption of concrete in 24 hours, .65% per ASTM 642.

2.02 OTHER MATERIALS

A. Sealants, primers, and other materials not specifically described but required for a complete and proper installation of the work in accordance with manufacturer's recommendations.

PART 3 – EXECUTION

2.01 COORDINATION

A. Coordinate work with concrete placement and stair erection.

2.02 INSPECTION

A. Before starting work, ensure environmental and site conditions are suitable for application.

B. Substrate shall be sound, dry, and free of dust, dirt, paint, grease, oil, or other foreign substance.

C. Variation in plane shall not exceed 1:350, in any measurement unit.

2.03 INSTALLATION OF WATERPROOFING

A. General Surface preparation:

1. Subsurface to receive waterproofing shall be inspected and approved by the manufacturer's representative.
2. Patch honeycombs, bug holes, form-tie holes (after removal of form-tie cones), and irregular surfaces of concrete. Remove concrete fins and projections as well as concrete splatter. Patching shall be done with Portland cement grout, concrete, or epoxy grout.
3. Remove general surface dirt, and any other foreign materials so as to leave surfaces in a clean condition suitable for application of membrane. Surface to be dry and free of grease, oil, dirt, loose paint, rust, or other contaminants. Clean surfaces with high-pressure air to remove dust prior to placement.

B. Sealing edges: Membrane shall he applied over the edge of the slab and sealed. Terminate membrane on vertical surfaces. Where no reglet or counterflashing occurs, terminate on the concrete by pressing to the wall and finish with a troweled bead of mastic. Terminations on horizontal applications, are to be finished with a troweled bead of mastic.

C. Sheet Membrane Waterproofing:

1. Priming: All concrete surfaces must be conditioned with surface conditioner with coverage of 350 to 450 sq. ft./gal. Apply with a sprayer system. Allow conditioner to dry 1 hour or until tack-free. Condition only the area that is to be covered with membrane in a working day. Metal surfaces do not require conditioning.
2. Temperature: Apply in fair weather when the air and surface temperatures are above 40 degrees Fahrenheit.
3. Apply membrane sheets with a minimum 2-1/2 inch overlap. Remove bubbles and fish mouths per manufacturer's specifications. Misaligned or inadequately lapped seams must be patched with membrane material.
4. For vertical applications, use heavy hand pressure and a seam roller on the laps.
5. Double-cover outside corners with an initial strip of sheet membrane 11-inch minimum width centered on the axis of the corner. This strip must be completely covered by the regular application (36 inches wide) of Bituthene Sheet Membrane. Outside corners must be free of sharp edges. Inspect surfaces adjacent to all corners and repair if necessary to provide a smooth dense surface.
6. Inside Corners: Form a fillet with membrane coating and apply a layer of membrane. Apply mastic over all membrane seams within 12 inches of all corners.
7. Protection of membrane at horizontal surfaces: Allow the membrane to dry, and install protective board over surfaces.

D. Water Repellant

1. Allow concrete to cure 28 days and patching to cure for minimum, three days before applying finish.
2. Apply at rates and by methods recommended by product manufacturer.

3.04 WATERPROOFING SCHEDULE

A. Apply waterproofing per the following schedule:

Location	Description
Concrete Planters	Sheet Membrane Waterproofing
Concrete Stem Walls, exterior	Water Repellent
Below Grade Walls	Sheet Membrane Waterproofing

END OF SECTION

SECTION 07210

INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Building insulation in walls, soffits, and as shown on the Drawings and as specified herein.

B. Related work described elsewhere:

1. Section 06100: Rough Carpeting
2. Section 07220: Insulation for Membrane Roofing
3. Section 07841: Through Penetration Firestop Systems
4. Section 07920: Joint Sealants
5. Section 09250: Gypsum Wall and Ceiling Board

1.02 QUALITY ASSURANCE

A. Qualifications of manufacturers: 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 satisfactory production.

B. Qualifications of installers: Use adequate numbers of skilled workers who are trained and experienced in the necessary crafts, and who are familiar with the specified requirements and the methods needed for proper installation of the work of this section.

1.03. SUBMITTALS

A. General: Comply with the provisions of Section 01330.

B. Product data: Submit

1. A complete materials list of all items proposed to be furnished and installed under this section.
2. Manufacturer's specifications, catalog cuts, and other data as required demonstrating compliance with the specified requirements.
3. Manufacturer's recommended installation procedures that will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation, and to protect the work and materials of all other trades.

B. Replacements: Wet insulation shall be removed from the site and replaced. Drying of insulation will not be allowed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Thermal insulation shall be Certainteed Thermal FSK-25 Fiberglass batt insulation or equal.

1. Thickness: As required, conforming to ASTM C 518.
   a. R-19 at walls.
   b. R-30 at ceilings and roof assemblies.

2. Characteristics: R-value R-19; flame spread 25, fuel contribution 50, smoke development 50, per ASTM E 84.
3. Provide moisture barrier backing to the exterior side at exterior walls.

B. Acoustic insulation shall be Certainteed, Acoustatherm, faced, batt insulation, or equal conforming to ASTM C518 3 ½ inch thick, friction-fit between studs, joists, and other framing members. Insulation shall have a flame-spread rating of 25, and a smoke-develop rating of 50.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to the timely and proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install the work of this section where indicated in the schedule, and in accordance with the manufacturers' recommendations.

3.03 INSULATION SCHEDULE

Location	**Type**
Interior walls between normally occupied spaces including toilet facilities and mechanical and electrical rooms.	Acoustical, R-19
Storage rooms, janitor closets and other similar spaces.	Thermal, R-19
Exterior walls, floor to parapet	Thermal, R-19

END OF SECTION

SECTION 07220

INSULATION FOR MEMBRANE ROOFING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, equipment, and materials to install roof insulation over the deck substrate.

1.02 RELATED SECTIONS

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

B. Related work specified elsewhere:

1. Section 06100: Rough Carpentry
2. Section 07500: Membrane Roofing
3. Section 07620: Sheet Metal Flashing and Trim
4. Section 07720: Roof Accessories

1.03 REFERENCES

A.	ASTM C-165	Test Method for Measuring Compressive Properties of Thermal Insulation
B.	ASTM C-208	Specifications for Cellulosic Fiber Insulating Board
C.	ASTM C-209	Test Method for Cellulosic Fiber Insulating Board
D.	ASTM C-272	Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions
E.	ASTM C-578	Specification for Rigid, Cellular, Polystyrene Thermal Insulation
F.	ASTM D-2126	Test Method for Response off Rigid Cellular Plastics to Thermal Humid Aging
G.	FM	Factory Mutual System, Norwood, Massachusetts
H.	NRCA	National Roofing Contractors Association, Chicago, IL
I.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
J.	SDI	Steel Deck Institute, St. Louis, Missouri
K.	UL	Underwriter's Laboratories, Inc., Northbrook, Illinois

1.04 SUBMITTALS

A. Submit under provisions of Section 01330.

B. Product Data: Provide manufacturer's specification data sheets for each product in accordance with Section 01330.

C. Provide approval letters from insulation manufacturer for use of their insulation with the roofing system specified in 07500.

D. Shop Drawings

1. Submit manufacturer's shop drawings indicating complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thickness, crickets and saddles.
2. Shop drawing shall include: Outline of roof, location of drains, complete board layout of tapered insulation components, thickness and the average "R" value for the completed insulation system.

E. Certification

1. Submit roof manufacturer's certification that insulation furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

1.05 QUALITY ASSURANCE

A. Fire Classification, ASTM E-108.

B. Submit certification that the roof system furnished is approved by Factory Mutual, Underwriters Laboratories or Warnock Hersey for external Fire E-108 Class 1A and that the roof system is adhered properly to meet or exceed 1-90.

C. Submit certification that the roof system furnished meets local or nationally recognized building codes for fire Class A

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.

C. Keep materials enclosed in a watertight, ventilated, enclosure.

D. Store materials off the ground. Any warped, broken or wet insulation boards shall be removed from the site.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. Where insulation is required use fiberboard over rigid or tapered polyisocyanurate.

B. Provide thickness of insulation indicated, provide combination of types and thickness to provide a complete system.

1. RIGID POLYISOCYANURATE ROOF INSULATION
   a. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy-duty glass fiber mat facers.
      1. Aged R-Value: Minimum 30
      2. Thickness: Layers and overall depth as shown on the Drawings to achieve R-30; in no case less than 5-inches depth overall.
   b. Source
      1. E'NRG'Y-2 by NRG Barriers, Inc.
      2. Ultra Gard Gold II by Schuller Roofing Systems
      3. GAFTEMP Isotherm R by GAF
      4. SiPlast Insulation

5. Equal

c. Insulation board shall meet the following requirements
   1. UL, WH or FM listed under Roofing Systems
   2. Federal Specification HH-I-1972, Class 1

d. Physical Properties

1.	Dimensional Stability	ASTM D-2126	2% max.
2.	Compressive Strength	ASTM D-1621	25 psi min.
3.	Vapor Permeability	ASTM E-96	1 perm max.
4.	Foam Core Density	ASTM D-1622	2.0 pcf min.
5.	Water Absorption	ASTM C-209	<1%
6.	R-Factor HR per inch		
7.	Thickness	ASTM C-518	

2. TAPERED POLYISOCYANURATE ROOF INSULATION
   a. Qualities: Factory Tapered, closed cell polyisocyanurate foam core bonded to heavy-duty glass fiber mat facers.
      1. Taper Thickness: Minimum 1 inch at low points.
      2. Tapered Slope: As shown on drawings.
      3. Average Aged R-Value: Minimum 19.
   b. Source
      1. E'NRG'Y-2 by NRG Barriers, Inc.
      2. Ultra Gard Gold II by Schuller Roofing Systems
      3. GAFTEMP Isotherm R by GAF
      4. SiPlast
      5. Equal
   c. Insulation board shall meet the following requirements
      1. UL, WH or FM listed under Roofing Systems
      2. Federal Specification HH-I-1972, Class 1
   d. Physical Properties

1.	Dimensional Stability	ASTM D-2126	2% max.
2.	Compressive Strength	ASTM D-1621	25 psi min.
3.	Vapor Permeability	ASTM E-96	1 perm max.
4.	Foam Core Density	ASTM D-1622	2.0 pcf min.
5.	Water Absorption	ASTM C-209	<1%
6.	R-Factor HR per inch		
7.	Thickness	ASTM C-518	

3. Fiberboard
   a. Wood Fiberboard Insulation, ½ inch thick, comply with ASTM C208.

2.03 RELATED MATERIALS

A. Fiber Cant and Tapered Edge Strips: Pre-formed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard. Cants shall be four inches unless noted otherwise.

B. Roof Board Joint Tape: 6-inch wide glass fiber mat with adhesive compatible with insulation board facers.

C. Adhesive

1. Fas-N-Free by Tremco, or equal.

PART 3 - EXECUTION

3.01 INSPECTION OF SURFACES

A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.

1. Verify that work that penetrates roof deck has been completed.
2. Verify that wood nailers are properly and securely installed.
3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
   a. Do not proceed until defects are corrected.
   b. Do not apply insulation until substrate is sufficiently dry.
   c. Broom clean substrate immediately prior to application.
   d. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.

3.02 INSTALLATION

A. Attachment with Adhesive.

1. Insulation board shall be fully attached to the deck with an adhesive system. As a minimum, the amount of adhesive shall be in accordance with manufacturer's recommendation for FM 1-90 approved system.
2. Attach fiberboard to tapered insulation with adhesive.

3.03 CLEANING

A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.

END OF SECTION

SECTION 07410

MANUFACTURED SHEET METAL PANELS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Furnish all labor, materials, equipment, appliances, and necessary incidentals for the complete and proper installation of pre- finished perforated corrugated sheet metal panels, as shown on the drawings and specified herein.

B. Prevent galvanic action and other forms of corrosion by insulating metals from direct contact with incompatible materials.

C. Related work described elsewhere:

1. Section 03300: Cast-In-Place Concrete
2. Section 05120: Structural Steel
3. Section 05500: Metal Fabrications
4. Section 07120: Waterproofing
5. Section 07620: Sheet Metal Flashing and Trim
6. Section 07720: Roof Accessories
7. Section 07920: Joint Sealants
8. DIVISION 9: Finishes

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced and are familiar with the specified requirements and the methods needed for proper performance of the work in this section.

B. Installer shall be acceptable to the panel manufacturer, with a minimum of 5 years experience in successful panel projects of this nature. Submit approvals in writing prior to commencement of the work.

C. Testing and Certification: Requirements of regulatory agencies: Preformed metal roofing shall be UL Class A construction in accordance with UL Standards.

D. Comply with the following as a minimum requirement:

1. AISC - Steel Construction Manual.
2. AISI - Cold Form Steel Design Manual.
3. ASTM A 653 - Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A 792 - Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
5. ASTM A 924 - Steel Sheet, Metallic- Coated by the Hot-Dip Process.
6. SMACNA – Architectural Sheet Metal Manual.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01330.

B. Product Data: Along with shop drawings, submit manufacturer's technical data including recommended method of installation. When approved by the Architect, these documents will become the basis for inspecting and accepting or rejecting the actual installation of the work.

C. Shop Drawings: Submit shop drawings showing location of all details of fabrication, assembly, anchorage methods, splices, attachments and installation including templates for fastener placement. Show panel layout, trim installation, and panel attachment.

D. Samples: Prior to ordering material and products, provide each shape and type of metal finish indicated and to be installed in this project. Do not proceed with the work until samples and shop drawings have been approved by the Architect.

E. Site Conditions: Provide completed site condition form for the specified finish to suit project conditions.

F. Uplift Calculations: Manufacturer shall verify fastener spacing, size and all other pertinent requirements by design calculations by a licensed Structural Engineer in the State of California.

1.04 PRODUCT HANDLING

A. Delivery and storage: Deliver all materials of this section to the jobsite in the original unopened containers with all labels intact and legible at time of use. Store only under conditions recommended by the manufacturer. Store products and materials under weatherproof cover; protect panels from standing water and condensation between panels.

1. Handle panels with non-marring slings.
2. Remove any strippable film prior to installation and do not allow it to remain on panels in extreme cold, heat or in direct sunlight.

B. Protection: Use all means necessary to protect the materials of this section against damage and discoloration before, during and after installation, and to protect the work and materials of all other trades.

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

1.05 WARRANTY

A. Manufacturer's Warranty: Standard coating performance warranty, as available for specified installation and environmental conditions. Submit two (2) copies of 20 year warranty for "Zincalume" finish at the close and acceptance of the project.

B. Contractor's (Installer's) Warranty: Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, to remain watertight and weatherproof under normal usage and conditions for two (2) years following project acceptance date.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Panels: Design is based on similar products as manufactured by IMSA Building Products, Inc., 10905 Beech Avenue, Fontana, CA 92337, Telephone: (909) 823-0401. Provide products from a single source unless expressly accepted by the Architect through the submittal process. Equal products will be acceptable in accordance with the General Conditions and Section 01300. Products manufactured by Metal Sales Manufacturing Corportation are considered equal to the specified product for this Section.

1. Panels: Nu-Wave Corrugated through-fastened 20-gauge metal wall panels with 7/8-inch deep corrugations. Panels shall measure 36-inches out-to-out, with a 34-2/3-inch net coverage for wall applications.
2. Perforation Pattern (where indicated on drawings): 23.4% Open Area, 0.127" diameter holes spaced 0.250" on center (longitudinal) and 0.127" on center (transverse).

3. Protective Coating: "Zincalume", ASTM A-924/ASTM A-792, AZ50. 45% zinc/55% aluminum alloy applied by a continuous hot dip coating process as manufactured by IMSA Building Products, Inc. applied after perforation.
4. Finish: "ZACtique" metal treatment sealer as manufactured by IMSA.

B. Accessories:

1. Sheet Metal Flashing and other Materials and Accessories: Coordinate with materials specified in other sections and provide other incidental miscellaneous products and trim as required by the manufacturer for a complete and proper installation.
2. Fasteners: Provide all fasteners and washers of the size, length, strength and spacing as recommended by the manufacturer for a proper installation. Provide neoprene washers at all fasteners.
3. Clips, flashings, ridge sections, z-girts, closures and other accessories: Manufacturer's standard, finished to match wall sheets where exposed.
4. Underlayment: Vycor Ultra, manufactured by W.R. Grace, or equal, high temperature resistant, butyl rubber-based adhesive-backed, high-density cross laminated polyethylene sheet, 30 mils thick, furnished in 34" wide rolls.
5. Slip sheet: Unsaturated building paper weighing not less than 5 pounds per 100 square feet.
6. Sealant: Elastomeric type containing no oil or asphalt. Exposed sealant shall be colored to match the applicable building color and shall cure to a rubber-like consistency. Sealant placed in the roof panel standing seam ribs shall be provided in accordance with the manufacturer's recommendations.
7. Gaskets and insulating compounds: Non-absorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be non-running after drying.

2.04 FABRICATION

A. Roll form panels in continuous lengths, full length of detailed runs.

B. Fabricate trim, flashing and accessories to detailed profiles.

C. Fabricate trim and flashing from same material as panel.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Field Measurements: Verify prior to installation. Make all necessary field adjustments for proper fitting and installation; notify the Inspector and Architect of conflicts prior to proceeding with the work.

B. Protection: Treat, or isolate with protective material, and contacting surfaces of dissimilar materials to prevent electrolytic corrosion. In the event of damage, make all necessary repairs in conjunction with the work.

C. Surface Preparation: Clean and dry surfaces prior to applying sealant.

3.03 INSTALLATION

A. Workmanship and Cutting: All cuts shall be square and accurate for minimum joint gap. Cuts shall be clean and straight, free of "chamfer" from deburring, burrs and nicks. All holes shall be drilled the proper size to receive fasteners as applicable. Where protection is applied for prevention of electrolytic action, care shall be taken that none of the protective material is visible when assembly is completed.

1. Treat all field-cut edges with a suitable non-rust coating as acceptable to the manufacturer and compatible with the finish.
2. Provide folded edges as recommended by the manufacturers. Shop weld as required.

B. Provide integral-neoprene washer anchors at all panel attachment locations as recommended by the manufacturer.

C. Install panels plumb, level and straight with seams and ribs/battens parallel, conforming to design indicated on Drawings.

3.04 CLEANING

A. In addition to the requirements of Section 01710 of these specifications, and prior to acceptance of the work, thoroughly clean all metal panels and remove all finger-marks and other defacements.

1. At completion of each day's work, sweep panels, flashings, gutters and all adjacent areas clean. Do not allow fasteners, cuttings, filings, scrap or other materials to accumulate.
2. Remove debris from project site upon work completion or periodically, as directed.

END OF SECTION 07410

SECTION 07500

MEMBRANE ROOFING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Labor, equipment, and materials to install a cold process bitumen roof system and modified bitumen flashing.

1.02 RELATED SECTIONS

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

B. Related work specified elsewhere:

1. Section 06100: Rough Carpentry
2. Section 07220: Insulation for Membrane Roofing
3. Section 07620: Sheet Metal Flashing and Trim
4. Section 07720: Roof Accessories
5. Section 07920: Joint Sealants
6. Division 15: Mechanical – Rooftop Equipment & Supports
7. Division 16: Electrical- Rooftop Penetrations

1.03 REFERENCES

ASTM D - 41	Specification for Asphalt Primer Used in Roofing, Damp-proofing, and Waterproofing
ASTM D - 312	Specification for Asphalt Used in Roofing
ASTM D - 451	Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products
ASTM D - 1079	Terminology Relating to Roofing, Waterproofing, and Bituminous Materials
ASTM D - 2178	Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
ASTM D - 2822	Specification for Asphalt Roof Cement
ASTM D - 3019	Specification for Lap Cement Used with Asphalt Roll Roofing
ASTM D - 4601	Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
ASTM D - 5147	1991 Test Method for Sampling and Testing Modified Bituminous Sheet Materials
ASTM E - 108	Test Methods for Fire Test of Roof Coverings
FM	Factory Mutual
NRCA	National Roofing Contractors Association
UL	Underwriters Laboratories
WH	Warnock Hersey

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Submit certification that the roof system furnished is tested as a Class A roof system with or Listed by Underwriters Laboratories or Warnock Hersey for external fire tests of ASTM E - 108 Class A.

C. Product Data for each type of product specified include manufacturer's technical product data, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with specified requirements.

D. Show evidence that materials provided conform to all requirements specified, and are chemically and physically compatible with each other and are suitable for inclusion within the total roof system specified herein.

E. Show evidence that the Installer specializes in cold process roof application with a minimum 5 years experience and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.

F. Provide a sample of each product.

G. Unexecuted Manufacturer's warranty with service agreement.

H. Certified copy of ISO 9001 compliance.

I. Project closeout documents noted in this section.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Roofing system manufacturer shall have a minimum of 10 years experience in manufacturing modified bitumen roofing products in the United States and be ISO 9001 certified.

B. Installer Qualifications: Installer shall specialize in cold process roof application with minimum 5 years experience in cold process and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.

C. It is the intent of this specification to provide a roof system with an external fire rating. The descriptions given below are general descriptions. The insulation, recovery board, and other components shall be as required by the membrane manufacturer to provide a Class A fire resistance rating.

D. Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Foreman on job site during all phases of modified bituminous sheet roofing work and at any time roofing work is in progress. A copy of the specification shall be in the possession of the Supervisor/Foremen and on the roof at all times.

E. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction.

F. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

G. Pre-application Roofing Conference: Approximately 2 weeks before scheduled commencement of the Work, meet at Project site with the Installer; installer of each component of associated work; installers of deck or substrate construction to receive roofing work; installers of rooftop units and other work around roofing that must precede or follow the work (including mechanical work); Architect/Owner/Inspector; and roofing system manufacturer's representative. Objectives to include:

1. Review foreseeable methods and procedures related to roofing work.

2. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work.
3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
4. Review roofing systems requirements: drawings, specifications, and other contract documents.
5. Review submittals. Architect's submittal review must be complete prior to scheduling the meeting.
6. Review required inspection, testing, and certifying procedures.
7. Review notification procedures for weather or non-working days.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll-goods with a canvas tarpaulin or other breathable material (not polyethylene).

C. Do not leave unused rolled-goods on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.

D. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.07 MANUFACTURER'S INSPECTIONS

A. When the project is in progress, the Roofing System Manufacturer will provide the following:

1. Keep the Architect informed as to the progress and quality the work as observed.
2. Provide job site inspections a minimum of three days a week.
3. Report to the Architect in writing, corrections and unacceptable practices called to the Contractor's attention.
4. Confirm, after completion of the project, and based on manufacturer's observations and tests, that manufacturer has complied with the plans and specifications.
5. Provide job closeout with warranty, inspection reports and photos of progress of job.

1.08 PROJECT CONDITIONS

A. Weather Condition Limitations: Do not apply roofing membrane during inclement weather or when a 40% chance or greater of precipitation is expected.

B. Do not apply roofing insulation or membrane to damp deck surface.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

D. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.

1.09 SEQUENCING AND SCHEDULING

A. Sequence installation of built-up sheet roofing with related units of work specified in other sections to ensure that roof assemblies, including roof accessories, flashing, trim, and joint sealers, are protected against damage from effects of weather, corrosion, and adjacent construction activity.

B. Work for each roofed area must be completed on each day. Phased construction will not be accepted.

1.10 WARRANTY

A. Membrane Manufacturer upon completion of installation, and acceptance by the Owner and Architect, the manufacturer will supply to the Owner a 20-year quality assurance plus warranty, with roof preventative maintenance over the life of the warranty, from the manufacturer. The roofing manufacturer shall agree to perform maintenance and make all repairs on the roof at no cost to the District for the duration of the warranty time. Warranty shall cover membrane and flashing.

B. Contractor will provide an additional five-year warranty to the Owner.

C. By bidding on this work, the contractor accepts the design shown on the drawings and in these specifications, to be warrantable. Work not shown, but required to provide a warranty, is to be included in the bid price and performed at no additional cost to the District.

1.11 SINGLE SOURCE

A. Major roofing components including but not limited to roofing base sheets, cold process adhesive, appropriate flashings, and sealants shall be manufactured by the same manufacturer providing the warranty for said project.

1.12 PROJECT CLOSEOUT DOCUMENTS.

A. Material manufacturer's written acceptance.

B. Inspection reports

C. Photos of progress.

D. Owner's manual

E. Copy of UL ratings

F. Executed warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. When a particular trade name or performance standard is specified it shall be indicative of a standard required.

B. Provide products as manufactured by Tremco Inc. (Tremco) or equal.

C. Items or materials submitted as an alternate to the manufacturer specified must comply in all respects as to the quality and performance, including job site investigation of the brand name specified. The District shall be the sole judge as to whether or not an item submitted as an equal is truly equal.

2.02 ROOFING MATERIALS

1. Type II Base Sheet meeting ASTM D 4601
   a. Tremco: Burmastic Trilaminate Composite Ply.
2. Cold Process InterPly Adhesive
   a. Tremco: Powerply Adhesive
3. Cold Process Ply Sheets
   a. Tremco Burmastic Glass, 28 pound.
4. Flashings and Angles

a. Tremco: POWERply Supreme HT FR

5. Reinforced Roof Flashings
   a. Tremco: Burmastic Trilaminate Composite Ply
6. Primers for Metal Flashings Flanges
   a. Tremco: Tremprime WB
7. Roofing Mastics
   a. Tremco: E.L.S.
8. Sealants
   a. Tremco: Tremseal GP
9. Cap Sheet:
   a. Tremco: POWERply Supreme HT FR.

2.03 RELATED MATERIALS

A. Roof Insulation: See Section 07220 – Insulation for Membrane Roofing for requirements.

B. Base sheet shall meet the requirements of ASTM D-4601 Type II and be recommended and furnished by the membrane manufacturer.

C. Nails and Fasteners: Non-ferrous metal or galvanized steel. Nails and fasteners shall be flush-driven through flat metal discs of not less than 1-inch diameter. Metal discs may be omitted when one-piece composite nails or fasteners with heads not less than 1-inch diameter are used.

   1. Where roof sheathing is exposed at the interior, do not leave fasteners exposed to view.

D. Walk-way Pads: As recommended and furnished by the membrane manufacturer. Refer to the Drawings for locations.

E. Continuous Sheet Membrane Liner: Garland Butyl Sealing Tape, Tremco T.F. Tape or equal.

2.04 METAL FLASHINGS

A. Plumbing vents, covers, and drain flashings.

   1. ASTM B 29-79 (84), four pound sheet lead, installed per manufacturer's recommended details.

B. Coping - 22 gauge metal sheet metal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrate surfaces to receive roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Roof System Manufacturer.

B. Verify requirements of other trades including mechanical equipment curbs, duct supports and roof mounted electrical equipment.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.

B. Insurance/Code Compliance: Where required, install and test the bituminous roofing system to comply with governing regulation and specified insurance requirements.

C. Protect other work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore other work damaged by installations of the bituminous roofing system work.

D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut-offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of #15 organic roofing felt with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work.

E. Cold applied membrane adhesive coverage rates for interply application two and one-half (2 1/2) gallons per 100 square feet.

F. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building or damaging roofing system components or adjacent building construction.

G. Apply roofing materials as specified herein unless recommended otherwise by manufacturer's instructions. Keep roofing materials dry before and during application. Do not permit phased construction. Complete application of roofing plies in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day.

H. Cut-Offs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of two (2) plies of #15 organic roofing felt set in full mopping of bitumen with joints and edges sealed.

3.03 ROOF SYSTEM MEMBRANE INSTALLATION

A. Adhere base sheet to insulation with cold process interply adhesive at a rate of 2 gallons, per square.

B. Base Plies: Install two base plies at a rate of 2-1/2 gallons, per square per ply of cold applied membrane adhesive shingled uniformly to achieve two plies throughout over prepared substrate. The sheet must be cut in eighteen-foot (18) maximum length and allowed to relax prior to being re-rolled and installed. Shingle in proper direction to shed water on each large area of roofing. Prior to installation, cut sheets into 18-foot lengths and allow to relax.

C. Extend plies two inches beyond top edges of cants at wall and projection bases.

D. Install base flashing ply to all perimeter and projection details.

E. Install cap sheet in asphalt at a rate of 2 to 2-1/2 gallons, per square.

3.04 FLASHING MEMBRANE INSTALLATION (GENERAL)

A. All curb, wall and parapet flashings shall be sealed with an application of mastic and mesh on a daily basis. No condition should exist that will permit moisture entering behind, around, or under the roof or flashing membrane.

B. Prepare all walls, penetrations and expansion joint to be flashed, with asphalt primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.

C. All plies will be adhered with Flashing Bond Mastic. The base flashing ply and the modified membrane will be used as the flashing and nailed off 8 inches on center at all vertical surfaces.

D. The entire sheet of flashing membrane must be solidly adhered to the substrate.

E. Seal all vertical laps of flashing membrane with a three-course application of Flashing Bond and fiberglass mesh.

F. Counter flashing, cap flashings, expansion joints and similar work to be coordinated with roofing work are specified in other sections.

G. Roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with the roofing system work are in other sections.

3.05 CLEANING

A. Remove bitumen and adhesive from all walls, windows, floors, ladders and finished surfaces.

B. In areas where finished surfaces are soiled by bitumen or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

3.06 FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with Installer, installer of associated work, Owner, roofing system manufacturer's representative and other representatives directly concerned with performance of roofing system.

1. Water test all drains, scuppers, and parapet copings to the satisfaction of the manufacturers representative and inspector.

B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to the District.

C. The District reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The Roofing Contractor at a negotiated price shall provide the thermographic scan. If wet materials are discovered, the contractor shall pay cost for initial test and all subsequent tests required to assure no wet materials remain.

D. Take up to three core cuts as directed by the District. If core cuts verify the presence of non-conforming work, the Roofing Contractor shall be required to replace the work at his own expense.

E. Following the final inspection, the material manufacturer will make acceptance in writing.

END OF SECTION 07500

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SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following sheet metal flashing and trim:

1. Through-wall flashing.
2. Manufactured reglets.
3. Formed roof flashing and trim.
4. Formed wall flashing and trim.
5. Formed equipment support flashing.

B. Related Sections include the following:

1. Section 05500: Metal Fabrications
2. Section 06100 Rough Carpentry
3. Section 07120: Waterproofing
4. Section 07500: Membrane Roofing
5. Section 07720: Roofing Accessories
6. Section 07920: Joint Sealants
7. Section 08100: Hollow Metal Doors and Frames
8. Section 08411: Aluminum Framed Storefronts

1.03 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled works. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Manufacturer's recommended installation procedures, which, when approved by the Architect, will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.

D. Guarantee for two years against leaks, faulty workmanship or materials.

1.05 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

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 acceptable to the Architect.

C. Qualifications of installers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weather-tight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the District.

1.07 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak-proof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.01 SHEET METALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality, mill phosphatized for field painting.

B. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.

2.02 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil (0.15-mm) thick polyethylene sheet complying with ASTM D 4397.

B. Continuous Membrane Liner per Section 07500

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.

C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Solder for Lead: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

E. Solder for Zinc: ASTM B 32, 60 percent lead and 40 percent tin with low antimony, as recommended by manufacturer.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.04 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.

1. Available Manufacturers:
   a. Fry Reglet Corporation.
   b. Heckmann Building Products Inc.
   c. Keystone Flashing Company, Inc.
2. Material: Aluminum, 0.024 inch (0.6 mm) thick, galvanized steel, 0.0217 inch (0.55 mm) thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers and with channel for sealant at top edge.
4. Plaster Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials. Weep screeds, at typical reveal detail, to be rigid vinyl, Fry's FWS 875 or equal.
   a. Control Joint: Fry's PCS-75-75 or equal
   b. "F" Reveal: Fry's FPM-75-75 or equal
   c. Expansion Joint: Fry's PCS-75-75 2 PC or equal

5. Drywall Type:
   a. "F" Reveal, Fry's DRMF-625-625 or equal
   b. "W" Reveal, Fry's DRWT-75-75 or equal

2.05 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual for application but not less than thickness of metal being secured.

2.06 ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.

1. Joint Style: Butt, with 12-inch- (300-mm-) wide concealed backup plate and 6-inch- (150-mm-) wide exposed cover plates.
2. Fabricate copings from the following material:
   a. Galvanized Steel: 0.0396 inch (1.0 mm) thick.

B. Roof Flashing and Counter-flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch (0.7 mm) thick.

C. Roof-Penetration Flashing: Fabricate from lead, 4.0 pounds per square foot, 1.6 mm thick.

D. Roof-Drain Flashing: Fabricate from lead, 4.0 pounds per square foot, 1.6 mm thick, hard tempered.

2.07 WALL SHEET METAL FABRICATIONS

A. Opening Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from Galvanized Steel: 0.0217 inch (0.55 mm) thick.

2.08 FINISHES

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

B. Paint flashing exposed to view, including roof flashing.

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

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. General: 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.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: 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 fabricator or manufacturers of dissimilar metals.

1. Coat side of lead and sheet metal flashing and trim with bituminous coating where flashing and trim will contact cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious substrate, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Cleats to be continuous fastened at 12 inches on center.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

H. Seal joints with sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm) except where pretinned surface would show in finished Work.

3.03 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch (400-mm) centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal with sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.04 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Use galvanized metal sheet, pre-formed and inserted in opening during construction of the wall.

C. Reglets: Install in straight, plumb and level, lines. Provide protective filler to protect exposed portion of reveal. Remove protective filler on completion.

D. Weep Screeds: Install weep screeds as noted in the drawings. Where screeds end at corners, and do not return, provide a closure cap.

3.05 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with sealant to equipment support member.

3.06 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.07 TESTS

A. Demonstrate by hose or standing water that all sheetmetal is completely watertight.

END OF SECTION

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SECTION 07720

ROOF ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide prefabricated roof accessories, complete, in place, as shown on the Drawings, including but not necessarily limited to:

1. Roof Hatches
2. Roof Curbs
3. Metal Collars

B. Related work described elsewhere:

1. Section 07220: Insulation for Built Up Roofing
2. Section 07500: Built-Up Roofing
3. Section 07620: Sheet Metal Flashing and Trim
4. Section 09900: Painting and Coatings

1.02 QUALITY ASSURANCE

A. Submit two-year written warranties on roof accessories, agreeing to repair or replace units that fail to perform as specified, including breakage and water leakage.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01330.

B. Submit product data of all items proposed to be furnished and installed under this Section.

C. Submit shop drawings showing details, methods of fastening and attachments.

D. Show details of flashing and roof curbs, cants and crickets.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Roof Hatch: Model: SAH-12-SF "Steel" Access Hatch by Bristolite, with insulated, galvanized steel curb and cover or equal.

B. Roof curbs: Wood as shown on the plans. Where curbs are required, but not detailed, install using 6x wood members, fire treated, shaped to accommodate roof slope.

C. Metal Collar Flashing: Lead, with minimum base size of 12 inches square.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Coordinate installation with related work.

B. Install roof hatch, vents and curbs per manufacturer's printed instructions.

C. Metal Collar Flashing: At conduits or vents at roof membrane, install metal collars. Prime with Asphalt Primer and allow to dry. Install collars on top of completed base sheet assembly with the flange set in plastic cement. Seal the flange with Ruftac.

END OF SECTION

SECTION 07841

THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.

1. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM-E-814, but not less than the fire-resistance rating of the constructions penetrated.
2. T-Rated Through Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM-E-814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupied floor areas. T-rated assemblies are required where the following conditions exist:
   a. Where firestop systems protect penetrating items larger than 4-inches in diameter or over 16-square-inches in area.
3. Fire-Resistive Joint Sealant: Provide joint sealant with fire-resistive rating not less than the fire-resistance rating of the construction in which the joint occurs, as determined per ASTM-E-119.
4. For firestopping exposed to view, traffic, moisture and physical damage, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM-E-84, and do not deteriorate when exposed to these conditions.

B. Related work described elsewhere:

1. Section 03300: Cast-In-Place Concrete
2. Section 06100: Rough Carpentry
3. Section 07920: Joint Sealants
4. Section 09250: Gypsum Wall and Ceiling Board
5. Division 15: Mechanical and Plumbing
6. Division 16: Electrical

1.02 QUALITY ASSURANCE

A. Comply with applicable codes and regulations of governmental agencies having jurisdiction.

B. Standards: Comply with standards specified in this section, as listed in Section 01400.

C. Qualifications of installers: Use adequate numbers of skilled workers who are trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed for proper performance of the work of this section.

D. Single source: All work of this section to be produced by a single manufacturer.

1.03 SUBMITTALS

A. General: Comply with provisions of Section 01330.

B. Product data for each type of product to be used.

C. Certification, by firestopping manufacturer, that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are non-toxic to building occupants.

D. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item along with design designation of qualified testing and inspecting agency.

E. Product certificates signed by manufacturers of firestopping products certifying compliance of their products with specified requirements.

F. Product test reports from a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

1.04 FIRE-TEST-RESPONSE CHARACTERISTICS:

A. Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" paragraph:

1. Firestopping tests are to be performed by a qualified testing and inspecting agency, including UL, Warnock Hersey, or another agency performing testing and follow-up inspection services that is acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM-E-814.
3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM-E-119.
4. Ratings of Firestopping: As indicated by reference to designations of UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers:

1. Isolatek International (Cafco)
2. Hilti
3. 3M
4. United States Gypsum Company

2.02 MATERIALS

A. Through-Penetration Firestop Systems: Comply with the following requirements in providing system components that are compatible with each other, the substrates forming openings, and the item penetrating the firestop under conditions of service and applications, based on testing and field experience.

1. Accessories: Provide the following components for each firestopping system as needed to install fill materials and to comply with "System Performance Requirements" paragraph:
   a. Permanent backing or form materials may include the following:
      1) Semirefratory fiber (mineral wool) installation.
      2) Ceramic fiber.

3) Sealant used in combination with other backing or form materials to prevent leakage of fill materials in liquid state.
4) Fire-rated formboard.
5) Joint fillers for joint sealant.
   a) Temporary forming materials.
   b) Substrate primers.
   c) Collars.
   d) Steel sleeves.

2. Fill Materials: Provide through-penetration firestop systems composed of the fill materials indicated below:
   a. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
   b. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
   c. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
   d. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM-E-136, with flame-spread and smoke-developed ratings of zero per ASTM-E-84.
   e. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogenous mortar.
   f. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant.

B. Fire-Resistive Elastomeric Joint Sealant: chemically curing, elastomeric sealant complying with ASTM-C-920 requirements.
   1. Sealant Colors: Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
   2. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS, Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
      a. Additional capability, when tested per ASTM-C-719, to withstand the following percentage changes in joint width as measured at time of installation and still comply with other requirements of ASTM-C-920:
         1) 50 percent movement in both extension and compression for a total of 100 percent movement.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify actual field conditions. Inspect related work and adjacent surfaces.

3.02 APPLICATION

A. Install through-penetration firestop to comply with the through-penetration firestop manufacturer's installation instructions.

B. Install fire-resistive joint sealant to comply with ASTM-C-1193 and with the sealant manufacturer's installation instruction.

C. Install sealant flush with adjacent surfaces, free of voids and pits.

D. At penetrations in areas exposed to view, use sealants or sealant cover, suitable for painting. Paint to match adjacent surfaces.

3.03 CLEANUP

A. Remove firestopping splatter from exposed adjacent work.

END OF SECTION

SECTION 07920

JOINT SEALANTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: sealant, other than fireproofing sealant for penetrations, and waterproofing of joints, openings and seals.

B. Related work described elsewhere:

1. Section 03300: Cast-in-place Concrete
2. Section 07620: Sheet Metal Flashing and Trim
3. Section 07841: Through-Penetration Firestop Systems

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this section and as listed in Section 01400, Quality Requirements.

B. Qualifications of installers:

1. For installation of sealant, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown on the Drawings and the installation requirements called for in this section.

1.03 SUBMITTALS

A. General: Comply with provisions of Section 01330, Submittal Procedures.

B. Manufacturers' data, submit:

1. A complete materials list showing all items proposed to be furnished and installed under this section.
2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.
3. Manufacturer's recommended installation procedures which will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.

C. Samples: Submit samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.04 PRODUCT HANDLING

A. Delivery and storage: Deliver all materials of this section to the job site in the original unopened containers with all labels intact and legible at time of use. Store only under conditions recommended by the manufacturers. Do not retain on the job site any material that has exceeded the shelf life recommended by its manufacturer.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation, and to protect the work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 - PRODUCTS

2.01 SEALANTS

A. General: Except as specifically called for in other sections of this use sealant best suited for application. See section 07841 for fire rated sealants.

B. Polyurethane sealant: Polyurethane base, one or two component, chemical curing, self leveling, low-sagging, conforming to FS TT-S-00227E Type I Class A, colors to match adjacent surfaces; as manufactured by Bostik, Chem-Calk 900, Tremco or equal.

C. Butyl caulking compound: One part polymeric caulk, conforming to FS TT-S-01657, Type I, Bostik Chem-Calk 500, Pecora BC-158, DAP Butyl-Flex Caulk, or equal.

D. Acoustical sealant: Prestite #579.64, manufactured by the Inmont Company, #313, manufactured by the W.W. Henry Company, Tremco, or #BA-98, manufactured by Pecora.

E. PVC form sealant:

1. Norseal, V730 Series, as manufactured by Nofton Sealant, Granville, NY.
2. Low-density vinyl foam with a high-tack positioning adhesive.
3. Minimum 30% compression.
4. Provide width and thickness as required.

F. Colors:

1. Colors for each sealant installation will match the adjacent material. Should such color not be available from the manufacturer's selection except at additional charge, provide colors at no additional cost to the District.
2. In concealed installations, and in partially exposed installations standard gray or black sealant may be used.

2.02 PRIMERS:

A. Use only those primers that are non-staining, have been tested for durability on the surfaces to be sealed, and are specifically recommended for this installation by the manufacturer of the sealant used.

2.03 BACKUP MATERIALS

A. Rods as described below:

1. Closed-cell resilient urethane or PVC foam
2. Closed-cell polyethylene foam
3. Preformed support strips for ceramic-tile control-joint and expansion-joint work shall be polyisobutylene or polychloroprene rubber.

2.04 BOND-PREVENTIVE MATERIALS:

A. Use only one of the following as best suited for the application and as recommended by the manufacturer of the sealant used.

1. Polyethylene tape, pressure-sensitive adhesive, with the adhesive required only to hold tape to the construction materials.
2. Aluminum foil conforming to MIL-SPEC-A-148E; (3) wax paper, conforming to Fed. Specification, UU-P-270.

2.05 MASKING TAPE:

A. For masking around joints, provide masking tape conforming to Federal Specification UU-T-106c.

PART 3 - EXECUTION

A. Provide all labor and materials required to seal joints as required to provide a positive barrier against acoustical penetrations and the passage of air and moisture. All exterior openings and penetrations are to receive sealant.

3.01 INSPECTION:

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Concrete and ceramic-tile surfaces:

1. Surfaces in contact with sealant shall be dry, sound, and well brushed and wiped free from dust.
2. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
3. Where surfaces have been treated, remove the surface treatment by use of sandblasting or wire brushing.
4. Remove all laitance and mortar from the joint cavity.
5. Where backstop is required, insert the approved backup material in the joint cavity to the depth required.

B. Steel surfaces:

1. Steel surfaces in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish, the metal shall be scraped or wire-brushed to remove mill scale.
2. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
3. Remove protective coatings or primer on steel by sandblasting or by a solvent that leaves no residue.

3.03 INSTALLATION OF BACKUP MATERIAL:

A. Use only the backup material recommended by the manufacturer of the sealant for the particular installation, compressing the backup material 25% to 30% to insure a tight fit. Avoid lengthwise stretching of the material. Do not twist or braid rod backup stock.

3.04 PRIMING:

A. Use the primer recommended by the manufacturer of the sealant for the particular installation. Apply the primer in accordance with the manufacturer's recommendations.

3.05 BOND BREAKER INSTALLATION:

A. Install a bond breaker where recommended by the manufacturer of the sealant adhering to the installation recommendations.

3.06 INSTALLATION OF SEALANTS

A. General: Prior to start of installation, in each joint, verify the joint type according to the details in the Drawings and verify that the required proportion of width of joint to depth of joint has been secured.

B. Equipment: Apply sealant under pressure with a hand or power actuated. Guns shall have nozzle of proper size and shall provide sufficient pressure to completely fill joints as designed.

C. Masking: Thoroughly and completely mask all joints where they are visible.

D. Installation of sealant: Install the sealant in accordance with the manufacturer's recommendations, thoroughly filling all joints to the recommended depth.

E. Tools joints to be flush with adjacent surfaces or 45 degrees if joining perpendicular surfaces.

F. Cleaning up:

1. Remove masking tape immediately after joints have been tooled.
2. Clean adjacent surfaces free from sealant as the installation progresses. Use solvent or cleaning agent as recommended by the sealant manufacturer.

3.07 SEALANT SCHEDULE

A. Install sealant at the following locations, and where required for a weather tight installation.

Location	**Type**
Wall to floor and wall to ceiling connections at partition walls.	Acoustical
Door and Window Frames, exterior stairs and penetrations.	Polyurethane
Concrete joints.	PVC Form Sealant
Toilet fixtures and ceramic tile.	Butyl Caulk
Roofing sheet metal and flashings	Polyurethane

END OF SECTION

SECTION 08100

HOLLOW METAL DOORS, WINDOWS AND FRAMES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Steel doors and frames, including hollow metal window frames, and fire rated assemblies.

B. Related work described elsewhere:

1. Section 03300: Cast-In-Place Concrete
2. Section 06100: Rough Carpentry
3. Section 07920: Joint Sealants
4. Section 08710: Finish Door Hardware
5. Section 08800: Glazing
6. Section 09250: Gypsum Wall and Ceiling Board
7. Section 09900: Painting

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this section as listed in Section 01400, Quality Requirements, including SDI, UL, and NFPA Pamphlet 80.

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.

C. Single source: A single manufacturer shall produce all work of this section.

1.03 SUBMITTALS

A. General: Comply with provisions of Section 01330, Submittal Procedures.

B. Manufacturers' data, submit:

1. A complete materials list of all items proposed to be furnished and installed under this section.
2. Manufacturers' specifications demonstrating compliance with the specified requirements.
3. Shop drawings showing details of each frame type, elevations of each door design type, details of all openings, and all details of construction, installation, and anchorage.
4. Schedule for location of each unit.
5. Manufacturer's recommended installation procedures will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.
6. A copy of the guarantee.
7. Certification that hardware has been properly adjusted.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect materials of this section before, during, and after installation, and to protect installed work and materials of all other trades.

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

PART 2 - PRODUCTS

2.01 MATERIALS

A. Hot-rolled steel sheets and strip: Commercial-quality carbon steel pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-rolled steel sheets: Commercial-quality carbon steel complying with ASTM A 366 and ASTM A 568.

C. Supports and anchors: Fabricate of not less than 16-gauge galvanized sheet steel; stiles type T-12 bracket or equal; metal stud type.

D. Inserts, bolts, and fasteners: Manufacturer's standard units, except hot-dip-galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D, as applicable.

2.02 FABRICATION

A. General:

1. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles.
2. Wherever practical, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the site.
3. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers, and moldings from 16-gage steel, either cold-rolled or hot-rolled (at fabricator's option).
4. Furnish UL labels on doors and frames for the designated ratings. Label shall specify type of construction for which door installation is approved and shall be installed on the hinge edge of the door.

B. Exposed fasteners: Provide countersunk flat Phillips or Jackson heads for exposed screws and bolts. Use exposed bolts only where allowed by these specifications.

C. Finish hardware preparation:

1. Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with the Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115.
2. Reinforce hollow metal units to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at site.
3. Locate finish hardware in accordance with "Recommended Locations for Builders Hardware, published by the National Builders Hardware Association; and as specified in Section 08710, Finish Hardware.
4. Install reinforcing as recommended by the manufacturer of the hardware.

2.03 STEEL DOORS

A. General: Provide metal doors of the types and styles indicated on the Drawings or schedules and complying with SDI 100, UL, and NFPA for minimum materials and construction requirements and the following:

1. Doors to be Level III, extra heavy duty.

2. Model 2, seamless construction.
3. 16 gage galvanized steel faces.
4. Vertical edges:
   a. Join face sheets at vertical edges by continuous welding:
      1) Join door faces by continuous weld on each edge, extending full door height.
      2) Grind, fill, and dress welds to provide smooth flush surface.
5. Horizontal edges:
   a. Close top and bottom edges of doors with continuous steel channels, 16 gage minimum; spot-weld channels to both door faces.
   b. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.
   c. Provide additional flush closing channel at top and bottom edges of doors; spot-weld channel to both door faces.

B. Internal Construction shall be vertical stiffeners with mineral core fiber between stiffeners.
   1. Stiffen face sheets with continuous vertical sections, formed of steel sheet, that, upon assembly, span full thickness of interior space between door faces.
   2. Spot-weld stiffeners to both face sheets.

C. Provide UL fire rated assemblies where called for on the schedule and to match wall assemblies in which they are placed.

2.04 STEEL FRAMES

A. General:
   1. Provide metal frames of the types and styles indicated on the Drawings or Schedules: 16-gauge for all doors, window frames, and miscellaneous frames and trim pieces; and complying with SDI 100, UL, and NFPA for minimum materials and construction requirements.
   2. Provide metal frames for doors, windows and other openings as shown on the Drawings. Conceal all fastenings. Dimensions indicate clear glass area.
   3. Fabricate frames of welded construction. Miter all corners. Grind all welds smooth.
   4. Form frames of hot-dip-galvanized steel.

B. Plaster guards: Provide 26-gauge steel plaster guards or mortar boxes, welded to the frame, at back of all finish hardware cutouts where mortar or other materials might obstruct hardware operation.

2.05 FINISH

A. Painting: All doors and frames shall be field-painted per Section 09900. Do not paint fire-rating labels.
   1. Shop prime shall be removed prior to installation of final finish.

2.06 LOUVERS

A. Provide louvers per Section 10200.

2.07 NON-STANDARD DOORS AND FRAMES

A. When doors and frames are required that are not available from the manufacturer as stock items, provide such items as custom items constructed in conformance with the requirements for Type III doors within the profiles and size limitations shown on the Drawings.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Pre-install hollow metal units and accessories in accordance with manufacturer's data and as specified herein.

B. Coordinate location of door and doorframe contacts. Prepare door and frame to receive contacts.

C. Door installation:

1. Fit doors accurately in their respective frames, within clearances specified in SDI 100.
2. Place fire-rated doors with clearances as specified in NFPA No. 80 and as shown on Drawings.

3.03 SHOP FINISHING

A. Deliver fabricated doors and frames for painting.

B. Protect coatings and deliver to field after painting.

3.04 NSTALLATION OF DOORS AND FRAMES

A. Set frames straight and plumb. Anchor securely. Solid grout frames where indicated on the schedule.

B. Initial inspection of doors and frames: Prior to start of installation of each door and/or frame, carefully inspect the door and verify:

1. That the door and/or frame furnished is the proper one for the opening, as described on the Door Schedule in the Drawings.
2. That the door is in sound condition, unblemished, without warp, twist, bow, or other attributes causing it to be rejected upon installation.

C. Fitting: Manufacture doors to provide a uniform clearance of between 1/8 inch and 3/16 inch at jambs and head, and a uniform clearance at the threshold or floor to properly clear the floor covering described on the Finish Schedule in the Drawings.

D. Installing: Anchor each new frame securely and plumb in the prepared opening. For each door, verify the hardware type as described on the Door Schedule.

3.05 INSPECTION, ADJUSTMENT, AND REPORTING

A. General: Inspect each item of installed finish hardware. Verify that each such item has been installed in accordance with the manufacturer's recommendations, is in proper condition, and functions in its intended manner.

B. Adjustment: On all finish hardware items designed to permit adjustment, submit a written report:

1. That states that all installed finish hardware has been inspected in accordance with this Article.
2. Stating that all installed finish hardware is in accordance with these Specifications as to quality, type, appearance, operation, and all other specified attributes.

3.06 FINISH TOUCH-UP

A. Use professional painters to touch-up damaged doors and frames.

B. Use touch-up paint that is identical to the original coating.

END OF SECTION

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SECTION 08305

ACCESS DOORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Access doors in walls and ceilings as required providing access to attic spaces, plumbing, HVAC and electrical work.

B. Related work described elsewhere:

1. DIVISION 9: Finishes
2. DIVISION 15: Mechanical and Plumbing
3. DIVISION 16: Electrical

1.02 QUALITY ASSURANCE

A. 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 satisfactory production.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01330, Submittal Procedures.

B. Product data, submit:

1. A complete materials list of each door proposed to be furnished and installed under this section.
2. Manufacturer's specifications, catalog cuts, and other data as required demonstrating compliance with the specified requirements.
3. Manufacturer's recommended installation procedures shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

C. Shop drawings, showing locations and sizes of each door required.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation, and to protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 - PRODUCTS

2.01 WALL ACCESS DOORS

A. Milcor or equal; style DW. Use style MS, stainless steel, at tile walls.

1. Sufficient to provide access to the equipment concealed.
2. Frame: 16-gauge, with 14-gauge door panel.
3. Key operated cylinder lock by manufacturer.

2.02 CEILING ACCESS DOORS

A. Milcor or equal.

1. Size: As required for equipment access or 22 by 30 inches minimum for attic access, if not noted.
2. Frame: 16-gauge, with 20-gauge door panel
3. Automatic panel closer
4. Key-operated cylinder lock by manufacturer

B. Milcor or equal; style AT or ATR. Doors penetrating 1-hour fire-rated surfaces shall be labeled assemblies.

1. Size: As required for equipment access or 22 by 30 inches minimum for attic access, if not noted.
2. Frame: 16-gauge, with 18-gauge door panel
3. Key operated cylinder lock by manufacturer

2.03 FINISHES

A. Paint to match adjacent surface, except if stainless steel is used.

PART 3 - EXECUTION

3.01 LOCATIONS

A. The locations of access panels are not shown on the drawings.

1. Locations include but are not limited to: pipe chases, mechanical equipment, fire dampers, dampers, damper motors, valves, strainers, traps, control valves, clean-outs, damper rods, unions, access to elevator heat detector, and electrical pull boxes installed above ceilings.
2. Attic access is required in ceilings with over 36 inches of attic space.

3.02 INSPECTION

A. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to the timely and proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected to the satisfaction of the Architect.

3.03 INSTALLATION

A. Install the work of this section where shown on the drawings and in accordance with the manufacturer's recommendations, anchoring all components firmly into position with mechanical fasteners.

B. Use stainless steel fasteners at exterior locations.

C. Install blocking as required to anchor access doors on four sides.

D. Key access door locks to a master key where possible. Label keys and provide six copies of each key to the District.

E. Color-code each access door with a 1-inch diameter painted dot.

1. HVAC: Yellow
2. Fire: Red
3. Water: Blue
4. Attic Access: Black

3.04 ACCESS

A. Access doors must be located and sized sufficiently to access the space or equipment. Confirm that access doors are not blocked, open fully, and provide sufficient access to the equipment or space served.

END OF SECTION

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SECTION 08411

ALUMINUM FRAMED STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents: Conditions of the Contract, Division 1 - General Requirements, and Drawings apply to Work of this Section.

B. Section Includes:

1. Storefront systems complete with reinforcing, fasteners, anchors and attachment devices.
2. Aluminum doors.
3. Accessories necessary to complete work.

C. Related Sections:

1. Section 06100: Rough Carpentry
2. Section 07920: Joint Sealants
3. Section 08710: Door Hardware
4. Section 08800: Glass and Glazing

1.02 REFERENCES

A. Aluminum Association (AA):

1. DAF-45 Designation Systems for Aluminum Finishes.

B. American Architectural Manufacturers Association (AAMA):

1. 503.1 Test Method for Condensation Resistance of Windows, Doors and Glazed Wall Systems.
2. 605.2-92 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
3. Manual #10 Care and Handling of Architectural Aluminum from Shop to Site.
4. SFM-1 Aluminum Storefront and Entrance Manual.

C. American National Standards Institute (ANSI):

1. A117.1 Safety Standards for the Handicapped.

D. American Society for Testing and Materials (ASTM):

1. B209 Aluminum and Aluminum - Alloy Sheet and Plate.
2. B221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
3. B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
4. C509 Cellular Elastomeric Pre-formed Gasket and Sealing Material.
5. C864 Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.

6. E283 Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
7. E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
8. E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

E. Federal Specifications (FS): TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.

F. Steel Structures Painting Council (SSPC): Paint 12 Cold-Applied Asphalt Mastic (Extra Thick Film).

1.03 SYSTEM REQUIREMENTS

A. Design Requirements:

1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
2. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members. Actual sizes are to be determined by structural calculations.
3. Provide concealed fastening.
4. Provide storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
5. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
6. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
7. Provide for expansion and contraction without detriment to appearance or performance.
8. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
9. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.

B. Performance Requirements:

1. Air infiltration: Air leakage through fixed light areas of storefront shall not exceed 0.06 cfm per square foot (0.0003 m^3/sm^2) of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf (300 Pa).
2. Water infiltration: No uncontrolled water penetration when tested in accordance with ASTM E 331 at test pressure of 10.0 psf.

C. Thermal Requirements:

1. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees Fahrenheit (82 degrees Celsius) without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
2. Ensure doors function normally within limits of specified temperature range.

D. Structural Requirements, as measured in accordance with ANSI/ASTM E330:

1. Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall, when subjected to specified design pressures per CBC 2007 with minimum 20 psf, shall not exceed 1/175 of its clear span.

E. Testing Requirements: Provide components that have been previously tested by an independent testing laboratory.

1.04 SUBMITTALS

A. General: Submit in accordance with Section 01330.

B. Product Data:

1. Submit manufacturer's descriptive literature and product specifications.

2. Include information for factory finishes, hardware, accessories and other required components.

C. Engineering Calculations

1. Calculations, signed by a licensed California structural engineer, showing the proposed frames meet the system requirements in Part 1.03 above.

D. Shop Drawings:

1. Submit shop drawings covering fabrication, installation and finish of specified systems.

2. Include following:

a. Fully dimensioned plans and elevations with detail coordination keys.
b. Locations of exposed fasteners and joints.

3. Provide detailed drawings of:

a. Composite members.
b. Joint connections for framing systems and for entrance doors.
c. Anchorage.
d. System reinforcements.
e. Expansion and contraction provisions.
f. Glazing methods and accessories.
g. Internal sealant requirements as recommended by sealant manufacturer.

E. Samples:

1. Submit samples indicating quality of finish, in required colors, on alloys used for work, in sizes as standard with manufacturer.

2. Where normal texture or color variations are expected, include additional samples illustrating range of variation.

F. Test Reports:

1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of re-testing. Include other supportive data as necessary.

G. Certificates:

1. Submit manufacturer's certification stating that systems are in compliance with specified requirements.

H. Qualification Data:

1. Submit installer qualifications verifying years of experience.

2. Include list of projects having similar scope of work identified by name, location, date, reference name, and phone number.

I. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility:

1. To ensure quality of appearance and performance, obtain materials for each system from either a single manufacturer or from manufacturer approved by each system manufacturer.

B. Installer Qualifications: Certified in writing by Contractor as qualified for installation of specified systems.

C. Perform Work in accordance with AAMA SFM-1 and manufacturer's written instructions.

D. Conform to requirements of ANSI A117.1 and local amendments.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect finished surfaces as necessary to prevent damage.

B. Do not leave coating residue on any surfaces.

1.07 WARRANTY

A. Provide warranties in accordance with Section 01700.

B. Provide written manufacturer's warranty, executed by company official, warranting against defects in materials and products for 2 years from date of Substantial Completion. Warrant door corner construction for the life of the project.

C. Provide written installer's warranty, warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail two years or sooner from date of Substantial Completion.

1. Warranty shall cover following:

a. Complete watertight and airtight system installation within specified tolerances.
b. Completed installation will remain free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
c. System is structurally sound and free from distortion.
d. Glass and glazing gaskets will not break or "pop" from frames due to design wind, expansion or contraction movement.
e. Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Arcadia, or equal.

B. Substitutions: Submit under provisions of Section 01330.

C. Acceptable Entrance Doors: WS512 Series with 5 inch stiles, 5 ½ inch top rail and 10 inch bottom rail (ADA).

Heavy Duty Doors: Series 850 Durafront with mid-panel panic device.

D. Acceptable Storefront Framing Systems, Arcadia Series noted below, or equal:

Series	Face Width	Head/Sill Depth	Glazing Infill	Glazing Method	Thermal Break
AG451T	2" (50.8mm)	4 1/2" (114.3mm)	1" (25mm)	Exterior/Interior	Yes

1. Framing System: Series AG451T or as needed to meet structural requirements.

2.02 FRAMING MATERIALS AND ACCESSORIES

A. Aluminum:

1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish

B. Internal Reinforcing:

1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
2. Shapes and sizes to suit installation.
3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.

C. Anchorage Devices:

1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.

D. Fasteners:

1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
2. Do not use exposed fasteners, except where unavoidable for application of hardware.
3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
4. For concealed locations, provide manufacturer's standard fasteners.
5. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil (0.77 mm) thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

G. Glazing Gaskets:

1. Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
2. Conform to ASTM C509 or C864.
3. Profile and hardness as required to maintain uniform pressure for watertight seal.
4. Provide in manufacturer's standard black color.

H. Weather stripping:

1. Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
2. Provide EPDM or vinyl-blade gasket weather stripping in bottom door rail, adjustable for contact with threshold.

I. Internal Sealants: Types recommended by sealant manufacturer.

J. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.

K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

2.03 GLASS AND GLAZING ACCESSORIES

A. Refer to Section 08810.

2.04 DOOR HARDWARE

A. Refer to Section 08710.

2.05 FABRICATION

A. Coordination of Fabrication:

1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
2. Fabricate units to withstand loads that will be applied when system is in place.

B. General:

1. Conceal fasteners.
2. Reinforce work as necessary for performance requirements and for support to structure.
3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or pre-formed separators that will prevent contact and corrosion.
4. Comply with Section 08810 for glazing requirements.

C. Aluminum Framing:

1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
2. Fabricate frame assemblies with joints straight and tight fitting.
3. Reinforce internally with structural members as necessary to support design loads.
4. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
5. Seal horizontals and direct moisture accumulation to exterior.
6. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
7. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
8. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.
9. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.

D. Entrance Doors:

1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
2. Provide extruded aluminum glazing stops of beveled and mitered design, permanently anchored on security side and removable on opposite side.

3. Customize door to accept specified hardware.

E. Hardware:

1. Receive hardware supplied in accordance with Section 08710 and install in accordance with requirements of Section 08710.

F. Welding:

1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

G. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.06 ALUMINUM FINISH

A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 60502. Duranar XL or equal.

a. Color and Gloss: Match PPG Duranar XL coatings "Silver" #UC51131 - 3 coat system.
b. Provide for exposed surfaces as indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances and method of attachment with other Work.

3.02 INSTALLATION

A. Erection Tolerances:

1. Limit variations from plumb and level:

a. 1/8 inch (3 mm) in 10 feet (3 M) vertically.
b. 1/8 inch (3 mm) in 20 feet (6 M) horizontally.

2. Limit variations from theoretical locations: 1/4 inch (6 mm) for any member at any location.
3. Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch (2 mm) from flush surfaces not more than 2 inches (51 mm) apart or out-of-flush by more than 1/4 inch (6 mm).

B. Install doors and hardware in accordance with manufacturer's printed instructions.

C. Set units plumb, level and true to line, without warp or rack of frame.

D. Anchor securely in place, allowing for required movement, including expansion and contraction.

E. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or pre-formed separators to prevent contact and corrosion.

F. Seal perimeter members as shown on manufacturer's installation instructions or as required for unique job conditions. Set other members with internal sealants and baffles as called for in manufacturer's installation instructions. Use sealants as recommended by sealant manufacturer.

G. Coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of Section 07920.

H. Glazing: Refer to requirements of Section 08810. Utilize "anti-walk" edge blocking on all vertical edges of glazing.

3.03 ADJUSTING

A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

3.04 CLEANING

A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.

B. Clean metal surfaces exercising care to avoid damage.

END OF SECTION

SECTION 08620

UNIT SKYLIGHTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included

1. Engineering, preparation of fabrication drawings for the entire skylight system.
2. Fabrication and installation of skylight assembly.
3. Finish of skylight assembly.
4. Gasket and sealants
5. Skylight glazing

B. Related work described elsewhere:

1. Section 05500: Metal Fabrication
2. Section 06100: Rough Carpentry
3. Section 07500: Membrane Roofing
4. Section 07620 Sheet Metal Flashing and Trim

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this section as listed in Section 01035, Applicable Standards and Codes, including AAMA, ASTM: A193, A307, B209, B211, B221, B316, C719, C794, D395, D412, D1171, D2240, E283, E330, E331, E783, ANSI Z97.1-1948

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.

C. Single source: A single manufacturer shall produce all work of this section.

1.03 SYSTEM DESCRIPTION

A. A complete skylight assembly that is weather tight and air tight conforming to the performance requirements in this section.

B. Performance Requirements

1. Structural Members shall be of sufficient size to support design loads as prescribed by government building codes per drawings
2. Deflection of skylight framing members shall not exceed L/240 when subject to a uniform load deflection test in accordance with ASTM E330, and per the above specified loads.
3. Water Penetration: No water penetration shall occur when system is tested in accordance with ASTM E331. Water penetration is defined as the appearance of uncontrolled water other than condensation on the interior surface of any part of the skylight.
   a. Drain to the exterior all water entering at joints or glazing

reveals as well as all condensation occurring within unit construction.

4. Air Infiltration: Air infiltration through the skylight assembly when tested in accordance with ASTM E283 shall not exceed 0.06 cubic feet per minute per square foot of fixed area.
5. Thermal Movement: Skylight assembly shall be so designed and anchored that there will be no objectionable distortion or stresses in fastening and joinery due to expansion and contraction when subjected to temperature variance.

1.04 SUBMITTALS

A. General: Comply with provisions of Section 01330, Submittal Procedures.

B. Manufacturers' data, submit:

1. A complete materials list of all items proposed to be furnished and installed under this section.
2. Manufacturers' specifications demonstrating compliance with the specified requirements.
3. Shop drawings showing details of construction, installation, and anchorage.
4. Schedule for location of each unit.
5. Manufacturer's recommended installation procedures will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.
6. A copy of the guarantee.

1.05 PRODUCT HANDLING

A. Protection: Use all means necessary to protect materials of this section before, during, and after installation, and to protect installed work and materials of all other trades.

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

1.06 QUALITY ASSURANCE

A. The work in this section including design, engineering, fabrication and glazing and erection shall be the responsibility of the skylight manufacturer. The skylight manufacturer shall have been regularly engaged in the specialized type of work for at least 10 years and have satisfactorily completed projects of a similar scope.

1.07 WARRANTY

A. Certify that skylight system will remain free from defects in material and workmanship and remain free of leakage for a period of 10 years from the date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Contact documents are based on Bristolite Skylights, Inc. Model AL-CM-2 4669

B. Substitution will be considered under provisions of section 01250 when the following conditions have been met.

1. Products of other manufacturers must be pre-qualified to bid not less than 10 days prior to bid date.

2. Submit supporting technical data, engineering calculations, certification of equivalent experience and samples for comparison.

2.02 MATERIALS

A. Extruded aluminum framing members shall be 6063-T5, 6061-T6, or 6063-T6 per ASTM B221.

B. Flashing, trim, closures and other accessory items shall be a minimum .032" thick aluminum.

C. Glazing Gaskets: Shall be dense EPDM, 50 durometer per ASTM C-509.

D. Setting Blocks: Compatible with glass edge seals; shall conform to ASTM D2240 Type A 80 durometer.

E. Fasteners:

1. Exterior fasteners used as cap retainers shall be 300 series stainless steel per ASTM A 193 B8.

2. Framework connections shall be cadmium plated steel or as required by connection.

F. Finish: Standard color coat to following specification.

1. Organic Coatings: AAMA 603.8 and AAMA 605.2

2. Anodic Coatings:

a) AAMA 607.1 Class I Clear Anodize A41

b) Class II Clear Anodize A31

G. Glazing

1. Glazing shall be acrylic plastic consisting of (Bronze) outer dome color, and (Clear) inner dome color.

H. Sealants: Compatible with all substrates and applied in accordance with manufacturer's recommendations.

2.03 FABRICATION

A. Skylights shall be factory fabricated and preassembled in largest size assemblies consistent with economic considerations for shipping to and handling at the job site.

B. All cap retainers shall be attached using stainless steel fasteners. These fasteners shall be designed and located such that all glazing strips are compressed to provide a uniform compression seal. Fasteners shall be located at 12" O.C. or less.

C. All welding shall be by the heliarc process. All exposed welds to be dressed where practical.

E. Waterproofing shall not be reliant on additional continuous exterior silicone sealant beads. Horizontal flush butt joints may rely on a continuous silicone seal.

F. Silicone or neoprene setting blocks shall be used for the support of the glazing and shall be sized and located in accordance with the glass manufacturer's recommendations.

G. Skylights shall have a properly designed weep system for drainage to the exterior without excessive air infiltration.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to beginning work of this section, an authorized representative shall examine the associated support structure to determine that it is properly prepared and ready to receive the skylight work included herein. No installation shall proceed until any discrepancies have been resolved.

3.02 PREPARATION

A. Aluminum surfaces in contact with masonry, concrete or dissimilar materials if not organically coated shall be given a heavy coat of zinc chromate or bituminous paint.

3.03 INSTALLATION

A. Installer shall comply with manufacturer recommendations and generally accepted practices.
B. Install skylights plumb, true without warping or racking of panels.
C. Anchor system in strict accordance with approved shop drawings.
D. During erection, provide for thermal movement with a minimum ambient air temperature shift of 100° Fahrenheit without creating undue stresses.

3.04 FIELD QUALITY CONTROL

A. Water Penetration: Field test in accordance with AAMA 501.3, at an air pressure difference equal to 20% of the positive design wind pressure with a minimum of 6.24 psf and a maximum of 12 psf . There shall be no uncontrolled water penetration as defined in AAMA 501.3 at this pressure difference.

3.05 CLEANING AND PROTECTION

A. Glazing panels shall be left in scratch free condition inside and out.
B. Remove all debris created by this work

END OF SECTION

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Door Hardware.
2. Storefront and entrance door hardware.
3. Gate Hardware as noted.

B. Related Sections:

1. Section 07920 - Joint Sealers – exterior thresholds
2. Section 08100 - Metal Doors and Frames
3. Section 08411 – Aluminum Framed Store Fronts

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Access doors and panels, except cylinders where detailed.
8. Metal gates and supports except as noted.

1.2 REFERENCES:

Use date of standard in effect as of Bid date.

A. American National Standards Institute – ANSI 156.18 – Materials and Finishes.

B. ICC/ANSI A117.1 - 1998 – Specifications for making buildings and facilities accessible.

C. ADA – Per CBC.

D. BHMA – Builders Hardware Manufacturers Association

E. DHI – Door and Hardware Institute

F. NFPA – National Fire Protection Association

1. NFPA 80 – Fire Doors and Windows
2. NFPA 105 – Smoke and Draft Control Door Assemblies
3. NFPA 252 – Fire Tests of Door Assemblies

G. UL – Underwriters Laboratories

1. UL10C – Positive Pressure Fire Tests of Door Assemblies.
2. UL 305 – Panic Hardware

H. WHI – Warnock Hersey Incorporated State of California Building Code

I. Local applicable codes

J. SDI – Steel Door Institute

K. WI – Woodwork Institute

L. AWI – Architectural Woodwork Institute

M. NAAMM – National Association of Architectural Metal Manufacturers

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Section 01330. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Type, style, function, size, quantity and finish of hardware items.
2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Location of hardware set coordinated with floor plans and door schedule.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, materials and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Manufacturer's technical data and installation instructions.

B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

C. Deviations: Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

F. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

a) Hardware supplier shall be responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C / California State Fire Marshal Standard 12-7-4 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Note: scheduled resilient seals may exceed selected door manufacturer's requirements.

F. See 2.6.E for added information regarding resilient and intumescent seals.

G. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions.

H. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to commencement of related work.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Delivery: coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores: secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.6 PROJECT CONDITIONS AND COORDINATION:

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:

1. Location of embedded and attached items to concrete.

2. Location of wall-mounted hardware, including wall stops.

3. Location of finish floor materials and floor-mounted hardware.

4. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.

5. Manufacturer templates to door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

1.7 WARRANTY:

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties:

1.	Locksets:	Three years
2.	Exit Devices:	Three years mechanical
3.	Closers:	Ten years mechanical
4.	Hinges:	One year
5.	Other Hardware	Two years

1.8 COMMISSIONING:

A. Conduct these tests prior to request for certificate of substantial completion:

1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.

2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.

3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

1.9 REGULATORY REQUIREMENTS:

A. Locate latching hardware between 30" to 44" above the finished floor, per California Building Code, Section 1133B.2.5.2.

1. Locate panic hardware between 36" to 44" above the finished floor.

B. Adjust doors to open with not more than 5.0 lbs pressure to open at exterior doors and 5.0 lbs at interior doors. As allowed per California Building Code, Section 1133B.2.5, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15 lbs.

C. Adjust door closer sweep periods so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door, per California Building Code Section 1133B.2.5.1

D. Meet California Building Code Sections 1133B.2.1, 1133B.2.5.1 and 1003.3.1.8l.

E. Thresholds: Comply with California Building Code Section 1133B.2.4.1.

F. Floor stops: Do not locate in path of travel. Locate no more than 4" from walls, per DSA Policy #99008 (Access).

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE SUB:
Hinges	(IVE) Ives	Bommer
Continuous Hinges	(IVE) Ives	Pemko
Key System	(BES) Best	District Standard
Locks	(BES) Best	District Standard
Exit Devices	(VON) Von Duprin	District Standard
Closers	(LCN) LCN	District Standard
Flush Bolts	(IVE) Ives	DCI
Coordinators	(IVE) Ives	DCI
Silencers	(IVE) Ives	Rockwood
Kickplates	(IVE) Ives	Rockwood
Stops	(IVE) Ives	Rockwood
Thresholds	(NGP) NGP	Zero
Seals & Bottoms	(NGP) NGP	Zero

2.2 HINGING METHODS:

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

C. Conventional Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.

2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. Continuous Hinges:

1. Geared-type aluminum.

    a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Mortise Locksets and Latchsets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
2. Latchbolts: 3/4 inch throw stainless steel anti-friction type.
3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.

    a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.

4. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
5. Thumbturns: accessible design not requiring pinching or twisting motions to operate.
6. Deadbolts: stainless steel 1-inch throw.
7. Electric operation: Manufacturer-installed continuous duty solenoid.
8. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
9. Scheduled Lock Series and Design: BEST 45series, 15H design.
10. Certifications:

    a) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.

    b) ANSI/ASTM F476-84 Grade 31 UL Listed.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. 0.75-inch throw deadlocking latchbolts.
4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Releasable in normal operation with 15-lb. maximum operating force per California State Fire Marshal Standard 12-10-3, and with 32 lb. maximum pressure under 250-lb. load to the door.

8. Exterior doors scheduled with XP-series devices: Static load force resistance of at least 2000 pounds.

9. Where devices span over door lite frame and the face of the selected lite manufacturer's frame is raised from the face of the door, furnish panic hardware manufacturer's fitted shims or glass-bead kits at no additional cost to the project.

10. Comply with CBC Section 1003.3.1.9.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.

2. Lever Trim: breakaway type, forged brass or bronze escutcheon min .130" thickness, compression spring drive, match lockset lever design.

3. Rod and latch guards with sloped full-width kickplates for doors fitted with surface vertical rod devices with bottom latches.

4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.

2.5 CLOSERS

A. Surface Closers:

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.

2. ISO 2000 certified. Units stamped with date-of-manufacture code.

3. Independent lab-tested 10,000,000 cycles.

4. Non-sized and adjustable. Place closers inside building, stairs and rooms.

5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.

6. Advanced Variable Backcheck (AVB): where scheduled, these units commence backcheck at approximately 45 degrees.

7. Adjustable to open with not more than 5.0lbs pressure to open at exterior doors and 5.0lbs at interior doors.

8. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.

9. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units. EDA arms: rigid main and forearm, reinforced elbow.

10. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.

11. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.

12. Non-flaming fluid, will not fuel door or floor covering fires.

13. Pressure Relief Valves (PRV) not permitted.

2.6 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design.

B. Overhead Stops: Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.

2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg deadstop. Note degree of opening in submittal.

E. Seals: Finished to match adjacent frame color. Resilient seal material: polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Do not furnish vinyl seal material. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability.

1. Proposed substitutions: submit for approval.

2. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.

3. Non-corroding fasteners at in-swinging exterior doors.

4. Sound control openings: Use components tested as a system using nationally accepted standards by independent laboratories. Ensure that the door leafs have the necessary sealed-in-place STC ratings. Fasten applied seals over bead of sealant.

5. Fire-rated Doors, Resilient Seals: UL10C / UBC Standard 7-2 compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive-mounted resilient seal, furnish rigid housed seal at minimum, or both the rigid housed seal plus the adhesive applied seal. Adhesive applied seals alone are deemed insufficient for this project where rigid housed seals are scheduled.

6. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C / UBC Standard 7-2. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required

F. Automatic door bottoms: low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.

G. Thresholds: As scheduled and per details. Comply with CBC Section 1133B.2.4.1.

1. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).

2. Acoustic openings: Set units in full bed of acoustic sealant, leave no air space between threshold and substrate.

3. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.

4. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

H. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

2.7 FINISH:

A. Generally BHMA 626 Satin Chromium.

1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

2.8 KEYING REQUIREMENTS:

A. Key System: Best existing interchangeable core. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner to determine system structure and keybow styles, furnish Owner's written approval of the system..

B. Keys

1. Construction keying: furnish keyed-alike temporary cores plus 10 operating keys. Temporary cores and keys remain property of hardware supplier.

C. Interchangeable Cores: 7-pin solid brass construction.

D. Permanent cores: furnish factory-keyed.

1. Locksets and cylinders same manufacturer.

E. Permanent keys and cores: use secured shipment direct from point of origination to Owner.

1. For estimate: 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.

F. Bitting List: use secured shipment direct from point of origination to Owner upon completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

A. Can read and understand manufacturers' templates, suppliers' hardware schedules and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.2 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of code conflicts before ordering material.

2. Locate levers, key cylinders, t-turn pieces, touchbars and other operable portions of latching hardware between 30 inches to 44 inches above the finished floor, per CBC Section 1133B.2.5.1.

3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops: before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.3 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.

3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.

4. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more that 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

D. Locate overhead stops for minimum 90 degrees and maximum allowable degree of swing.

E. Drill pilot holes for fasteners in wood doors and/or frames.

F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4. ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner's satisfaction.

2. Adjust doors to fully latch with no more than 1 pound of pressure.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.

4. Adjust door closers per 1.9 this section.

B. Inspection: Use hardware supplier's consultant or consultant's agent. Include supplier's report with closeout documents.

C. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:

1. Re-adjust hardware.

2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.

3. Identify items that have deteriorated or failed.

4. Submit written report identifying problems

3.5 DEMONSTRATION:

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING:

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule at the end of this section for hardware set assignments.

SPECWORKS # 84708-B7413H800
HW SET: 01

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	XP98NL-OP	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	DOOR PULL	VR910NL	630	IVE
1	EA	SURFACE CLOSER	4111 DEL EDA	689	LCN
1	EA	MOUNTING PLATE	4110-18	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS441	626	IVE
1	EA	DOOR BOTTOM	320N	AL	NGP
1	EA	THRESHOLD	813 MS/LA	AL	NGP
1			WEATHERSTRIPPING BY STOREFRONT SUPPLIER		

HW SET: 02

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	XP98NL-OP	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	DOOR PULL	VR910NL	630	IVE
1	EA	SURFACE CLOSER	4111 DEL EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS441	626	IVE
1	SET	SEALS	155S	AL	NGP
1	EA	DOOR BOTTOM	320N	AL	NGP
1	EA	THRESHOLD	813 MS/LA	AL	NGP

HW SET: 03

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	CLASSROOM-HB LOCK	45H7XRHB 15H	626	BES
1	EA	DOOR PULL	VR900LLP	630	IVE
1	EA	SURFACE CLOSER	4011 DEL	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	SET	SEALS	155S	AL	NGP
1	EA	DOOR BOTTOM	320N	AL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP
1			SIGNS AND GRAPHICS BY OTHERS		

HW SET: 04

6	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB257N	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	45H7D 15H X L/OS TRIM	626	BES
1	EA	DOOR PULL	VR900LLP	630	IVE
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	ASTRAGAL	139SP	600	NGP
2	EA	SURFACE CLOSER	4011 DEL H	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	DOME STOP	FS436	626	IVE
1	SET	SEALS	155S	AL	NGP
2	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	813 MS/LA	AL	NGP

HW SET: 05

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	45H7D 15H	626	BES
1	EA	SURFACE CLOSER	4111 DEL SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	155S	AL	NGP
1	EA	DOOR BOTTOM	320N	AL	NGP

HW SET: 06

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	COMMUNICATING LOCK	45H7G 15H	626	BES
1	EA	SURFACE CLOSER	4011 DEL H	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436	626	IVE
1	SET	SEALS	155S	AL	NGP
1	EA	DOOR BOTTOM	320N	AL	NGP

HW SET: 07

1	EA	PANIC HARDWARE	XP98L 996L	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
			BALANCE OF HARDWARE BY GATE SUPPLIER		

END OF SECTION

(DOOR SCHEDULE FOLLOWS)

Door Schedule

MARK	DOOR NO	HWSET	MODE	WIDTH	HEIGHT	THICK	DOOR	FRAME	RATING	OUTSIDELOCATION	INSIDELOCATION
100A	100A	01	SGL	3'0"	7'0"	1-3/4"	A/G	STF	NON-RTD	EXTERIOR	FITNESS CTR
100B	100B	01	SGL	3'0"	7'0"	1-3/4"	A/G	STF	NON-RTD	EXTERIOR	FITNESS CTR
101A	101A	02	SGL	3'0"	7'0"	1-3/4"	HMD	HMF	NON-RTD	EXTERIOR	CLASSROOM
102A	102A	03	SGL	3'0"	7'0"	1-3/4"	HMD	HMF	NON-RTD	EXTERIOR	WOMENS
103A	103A	03	SGL	3'0"	7'0"	1-3/4"	HMD	HMF	NON-RTD	EXTERIOR	MENS
104A	104A	04	PR	6'0"	7'0"	1-3/4"	HMD	HMF	NON-RTD	EXTERIOR	STORAGE
105A	105A	05	SGL	3'0"	7'0"	1-3/4"	HMD	HMF	NON-RTD	STORAGE	ELECTRICAL
106A	106A	02	SGL	3'0"	7'0"	1-3/4"	HMD	HMF	NON-RTD	EXTERIOR	CLASSROOM
106B	106B	06	SGL	3'0"	7'0"	1-3/4"	HMD	HMF	NON-RTD	CLASSROOM	CLASSROOM
GATE	GATE	07	SGL				GATE	UNK	NON-RTD	EXTERIOR	PARKING

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SECTION 08800

GLAZING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Exterior and interior glass and glazing, including, but not limited to:

1. Glass in doors, transoms and sidelights.
2. Glass in exterior windows.

B. Related work described elsewhere:

1. Section 06100: Rough Carpentry
2. Section 07920: Joint Sealant
3. Section 08100: Hollow Metal Doors and Frames
4. Section 08411: Aluminum Framed Storefronts
5. Section 09900: Painting

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this section and as listed in Section 01035 - Applicable Standards and Codes, as follows.

1. Flat Glass Marketing Association (FGMA): Glazing Manual.
2. Federal Specifications: DDLG-451 and DD-G-1403.
3. American National Standard Institute (ANSI Z97.1-1984) Reaffirmed 1994
4. Code of Federal Regulations: 16 CFR 1201 (1-1-97 Edition)
5. National Fire Protection Association (NFPA: 80-95).

B. Qualifications of Installers: Use adequate numbers of skilled workers who are trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed for proper performance of the work.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01330, Submittal Procedures.

B. Product data, submit:

1. A complete materials list showing all items proposed to be furnished and installed under this section.
2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.
3. Shop drawings of glazing details.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacements in the event of damage immediately make all repairs and replacements necessary.

PART 2 - MATERIALS

2.01 GLASS

A. Glass and glazing material shall comply with CBC 2007 section 704A.

B. Glass types: Refer to Drawings for location. All glazing shall be tempered.

1. Reflective Low Emissivity Insulating Glass (Low E Glass): Pre-assembled sealed lite units with dehydrated space between glass units, complying with ASTM E774 for Class CBA units. Provide units with thin metallic high-transmittance coating applied to the number 3 surface of the unit, unless otherwise indicated. The U-value for the IGU shall be no greater than 0.27, unless otherwise indicated. Design for 1-inch insulating glass, two layers of ¼-inch glass, shall be Solarban 60 (3) Gray or approved equal.

2.02 OTHER MATERIALS

A. Metal stops: Metal angle stops, applied with screws.

2.03 GLAZING COMPOUNDS AND SEALANTS

A. General: Use glazing compounds and pre-formed glazing sealant approved for the application and, except as otherwise specified, conforming to the Glazing Materials portion of the FGMA Glazing Manual.

B. Use of metal sash putty will not be permitted. The use of non-skinning compounds, non-resilient-type pre-formed sealers, and pre-formed impregnated-type gaskets will not be permitted.

2.04 GLAZING ACCESSORIES

A. Provide glazing accessories required to supplement those accessories that accompany the items to be glazed and as needed to provide a complete installation including glazing points, clips, shims, angles, beads, setting blocks, neoprene channel, and spacer strips. Use ferrous metal that will be exposed in the finished work and that has a finish that will not corrode or stain while in service.

2.05 PROTECTIVE FILM

A. Mylar film, 6 mil, GraffitiGard, by MSC Specialties, Inc. Distributed by Solar Gard International. Phone 1-888-306-7998 x14, or equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Glass setting:

1. Items to be glazed shall be field-glazed with glass of the quality and thickness specified and required by code.

2. Prepare surrounds and glass, unless otherwise directed, in conformance with the details and general conditions governing glazing in the FGMA Glazing Manual and SIGMA.

3.03 PROTECTIVE FILM

A. Install protective film per manufacturer's recommendations.

B. Remove and replace film that is damaged or blistered prior to project completion.

C. After installation, apply a taped "X" over all windowpanes, excluding doors.

3.04 CLEANING

A. Prior to acceptance of the work, thoroughly clean both side of glass and remove tape, labels, paint spots, putty, and other defacements.

3.05 SPARE MATERIAL

A. Provide 200 square feet of unused protective film.

END OF SECTION

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SECTION 09220

PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Metal, lath, and accessories and exterior cement plaster (stucco) on metal stud walls and soffits as shown and called for on the Drawings.

B. Related work described elsewhere:

1. Section 05120: Structural Steel
2. Section 05500: Metal Fabrications
3. Section 06100: Rough Carpentry
4. Section 07620: Sheet Metal Flashing and Trim
5. Section 07920: Joint Sealants
6. Section 08100: Hollow Metal Doors and Frames
7. Section 08305: Access Doors
8. Section 09250: Gypsum Wall and Ceiling Board
9. Section 09900: Painting

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this section, as listed in Section 01400, and below.

1. Plaster and Drywall Systems Manual, Gorman/Jaffe/Pruter and Rose, Third Edition.
2. Portland cement plastering standards: ASTM C926 and C1063.
3. Allowable tolerances: For flat surfaces, do not exceed 1/8 inch in. 8 feet for bow or warp of surface and for plumb or level.
4. Single-source responsibility: Obtain cement plaster from a single manufacturer

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01330. For each kind of plaster aggregate indicated, submit producer's certificate evidencing that materials comply with requirements.

B. Submit manufacturer's product specifications and installation instructions for each material, including other data as may be required to show compliance with these specifications.

C. Submit 6-inch by 6-inch samples of finish coat color and texture for Architect's review. More than one set of samples may be required.

D. Before starting the work install a 4-foot wide by 8-foot high sample. No Work shall commence until the sample panel is reviewed. Finish plaster surfaces shall match sample.

E. Submit shop drawing of all elevations showing all expansion and control joints for review and acceptance prior to installation.

1.04 PRODUCT HANDLING:

A. Deliver, store, and protect materials to comply with referenced standards.

1.05 JOB CONDITIONS

A. Environmental conditions: Comply with referenced standards and recommendations of plaster manufacturer for environmental conditions before, during, and after application of plaster.

B. Cold weather protection: When ambient outdoor temperatures are below 55°F, maintain continuous uniform temperature of not less than 55°F and not more than 70°F for not less than one week prior to beginning plaster application, during its application, and until plaster is dry, but for not less than one week after application is complete. Distribute heat evenly; prevent concentrated or uneven heat from contacting plaster near heat source.

C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for hydration of plaster. Begin ventilation immediately after plaster is applied and continue until it sets.

D. Protect contiguous work from soiling, spattering, moisture, deterioration, and other harmful effects that might result from plastering.

PART 2 - PRODUCTS

2.01 LATHING AND ACCESSORY MATERIALS

A. General: Lath and plaster materials and their applications shall be in accordance with the "Lath and Plastering Reference Specifications" of the California Lath and Plastering Contractors Association, latest edition.

1. Exterior Metal Lath for both Vertical and Horizontal Conditions: Lath shall be self-furring 3.4-pound expanded metal lath. Paper shall be class B (minimum). Two layers of paper are required over metal stud framing.

2. Provide strip lath at all areas requiring additional reinforcement.

B. Accessories: Galvanized metal unless noted otherwise. Moldings shall be 26-gage, installed in ten-foot lengths wherever possible. Molding shall be a standard product as specified, meeting ASTM A525-81 and A527-80.

1. Acceptable Manufacturers:

a. Amico Metal Lath and Accessories, Fontana, CA 800/962-0100

b. Fry Reglet Corporation (aluminum moldings and trim), Alhambra, CA 800/237-9773

c. Keene Products from Metalex (The Koller Group), Libertyville, IL 800/323-0792

d. Niles Building Products Company Niles, OH 800/323-3329

e. Unimast Incorporated Schiller Park, IL 800/323-0746

2. Square-edged casing beads: Manufacturer's Type SSS, with expanded or short flange, to suit application, or as indicated on drawings.

3. Strip reinforcement: Smooth edge strips of expanded-metal lath.

a. Corners: Strips pre-bent lengthwise in center for internal plaster angles but otherwise reinforced by metal lath lapped or carried around.

b. Strips: Flat strips for reinforcing joints.

c. Provide strip-lath "butterfly" details at all opening corners, and other areas that require reinforcement as recommended by the manufacturer. Standard detail shall be an additional 12-16-inches long x 9 -12-inches wide layer of metal lath, applied

at a 45-degree angle to the horizontal and perpendicular to the corner axis, with nailing at 4 corners

3. Control joints: Prefabricated of galvanized metal, Type SSP.

4. Expansion joints: Prefabricated of galvanized metal, 2- piece type.

5. Weep screeds: Prefabricated of galvanized metal, Type SWS with 4-inch vertical flange.

C. Fasteners: Galvanized steel, of type and length as recommended by the lath and accessory manufacturer.

1. Nails, Screws and Staples: For attaching lath, shall be of type, minimum size and maximum spacing required by applicable building code. Special clips shall be as recommended by manufacturer of lath.

2.02 PORTLAND-CEMENT PLASTER MATERIALS

A. Provide either neat or ready-mixed (where applicable) materials, at Contractor's option, complying with ASTM C926 and CLPCA.

B. Cement: Portland cement, ASTM C150, Type I or II, low alkali.

C. Lime: Special finish hydrated lime, Type S conforming to ASTM-C-206-49 or ASA K67.12-1960 for cement plaster.

D. Aggregate: Sand ASTM C897.

E. Exterior Stucco Finish Coat:

1. Finish and texture shall be 20/30 Medium Sand Float Finish.

2. Finish coat shall conform to the minimum requirements of A.C.I. Tentative Specifications for Finish Coat Portland Cement Stucco, C3-C029T.

3. Color shall be integral and selected from the manufacturer's standard color chart.

a) Integral – colored plaster shall also be painted.

F. Water: Fresh, clean and potable, and free from such amounts of mineral and organic substances as would adversely affect the hardening of cement mortar.

G. Waterproofing Admixture: "Berylex" as manufactured by Berylex Western of Oakland, California, A.C. Horn's "Hydratite", Sonneborn's Hydrocide Powder", or equal. Waterproofing admixture shall be added to all exterior and interior cement plaster scratch and brown coats in amounts recommended by the manufacturer.

H. Portland-cement plaster, mixes and compositions:

1. General: Comply with ASTM C926 for Portland-cement plaster base and finish coat mixes as applicable to plaster bases, materials, and other requirements indicated.

2. Portland-cement plaster base coat mixes and compositions: Proportion materials for respective base coats in parts by volume for cementitious materials and in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.

3. Three-coat work over steel stud walls and with metal lath: Base coats as indicated below:

a. Scratch coat: 1 part Portland cement, 0-3/4 parts lime, 2-1/2 to 4 parts sand.

b. Brown coat: 1 part Portland cement, 0-3/4 parts lime, 3 to 5 parts sand.

c. Finish color coat.

2. Two coat over concrete walls:

a. Bonding agent as recommended by manufacturer.

b. Brown coat: 1 part Portland cement, 0-3/4 parts lime, 3 to 5 parts sand.

c. Finish color coat.

PART 3 - EXECUTION

3.01 PREPARATION AND INSPECTION

A. Before applying lath, Contractor and manufacturer's representative shall inspect all surfaces to receive lath and assure himself that they are in satisfactory condition. Backing and blocking and perimeter framing for recessed items shall be in place as required by the other trades. All conduits, piping and any other required roughing in shall be complete. Commencing of lath Work will imply acceptance by the Contractor of the surfaces to receive lath.

B. Upon completion of lath Work, Contractor shall call for an inspection. No plastering shall be started until the manufacturer's representative and DSA Inspector have accepted the surfaces.

3.02 LATH AND ACCESSORIES

A. Expanded Metal Lath:

1. Portland-cement plaster lath and furring installation: Install lath and furring materials indicated to comply with ASTM C 1063, with joints between panels as indicated on the drawings and as required.

2. Provide fasteners compatible with metal studs.

3. Do not continue lath across expansion joints.

B. Accessories: Install plaster grounds, casing beads or stops, base screeds, corner reinforcement, special stops and other metal accessories. Apply and shim out to required thickness. Set plumb, level and straight, free of kinks and bends. Install casing beads or stops at the edges of all plaster continuously. Provide expansion joints or control joints where shown or required.

1. Anchor each accessories flange 8-inches on center to plaster base. Use full length stamp lath reinforcing at each flange.

2. Miter or cope accessory corners and install with tight joints, accurately aligned.

3. Set accessories plumb, level, and true to line, with a tolerance of 1/8-inch in 10-feet.

4. Install corner beads at external corners and weep screeds at bottom of walls and as indicated on the drawings.

5. Install casing beads at terminations of plasterwork, except where special screeds, bases or frames act as casing beads.

6. Install expansion joints every 30 feet or 900 square feet. Cut lath at expansion joints and attach ends to double stud.

7. Install additional control joints where plaster area exceeds 100 square feet, or ten feet in a single dimension.

8. Install control joints at corners and other places likely to crack. Identify locations of additional joints and review with the architect before proceeding.

C. Requirements: Where plaster stops, angles, and wall panels are employed for architectural treatment, panels framed by these accessories or other construction shall be finished in one operation. No stopping vertically or horizontally in the middle or intermediate area of a panel will be permitted. There shall be no visible junction marks in finish coat where one day's work adjoins another.

3.03 INSTALLATION OF EXTERIOR CEMENT PLASTER

A. Cement Plaster: General Requirements:

1. Mechanically mix plaster materials at project site; do not hand-mix except where small amounts are needed using less than one bag of plaster.

2. Sequence the plaster installation properly with the installation and protection of other work so that neither will be damaged by the installation of the other.

3. Unless otherwise shown, plaster flush with frames and other built-in items or accessories that act as a plaster ground. Where casing beads does not terminate plaster, cut base coat free before plaster sets and groove finish coat at the junctures as required.

4. Grout hollow metal frames occurring in plastered areas with base-coat plaster material prior to lath installation. Grout 6-inch lengths at each anchorage.

5. Apply 7/8-inch thickness of plaster over lath.

6. Cure plaster by maintaining each coat in a moist condition for 2 days following installation; keep enclosed and fog-spray (after initial set) as required to prevent dry-out. Take special care in curing of cement plaster and stucco work. Moist-cure Portland-cement plaster base and finish coats to comply with ASTM C 926, including recommendations for time between coasts and curing in "Annex A2 Design Considerations". Do not install plaster during "Santa Ana" wind conditions or other similar adverse wind conditions.

3.04 CUTTING AND PATCHING

A. Cutting and Patching: Do all cutting and patching of plaster as is necessary or required by the Work of other trades. Plaster containing cracks, pits, checks or discoloration will not be acceptable. Such plaster shall be removed and replaced with plaster conforming to the requirements of this section. Patching of defective work will be permitted only when approved, and patching shall match existing work in texture and color. Finish work shall be left with angles and lines clean and sharp and surfaces clean and smooth, ready to receive paint.

B. Cracks over 1/32 inch wide must be repaired.

C. Excessive cracking, one crack of any length per 100 square feet, must be repaired.

3.05 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from all surrounding surfaces that are not to be plastered. Repair floors, walls and other surfaces that have been stained, marred or otherwise damaged or marked during the plastering work. When plastering work is completed, remove unused materials, containers and equipment, and clean floors of plaster and debris.

B. Contractor shall protect the plaster from deterioration and damage during the remainder of the construction period.

END OF SECTION

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SECTION 09250 - GYPSUM WALL AND CEILING BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:
   1. Gypsum board panels and application.
   2. Taped and sanded joint treatment.

B. Related Sections
   1. Section 09900 – Painting and Coatings
   2. Section 07410 - Manufactured Sheet Metal Panels

1.02 REFERENCES

A. ASTM C1396 - Gypsum Wallboard.

B. ASTM C475 - Joint Compound and Joint Tape for Finishing Gypsum Board.

C. ASTM C840 - Application and Finishing of Gypsum Board.

D. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.

E. UL - Underwriters Laboratories, Inc., Fire Resistance Directory, Volume 1, Latest Edition.

F. GA-201 - Gypsum Board for Walls and Ceilings.

G. GA-214 - Levels of Gypsum Board Finish.

H. GA-216 - Application and Finishing of Gypsum Board.

I. GA-600 - Fire Resistance Design Manual.

J. Chapter 7, 2007 California Building Code.

K. Chapter 25, 2007 California Building Code.

L. Chapter 19A, 2007 California Building Code.

M. DSA, Interpretation of Regulations Document IR 25-3, August 21, 2005, Drywall Ceiling Suspension Conventional Construction-One Layer.

1.03 SUBMITTALS

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

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

C. Samples: For following products:
   1. Trim Accessories: Full-size sample in 12-inch- long length for each trim accessory indicated.
   2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in gypsum board systems work with three years experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products of following manufacturers form basis for design and quality intended.
   1. Certainteed, Valley Forge, PA
   2. USG
   3. Fry Reglet Co., Alhambra, CA

B. Or equal as approved in accordance with Division 01, General Requirements for Substitutions.

2.02 MATERIALS

A. Taping, Bedding and Finishing Compound: ASTM C475; compatible with tape and substrate.
   1. USG SHEETROCK Ready-mixed Joint Compound, non-asbestos, vinyl base.
   2. USG SHEETROCK Powder Joint Compound, non-asbestos vinyl base, conventionally drying.
   3. USG SHEETROCK Setting-type Joint Compound, chemical hardening.

4. USG SHEETROCK Joint Tape, cross fibered paper, PERMA - TITE TAPE, by Perma Glass Mesh Inc., Dover, OH.
5. Or equal as approved in accordance with Division 01, General Requirements for substitutions.

B. Accessories: Corrosive Protective-Coated steel.
1. Corner Bead: USG No. 103 for joint compounds.
2. U-Trims: USG No. 200A for joint compound.
3. J-Trim Casings: USG No. 402, no finishing compound.
4. Control Joint: USG Control Joint No. 093.

C. Fasteners: ASTM C1002 Phillips head, power-driven, nails not permitted.
1. Type W, wood construction, minimum penetration 5/8 inch.
2. Type G, gypsum board to gypsum board, minimum penetration 1/2 inch.

D. Waterproofing Membrane: ASTM D4601, Type I asphalt saturated glass felt.

E. Reveal Moldings: Extruded aluminum moldings as detailed and as manufactured by Fry Reglet Co., Alhambra, CA, or equal as approved in accordance with Division 01, General Requirements for substitutions. All intersections shall be factory fabricated with joints heliarc welded and backs sealed with permanent waterproof tape. Furnish with 6 inch legs to join with straight sections. Provide connector clips at butt joints of straight sections and end caps at terminations. Color as selected by Architect.

2.03 INTERIOR BOARD MATERIALS

A. Paperless Gypsum Board: ASTM C1396; 5/8 inch thick, maximum permissible length; ends square cut, tapered round edges, Certainteed ProRoc TAPERED GYPSUM PANELS from plants in either Toronto, ON, Moundsville, WV, and Carrollton, KY. Or equal. Gypsum board must have enough recycled content to qualify to be an Environmentally Preferred Product.

B. Fire-rated Gypsum Board: ASTM C1396; Type X, fire resistive type, UL rated; 5/8 inch thick, maximum permissible length; ends square cut, tapered round edges, Certainteed ProRoc, type 'X' TAPERED GYPSUM PANELS from plants in either Toronto, ON, Moundsville, WV, and Carrollton, KY. Or equal. Gypsum board must have enough recycled content to qualify to be an Environmentally Preferred Product.

C. Ceiling Gypsum Board: ASTM C1396; sag resistant, ½" thick, maximum permissible length; ends square cut, tapered edges, Certainteed ProRoc Interior Ceiling Gypsum Board. Gypsum board must have enough recycled content to qualify to be an Environmentally Preferred Product.

D. High-Impact Type: ASTM E84, E119, D5420, D4977; high impact; 5/8" thick, maximum permissible length; ends square cut, tapered edges, USG Fiberock Panels VHI Abuse-resistant. Gypsum board must have enough recycled content to qualify to be an Environmentally Preferred Product.

2.04 EXTERIOR BOARD MATERIALS

A. Exterior Sheathing: ASTM C1177/C1177M; ½" thick, maximum permissible length; ends square cut, square edges, USG Securock Glass-Mat Sheathing Panels. Gypsum Board must have enough recycled content to qualify to be an Environmentally Preferred Product.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that site conditions are ready to receive Work.

B. Beginning of installation means acceptance of substrate.

C. Delivery and Storage: Arrange for an adequate supply of materials on the jobsite so that progress of Work will be uninterrupted. Materials and accessories shall be delivered in original containers and bundles, and identified with the manufacturer's name and brand. Store gypsum board on flat, solid supports in dry areas, well protected from the elements.

D. Provide fixtures, anchors, sleeves, inserts and miscellaneous items, and provide openings and chases as necessary. Prior to closing in and finishing of dry wall Work, ascertain that piping, conduit, ductwork and fixtures which are to be concealed and which penetrate gypsum boards are in place, tested and approved.

E. Scaffolding: Construct, erect and maintain in conformance with applicable laws and ordinances.

F. Protection, Patching and Cleaning: Adjacent surfaces of other materials shall be protected from damage. Dry wall surfaces that have been cut out shall be neatly patched. Damaged or defective gypsum board finish shall be replaced. During progress of Work, rubbish droppings and water materials shall be removed.

G. Fire Protection: Where required, the Work shall comply with the requirements for the protection rating indicated in the governing building code.

H. Fire Sprinkler System: In areas where sprinkler heads occur, exercise care when installing drywall work. Do not damage or obstruct the heads in any way.

3.02 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with ASTM C840, GA 201, GA 216 and Section 2508 California Building Code. Conform to DSA, IR 25-3.

B. Erect single layer gypsum board vertically or horizontal on vertical framing, attached to studs and framing members with the specified fasteners spaced at 8 inches on centers at top and bottom and 12 inches on centers in the field. Solid backing not required at joints running perpendicular to studs and framing members.
   1. In wood framing construction erect gypsum board panels horizontally only.

C. Erect single or double layer fire-rated gypsum board panels in accordance with Table 720.1(2), 2007 California Building Code, Note (o) and GA-600, for one-hour or two hour, fire-rated, non-bearing partitions, steel or wood stud construction.

1. Gypsum board panels installed vertically or horizontally to vertical studs or framing shall be attached at 8 inches on centers at vertical edges and 12 inches on centers in field and at top and bottom. Stagger vertical and horizontal joints 24 inches on centers each side and opposite sides. Where joints are not staggered required minimum 24 inches, solid backing shall be provided. All joints shall be treated except as provided herein.

D. Place control joints consistent with lines of building spaces as indicated or at maximum of 30 ft on centers.

E. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

F. Seal all cutout and penetrations: For electrical, mechanical, plumbing and structural framing cutouts and penetration at interior surfaces. Per Section 07 92 00 for non-rated wall and fire-rated sealant for rated walls per section 07 84 00.

G. Foil-backed gypsum board shall be applied on the inside of exterior walls.

H. Install reveal moldings according to manufacturer's recommendations.

3.03 JOINT TREATMENT

A. Exposed gypsum board in wall areas and ceiling areas shall be cemented, taped and sanded, ready for paint.

B. On installations where two layers of gypsum board are required, only the face layer will require finishing of joints and screwheads.

C. Gypsum wallboard joints in walls may either be exposed or covered with joint tape and joint compound for the portion of the wall above a suspended ceiling, which is part of a fire resistive floor-ceiling or roof-ceiling assembly, as listed in U.L. Fire Resistive Ratings (BXUV), when the following conditions are met:
   1. Vertical joints occur over framing members.
   2. Horizontal joints are staggered 24 inches on opposite sides or covered with 6 inch wide strips of gypsum board attached with 1-1/2 inch laminating screws at 8 inches on centers.
   3. Partition is two-ply system with joints staggered 16 inches or 24 inches.
   4. Partition is not part of a smoke or sound control system.

D. Fire-Rated Partitions: Perimeters of fire-rated partitions shall be caulked with fire-rated sealant as specified in Section 07 84 00, both sides of partition.

E. Sound-Rated Partitions: Perimeters of sound-rated partitions shall be caulked with acoustical sealant as specified in Section 07 92 00, both sides of partition.

F. Joints, except where excluded above including internal corners shall be filled and taped. Thin uniform layer of cement, approximately 3 inches wide, shall be applied over joint. Tape shall be cemented over joint and seated into cement, leaving sufficient adhesive under tape to provide proper bond. Internal angles, both horizontal and vertical, shall be reinforced and with tape folded to form straight and true angle. Metal external corners shall be cemented in place. Joints shall be allowed to dry at least 24 hours between each application of cement.

G. Gypsum board finish shall be to following levels as defined by GA-214:

1. Plenum areas above ceilings - Level 1.
2. Substrate for tile, tackboards and markerboards - Level 2.
3. Areas receiving heavy textured paint - Level 3.
4. Areas receiving vinyl wall covering, texture finish or light textured flat paint - Level 4.
5. All Areas receiving non-textured, flat, egg-shell, gloss or semi-gloss paint - Level 5. Level 5 requires one of the following.
   a. Skim coat required for Level 5. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to entire surfaces. Surfaces shall be smooth and free of tool marks and ridges.
   b. Acrylic latex-based coating, spray apply: USG SHEETROCK Brand Primer-Surfacer Tuff-Hide or ProForm Surfacer/Primer by National Gypsum or equal. Apply to 15-20 mils wet film thickness to entire surface.
   c. Prep Coat Plus by Hamilton Materials Inc, Orange, CA.
   d. Apply primer coat per Section 09 90 00 Painting.

3.04 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09310

CERAMIC TILE

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work included: Ceramic tile floors, walls, and base, with accessories as indicated in the drawings and herein.

B. Related work described elsewhere:

1. Section 03300: Cast-in-Place Concrete
2. Section 06100: Rough Framing
3. Section 08100: Hollow Metal Doors and Frames
4. Section 08305: Access Doors
5. Section 09250: Gypsum Wall and Ceiling Board
6. Section 10800: Toilet Room Accessories

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein and as listed in Section 01400, Quality Requirements.

B. Qualifications of manufacturers: Products used in the work of this Section shall be produced by manufacturers engaged in manufacture of these items and with a history of successful production.

C. Qualifications of installers: Use only personnel who have been trained and who are familiar with the details indicated on the Drawings and the installation requirements of this Section.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01330, Submittal Procedures.

B. Product data, submit:

1. A complete materials list of all items proposed to be furnished and installed under this Section.
2. Manufacturer's recommended installation procedures that will become the basis for inspection and accepting or rejecting actual installation procedures.

C. Samples:

1. Accompanying the above submittal, submit samples of the following.

a. Color board showing the manufacturer's complete range of colors.
b. Samples of each trim shape to be used.
c. Color samples of grout showing manufacturer's complete range of colors.

1.04 PRODUCT HANDLING

A. Delivery: Tiles shall be delivered to the job in original grade-sealed cartons with seals unbroken and labels intact until time of use.

1. Tile shall be kept dry until removed from cartons and ready for use.

2. Care shall be taken to ensure that tiles are not stained or chipped.

B. Replacements: In the event of damage, immediately make repairs and replacements necessary.

PART 2 - PRODUCTS

2.01 SETTING MATERIALS

A. Floors: Water-Cleanable, Tile-Setting Epoxy Mortar with Portland cement additive, complying with ANSI A118.3.

B. Walls: Organic Adhesive complying with ANSI A136.1, Type I.

2.02 TILE

A. General: Tile shall be graded to meet or exceed the requirements of ANSI A137.1 for Ceramic Tile.

B. Design is based on use of products manufactured by U.S. Ceramic Tile, Crossville, Dal-Tile or equal. Equal products by other manufacturers will be acceptable in accordance with the General Conditions.

C. Ceramic floor and wall tile and coved base shall be as follows:

1. Floor: Ceramic mosaic, 2 inch by 2 inch face by ¼ inch thick. Floor tiles shall have a coefficient of friction of 0.60 or higher.

2. Wall: Glazed tile, 6 inch by 6 inch face by ¼ inch thick. All interior corners shall be coved and exterior corners bullnosed.

3. Base: Glazed tile, 6 inch by 6 inch face by ¼ inch thick, coved type.

4. Color: As selected by Architect from the entire range of manufacturer's premium colors and finishes. For bidding purposes use Dal-Tile's Price Group 4. Should the District select lower priced Price Group finishes, the contractor will provide a credit.

5. Pattern: Walls and floors to have a four-color pattern, to be determined by the architect. The patterns may be intermixed in a design approved by the Architect. Contractor shall bid all additional labor and handling necessary to lay up a four-color pattern with 25 percent of the tile varying in color from the dominant surface color.

D. Trim: Shall be compatible with type, color, thickness, face size, and finish of tile specified.

2.02 GROUT

A. Floors: Water-Cleanable, Tile-Setting Epoxy Mortar with Portland cement additive, complying with ANSI A118.3.

B. Walls: Polymer Modified Tile Grout, complying with ANSI A118.7.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Work shall not be performed unless the ambient temperature of the area in which the work occurs is at least 50°F and rising.

B. Install in accordance with the latest edition of Tile Council of America (TCA) , Handbook for Ceramic Tile Installations, systems as follow:

1. Floors F131, Cement Mortar Bed with waterproof /crack isolation membrane below.

2. Walls: W242, Cement Backer Board Underlayment with Latex Portland Cement Mortar.

D. Install grout in accordance with TCA and ANSI A108.10.

1. Walls: Use 1/8-inch grout joints with unsanded grout.

2. Floors: Use manufacturer's standard joints.

E. Install the work of this section in accordance with TCA guidelines.

F. Protect from damage until the acceptance of the building.

3.03 SPARE TILE

A. Provide a minimum of two square feet of each tile color.

END OF SECTION

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SECTION 09900

PAINTING AND COATINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Painting and finishing includes, but is not necessarily limited to, the following:

1. Galvanized sheet metal work.
2. Primed ferrous metal work to receive paint.
3. Non primed ferrous metal work including handrails and guardrail.
4. Interior gypsum board.
5. Interior and exterior cement plaster
6. Concrete Masonry Units
7. Hollow metal doors and frames.
8. Exposed mechanical and electrical, including piping, surface-mounted conduit, and raceways.
9. Exposed structural members, including trusses and support hangers.

B. Related work described elsewhere:

1. Section 03355: Concrete Finishes
2. Section 05120: Structural Steel
3. Section 07620: Sheet Metal Flashing and Trim
4. Section 08100: Hollow Metal Doors and Frames
5. Section 09220: Portland Cement Plaster
6. Section 09250: Gypsum Wall and Ceiling Boards
7. Division 15 for ductwork
8. Division 16 for conduit

C. Work not to be painted on site:

1. Factory or shop-finished materials.
2. Surfaces in concealed areas and inaccessible areas such as furred spaces, pipe spaces, and duct shafts, unless otherwise indicated.
3. Anodized aluminum, stainless steel, chromium plate, and similar finished materials, unless note otherwise.
4. Moving parts of operating units or mechanical or electrical parts such as valve operators, key cylinders, linkages, sensing devices, and motor shafts.
5. Labels or equipment identification plates, performance rating plates, nameplates, or nomenclature plates.

D. Definitions: The term "paint", as used herein, means all coating systems materials including primers, emulsions, epoxy, enamels, sealers, stains, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this section and as listed in Section 01035, Applicable Standards and Codes.

B. Qualifications of manufacturers: Products used in the work of this section shall be produced by manufacturers engaged in manufacture of similar items and with a history of successful production.

C. Qualifications of workers:

1. Painters shall be familiar with the specified requirements and the materials and methods needed for their execution.

2. Provide adequate numbers of workers skilled in the necessary crafts and properly informed of the methods and materials to be used.

D. Paint coordination:

1. Review other sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.

2. Furnish information on the characteristics of the specific finish materials to ensure that compatible prime coats are used.

3. Provide barrier coats over incompatible primers, or remove the primer and reprime as required.

4. Notify the Architect in writing of anticipated problems in using the specified coating systems over prime coating supplied under other sections.

1.03 SUBMITTALS:

A. General: Comply with provisions of Section 01330, Submittal Procedures.

B. Manufacturer's data submit:

1. A complete materials list of all items proposed to be furnished and installed under this section.

2. Manufacturers' specifications and other data required demonstrating compliance with the specified requirements.

3. For information only, submit two copies of manufacturer's specifications, including paint analysis and application instructions for each material. Indicate, by transmittal, that a copy of each manufacturer's instructions has been distributed to the applicator.

C. Upon receipt of review comments, make all revisions and corrections, and resubmit if so required.

D. Samples:

1. Submit samples for the Architect's review.

a. Provide two Samples of each color and each gloss for each material on which the finish is specified to be applied.

b. Samples shall be on 8 ½ by 11 inch paint boards.

c. Other miscellaneous actual color samples may be requested by the Architect for purposes of determining final color selection.

2. Revise and resubmit each sample as required until the Architect's review of gloss, color, and texture is achieved.

E. Field Samples:

1. After color selection is complete, provide 3-foot square review samples of each color on the walls to be painted prior to the start of the work.

2. Allow sufficient time for the architect to review and modify, if necessary, the field samples.

3. Provide a sample of each of the colors selected, plus provide cost and time allowance for the painting of ten additional samples.

1.04 PRODUCT HANDLING

A. Delivery of materials: Deliver all materials to the job site in original, new, and unopened containers bearing the manufacturer's name and label showing at least the following information:

1. Name or title of the material.

2. Manufacturer's stock number.

3. Manufacturer's name.

4. Contents by volume for major constituents.

5. Thinning instructions.

6. Application instructions.

B. Storage of materials: Provide proper storage to prevent damage to, and deterioration of, paint materials.

C. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.

1.05 JOB CONDITIONS

A. Surface temperatures: Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperature are below 45 degrees F, unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect.

B. Weather conditions: Do not apply paint in snow, rain, fog, or mist, or when the relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect. Applications may be specified by the paint manufacturer during application and drying periods.

1.06 EXTRA STOCK

A. Amount: Upon completion of the work of this section, deliver to the District an extra stock of 5 gallons of each color, type, and gloss of paint used and an additional 10 gallons of the primary plaster color and primary wall color.

B. Packaging: Tightly seal each container and clearly label with the contents and location used.

1.07 PAINTING ALLOWANCE

A. A 24 hour allowance shall be included requiring the painter to paint areas designated by the architect.

1.08 NUMBER OF COLORS

A. The architect will choose multiple colors for the items to be painted. Including but not limited to the following:

Area		Colors
1.	Exterior plaster colors	Three
2.	Interior walls	Two
3.	Doors and Windows	Four
4.	Flashing and sheet metal	Three

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

A. Manufacturers: Design is based on use of paint products manufactured by Tnemec, Dunn-Edwards (DE), Sherwin Williams (S-W), Pittsburgh Plate Glass (PPG), Benjamin Moore (Moore), and Frazee. Equal products of other manufacturers, may be substituted in accordance with the provisions of Section 01330.

B. General: Materials not displaying the manufacturer's identification, as a standard best-grade product will not be acceptable.

C. Durability: Provide paints of durable and washable quality. Do not use paint materials that will not withstand normal washing as required to remove pencil marks, ink, ordinary soil and similar material without showing discoloration, loss of gloss, staining, or other damage.

D. Undercoats and thinners: Provide undercoat paint produced by the same manufacturer as the finish coat. Use only the thinners recommended by the paint manufacturer, and use only to the recommended limits. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

E. Standards: Provide paint materials that meet or exceed the standards listed for each application in the Painting Schedule in Part 3 of this Section.

2.02 APPLICATION EQUIPMENT

A. General: For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as approved by the Architect.

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

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection: Prior to installation of the work of this section, carefully inspect the installed work and verify that it is complete to the point where this installation may properly commence. Verify that painting may be completed in accordance with the original design and the manufacturer's recommendations.

B. Discrepancies: Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 MATERIALS PREPARATION

A. General:

1. Mix and prepare painting materials in accordance with the material recommendations.

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

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

B. Stirring: Stir all materials before application to produce a mixture of uniform density, and as required during the application of materials. Do not stir into the material any film that may form on the surface. Remove the film and, if necessary, strain the material before using.

3.03 SURFACE PREPARATION

A. General:

1. Perform all preparation and cleaning procedures in accordance with the paint manufacturer's recommendations.

2. Remove all removable items that are in place and are not scheduled to receive a paint finish, or provide surface-applied protection prior to surface preparation and painting operations.

3. Following completion of painting in each space or area, reinstall the removed items by using workers skilled in the necessary trades.

4. Clean each surface to be painted prior to applying paint or surface treatment.

5. Remove oil and grease with clean cloths and cleaning solvents of low toxicity and a flash point in excess of 100 degrees F, prior to start of mechanical cleaning.

6. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall on to wet newly painted surfaces.

B. Preparation of metal surfaces:

1. Clean all surfaces until they are free from dirt, oil, and grease.

2. On galvanized surfaces, use solvent for the initial cleaning and then treat the surface thoroughly with phosphoric acid etch. Remove all etching solution before proceeding.

3. Allow item to dry before application of paint.

3.04 PAINT APPLICATION

A. General:

1. Slightly vary the color of succeeding coats. Apply no more than one (1) coat in any 24-hour period unless authorized by the District.

2. Sand and dust between enamel coats to remove all defects visible to the unaided eye from a distance of five feet.

3. Upon request, do not proceed with coats of paint without

B. Drying:

1. Allow sufficient drying time between coats. Modify the period as recommended by the material manufacturer to suit adverse weather conditions.

2. Oil-base and oleo-resinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Brush application: Brush out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, streaks, and other surface imperfections are not acceptable.

D. Spray application:

1. Confine spray application to metal framework and similar surfaces.

2. Where spray application is used, apply each coat to provide the equivalent thickness of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of two coats in one pass.

3. Cloudiness, spotting, holidays, laps, runs, sags, curtains, streaks, and other surface imperfections are not acceptable.

E. Completed work shall match the samples for color, texture, and coverage. Remove, refinish, or repaint all work not in compliance with specified requirements.

3.05 PAINTING SCHEDULE

A. General: Materials to be painted and paint types are defined below. All prime or seal (first) coats shall be non-pigmented. Overall Dry Film Thickness: 3.2 mils.

B. Exterior Coatings

1. Exterior Plaster: Flat Acrylic Finish, 2 finish coats over a primer.

   a. Primer: Alkali-resistant, exterior, acrylic-latex primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
      1) DE: Acrylic Alkali Resistant Masonry Surface Conditioner White, (VIP 1300).
      2) S-W: Loxon Exterior Acrylic Masonry Primer, A24 Series.
      3) Frazee: Epotilt 266
   b. First and Second Coats: Flat, exterior, acrylic-emulsion paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
      4) DE: ACRI-FLAT, Exterior 100% Acrylic Flat Finish (W 704).
      5) S-W: A-100 Exterior Latex Flat, A6 Series.
      6) Frazee: 203 Duratec

4. Metal, Ferrous: Including but not limited to exposed structural members and supports.

   a. Prime:
      1) DE: Corrobar 43-5.
      2) S-W: KemBond HSA
      3) Frazee: 661 Metal Prime.
   b. Finish, gloss, two coats, 2 mils per coat.
      1) DE: 10 Series, Syn-Lustro
      2) S-W: Industrial Enamel, B54Z Series
      3) Frazee: 648 AroPlate

5. Metal, Guardrails.

   a. Baked-Enamel Finish: Immediately after cleaning and pre-treating, apply manufacturer's standard 2-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.0254 mm) for topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.0508 mm).
   b. Color and Gloss: Custom color as selected by Architect, medium gloss.

2. Metal, Zinc-Coated: Low-Luster Finish, 2 finish coats over a galvanized metal primer. Includes, but not limited to, parapet copings and sheet metal flashing visible from the ground and sheet metal duct work visible from the ground. Excludes doors and frames.

   a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
      1) DE: 42-44 Versaprime
      2) S-W: DTM Acrylic Primer/Finish, B66W1 Series
      3) Frazee: 661 Metal Prime

b. First and Second Coat: Low-luster (eggshell of satin), exterior, acrylic-latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
   1) DE: INTERCRYL 520, Water Borne Acrylic, Matte.
   2) S-W: A-100 Exterior Latex Satin, A82 Series.
   3) Frazee: 215 Royal Supreme

C. Interior Coatings

3. Metal, Ferrous: Includes exposed structural members and supports. DOES NOT INCLUDE metal deck.

   a. Prime:
      1) DE: Corrobar 43-5.
      2) S-W: DTM Acrylic Primer
      3) Frazee: 661 Metal Prime.
   b. Finish, two coats, gloss finish.
      1) DE: Walltone, W420
      2) S-W: ProMar 400.
      3) Frazee: 011 Velvin

3. Metal, Ferrous: Includes metal deck. DOES NOT INCLUDE exposed structural members and supports.

   a. Prime:
      4) DE: Corrobar 43-5.
      5) S-W: DTM Acrylic Primer
      6) Frazee: 661 Metal Prime.
   b. Finish, two coats, 1.3 mils per coat.
      1) DE: SPARTAGLO, Interior and Exterior Acrylic Semi-Gloss Paint (W7500)
      2) S-W: ProMar 200 Interior Latex Semi-Gloss B31W200 Series
      3) Frazee: 628 AroPlate

6. Interior hollow metal doors, door frames and window frames.

   a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
   b. Primer: Tnemec Azeron Primer, Series FD88.
   c. Finish Coat: Tnemec, Hi-Build Epoxoline II, Series 69.
   d. Color and Gloss: Custom color as selected by Architect, medium gloss.

7. Gypsum Board: Semi gloss, Acrylic-Enamel Finish, 2 finish coats over a primer.

   a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.6 mils (0.031 mm).
      1) DE: UNIKOTE, Interior 100% Acrylic Enamel Undercoater (W-707)
      2) S-W: PrepRite Classic Interior Latex Primer, B28W101 Series.
      3) Frazee: 061 Aqua Seal
   b. First and Second Coats: Semi gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
      1) DE: Spartaglo, Interior and Exterior Acrylic Semi-Gloss Paint (W7500)
      2) S-W: ProMar 200 Interior Latex, Semi-gloss, B31W200 Series.
      3) Frazee: 128 Satin Glide

8. Interior Galvanized Metal, including exposed conduit, miscellaneous plumbing and mechanical ductwork, equipment, grilles and miscellaneous electrical equipment:

   a. Prime:
      1) DE: Versaprime 42-44 Galvanized Primer.

2) S-W: Galvite HS, B50WZ30
3) Frazee: 661

b. Finish, two coats, 1.3 mils per coat.
4) DE: SPARTAGLO, Interior and Exterior Acrylic Semi-Gloss Paint (W7500)
5) S-W: ProMar 200 Interior Latex Semi-Gloss B31W200 Series
6) Frazee: 628 AroPlate

END OF SECTION

SECTION 10162

TOILET PARTITIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide floor to ceiling anchored plastic toilet partitions complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related work described elsewhere:

1. Rough Carpentry (backing requirements): Section 06100
2. Gypsum Wall and Ceiling Board: Section 09250
3. Ceramic Tile: Section 09310
4. Toilet Room Accessories: Section 10800

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein and as listed in Section 01035.

1. Federal Specifications (FS or Fed Specs)
2. RR-P-1352B – "Partitions, Toilet, Complete"

B. Qualifications of manufacturers: 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 acceptable to the Architect.

C. Qualifications of installers: Use adequate numbers of skilled workers who are trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

A. General: Comply with provisions of Section 01300.

B. Product data, submit:

1. A complete materials list of all items proposed 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 and sufficient dimensional data to enable proper coordination of installation of concealed items of support.
4. Manufacturer's recommended methods of installation, that will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

1.04 COORDINATION

A. Coordinate with toilet room accessories. Review Drawings and Specifications for toilet room accessories installed directly to partition panels. Avoid conflicts with the location of accessories.

B. Determine substrates to which the partitions will be attached.

1.05 PRODUCT HANDLING

A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation, and to protect work and materials of all other trades.

B. Replacements: In the event of damage, immediately make repairs and replacements necessary to the approval of the Architect and at no additional cost to the District.

PART 2 - PRODUCTS

2.01 TOILET PARTITIONS

A. As manufactured by Capitol Partitions, Inc. "Poly-Pro Plus" solid plastic partitions or equal.

1. Partitions shall have a flame spread not to exceed 75 and smoke developed less than 450
2. Partitions shall have a 15-year warranty.

B. Panels, doors, and pilasters shall be fabricated from polyethylene (HDPE) resins, forming a single section, homogenous color throughout, that is waterproof, corrosion-proof, impact-resistant, and nonabsorbent, and that has a mar resistant surface that resists marking with pens, pencils, lipsticks, and other implements.

1. Provide integral metal heat sinks at the bottom edge of all exposed panels, including urinal screens.

C. Partitions shall be 1 inch thick, with all edges machined to a radius of 0.250" and all sharp corners removed.

1. Dividing panels and doors shall be 58 inches high and mounted 12 inches above the floor to match existing. Doors to accessible stalls shall be 36 inches wide.
2. Partitions pilasters to be floor mounted and overhead braced.

D. Accessible compartment doors shall be 36 inches wide.

1. Doors at front entry stalls shall have 32 inches minimum clear width when the door is open 90 degrees.
2. Doors at side entry stalls shall have 34 inches minimum clear width when the door is open 90 degrees.

E. Urinal Screens: Provide wall mounted, same material as partitions.

2.02 HARDWARE

A. Screws and bolts, shall be heavy gauge stainless steel. Fasteners shall be vandal-resistant type.

B. headrail brackets shall be non-grip, aluminum.

C. Door pulls, stops, and bumper/coat hooks shall be made of chrome plated zamak.

D. End caps, latches, strikes, brackets, and hinges shall be clear anodized aluminum.

E. Wall bracket shall be continuous aluminum

F. Disabled Stall shall have a slide bolt door latch, wire pulls both sides beneath the latch and self closing hinges. Mount hardware 40 inches above finished floor with pulls located underneath the latching system. Doors at front entry stalls shall have 32" minimum clear width when the door is open 90° and doors at side entry stalls shall have 34" minimum clear width when the door is open 90°.

2.03 FABRICATION

A. Fabricate in accordance with the manufacturer's product data for Special Heavy Traffic-School Specification. Reinforce and/or cut for all accessories.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordination: Properly coordinate with all other trades as required to ensure adequate provision for support and anchorage of the work of this Section and for proper interface with the work of other trades.

B. Inspection: Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install the work of this Section straight and plumb within a tolerance of 1-in-200 horizontally and 1-in-500 vertically, rigidly anchoring into position for long life under hard use. Perform all drilling and cutting for installation of anchors only at locations that will be concealed in the finished work. Provide a uniform vertical edge clearance for doors of approximately 3/16", resting open at approximately 30 degrees when the latch is not engaged.

3.03 CLEANING

A. Cleaning: Comply with provisions as set forth in Section 01710.

B. Protect from damage until final project acceptance.

C. Clean all products installed including adjacent surfaces and areas as the installation progresses. Use solvents or cleaning agents as recommended by the manufacturer. Provide final cleaning for acceptance.

END OF SECTION 10162

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SECTION 10426

SIGNAGE AND GRAPHICS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Room identification signs, architectural letters, donor board and brass signs, complete in place, specified herein, and as needed for a complete and proper installation.

B. Related work described elsewhere:

1. DIVISIONS 3, 4 and 9: Wall materials and finishes, mounting conditions.
2. Section 06100: Rough Framing (backing)
3. Section 08710: Finish Hardware (Toilet Room Signage)

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein and all applicable criteria of 2007 California Building Code (CBC), California Vehicular Code (CVC) and the Americans with Disabilities Act (ADA.)

B. Qualifications of manufacturers: 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.

1.03 SUBMITTALS

A. Product data, submit:

1. A complete materials list of all items proposed to be furnished and installed under this Section.
2. A graphic of each sign type, drawn to scale, showing correct lettering size, spacing and format. Signs of different sizes will be considered a different sign type.
3. Manufacturer's specifications and data demonstrating compliance with the specified requirements.
4. Manufacturer's recommended installation procedures that will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.

B. Samples:

1. Provide samples of each type of sign.
2. Provide one letter, each size, for the architectural lettering.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make repairs and replacements necessary.

PART 2 - PRODUCTS

2.01 ROOM IDENTIFICATION SIGNAGE

A. Acceptable Manufacturers (or equal).

1. National Sign Chino, CA - 909-591-4742
2. 3M, Commercial Graphics Div. St. Paul, MN - 612-737-6151
3. Apco

B. Room Identification Signs:

1. Colored plastic with non-glare finish; four inch by eight inch, rounded corners, colored numbering, set in a raised condition. Plastic shall be high-density, highest impact resistance and abuse resistance available through manufacturer. Signs shall include the corresponding Contracted California, Grade 2, Braille, as an integral component of the plastic (raised dots). Provide four mounting holes per sign.
   a) Do not place mounting holes in signs that are to be mounted on glass.

C. Exterior Letter Signs:

1. Cast aluminum letters with bracket extensions and mounting brackets. Height as indicated on drawings, or 12-inch high if not indicated.
2. Letters on metal stud and cement plaster. Letters shall float ½ -inches beyond the face of the plaster finish. Coordinate exact location with Architect.

D. Braille Symbols:

1. Room identification signs to have Braille text in addition to regular text.
2. Pursuant to Title 24, Section 1117B5.2; provide Contracted California, Grade 2 Braille. Dots shall be 1/10-inch (2.54 mm) on centers in each cell with 2/10-inch (5.08mm) space between cells. Dot shall be raised a minimum of 1/40 inch (0.635mm) above background.

E. Accessories and Appurtenances:

1. Fasteners to be stainless steel, vandal-resistant type, including metal wall anchors.
2. Adhesive for mounting signs: As recommended by manufacturer for permanent fastening.

F. Locate signs in the quantity type and location shown on the schedule and per ADA and CBC requirements.

1. On wall, 60-inches above finish floor.
2. Three-inches from door jamb on the strike side.
3. Where windows occur on the strike side, install on glass, add black vinyl backing to opposite side of glass.
   a) If an EXIT sign is required, it may be used as backing in lieu of black vinyl. In this case, the two signs must be of the same size.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install components plumb, level, square, and firmly into position. Signs shall be pre-drilled to receive fasteners.

1. Provide a minimum of four (4) fasteners per sign. Provide 1/8-inch thick neoprene washer (spacer) between sign and wall at all locations.

2. In addition to screws, glue signs to wall with adhesive recommended by the manufacturer.
3. All fasteners shall extend directly into backing or anchors.
4. Concrete and Masonry Locations: Install in a similar manner, except use lead expansion anchors.
5. Glazing locations: Permanent adhesive as recommended by the manufacturer.

3.03 JOB CONDITIONS AND CLEANING

A. Protect all installed work as well as the existing work installed by other contracts.

B. Clean all construction debris on a daily basis. Provide a final, professional cleaning of signs for inspection review and acceptance.

3.04 SIGN SCHEDULE

A. Refer to Drawings.

END OF SECTION

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SECTION 10500

MOTORIZED HORIZONTAL LOUVERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide interior motorized aluminum horizontal louver system with related specified hardware to complete the installation to the following locations: skylights.

B. Related work described elsewhere:

1. DIVISIONS 6 and 9: Wall materials and finishes, mounting conditions.
2. Section 06100: Rough Framing (backing)

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein and all applicable criteria of 2007 California Building Code (CBC), Division of the State Architect (DSA)

B. Qualifications of manufacturers: 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.

C. Manufacturer shall have a minimum of fifteen (15) years experience in the manufacturing of the specified shading system. All work specified under this section shall be supplied by one subcontractor.

D. Alternate bids, alternate products shall be submitted to the architect ten (10) days prior to bid due date.

E. Install one complete sample with accessories on site. Installation to be reviewed before proceeding with the remainder of the work. Sample to be adjusted as required to gain acceptance. Accepted work may form part of the final installations.

1.03 SUBMITTALS

A. Product data, submit:

1. Submit fully detailed drawings prepared in AutoCAD 2002 version format showing all components, finishes and other construction conditions, installation, controls and all applicable dimensions according to Section 01330- Submittal Procedures.
2. Submit duplicate samples of the key components of the specified motorized horizontal louver system with the specified finish. Minimum size 40" for review.
3. Submit duplicate samples of the specified brackets and attachment methods.
4. Horizontal louver motors and all electric control equipment supplied by this section shall comply with UR/CSA and UL/ULC standards. Copies of compliance shall be available upon request.

1.04 PRODUCT HANDLING

A. Receive: Do not deliver to site until areas to receive the motorized horizontal louver system are completely finished.

B. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

C. Replacements: In the event of damage, immediately make repairs and replacements necessary.

1.05 INSPECTION / PREPARATION

A. Verify that the structure necessary to carry the motorized horizontal louver system is a proper installation and secure

B. Notify the general contractor in writing of any deficiencies in the work of other trades that would affect the fixed horizontal louver system

C. Make accurate measurements at the site before fabrication. Check layout of skylight opening and loading capabilities.

1.06 WARRANTY

A. Provide a limited manufacturer's warranty from date of Substantial

PART 2 - PRODUCTS

2.01 HORIZONTAL MECHANICAL LOUVERS

A. Acceptable Manufacturers (or equal).

1. Arc Structures, Inc. 1, 115 – 28 Street SE, Calgary, Alberta, Canada T2A 5K4
Tel: 403 204 8699, Fax: 403 204 8676 e-mail: sales@arcstructures.com

2.02 SYSTEM TO COMPRISE:

A. Motorized horizontal louvers attaching to a secondary wood structure.

2.03 MATERIALS

A. Aluminum and steel hardware and brackets

1. Mounting Brackets- system to be attached to mounting brackets to be supplied by the manufacturer of the motorized horizontal louver system. Brackets to fix to studs surrounding the skylight. Mounting brackets shall be manufactured from engineered wall thickness to support the full weight of the system as determined by the local building and construction codes. Method of attaching to the structure to be coordinated with the carpenter.

2. Louvers - System shall incorporate single skin fabricated louvers.

a) Louvers shall be 2" wide

b) The louvers shall comprise the following components:

1) extruded aluminum leading edges

2) sheet aluminum skin – solid

3) aluminum screw attached, manufactured end caps to fit precisely to the profile of the fabricated louver

3. Electric Motors:

a) System to be operated by means of linear actuators

b) Number and size / output torque of linear actuators to be determined by reference to the specific project requirements

c) Linear acutators to be supplied with appropriate mounting brackets for fixing back to the structure

d) Each linear actuator to connect to an aluminum or steel operating strip which in turn connect the louvers in a single bank together

e) Operating strips to be manufactured from material with engineered dimensions to sufficiently support the applied loads.

4. Material quality and coatings:

a) All extruded aluminum components shall be extruded from 6063-T6 quality aluminum

b) All aluminum components shall have the following finish: Three (3) coat fluoropolymer finish to a standard metallic color

c) Steel components shall be manufactured from mild steel FE 230 G while any stainless steel components shall be manufactured from Stainless 18-8.

d) Steel components shall be hot dip galvanized or zinc plated.

5. Locate louvers in the quantity, type and location shown on the reflected ceiling plan.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install work using skilled tradesman and install in strict accordance with manufacturer's recommendations.

B. All items installed, plumbed, squared and rigidly anchored maintaining uniform clearances and accurate alignment measurements.

C. The motorized horizontal louver system shall be pre-measured and manufactured off-site.

3.03 JOB CONDITIONS AND CLEANING

A. Protect all installed work as well as the existing work installed by other contracts.

B. Clean all construction debris on a daily basis. Provide a final, professional cleaning of louvers for inspection review and acceptance.

END OF SECTION

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SECTION 10800

TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Toilet room accessories complete, in place, as shown on the Drawings, specified herein, and as needed for a complete and proper installation.

B. Related work described elsewhere:

1. Sealants 07920: Joint Sealants
2. Section 09250: Gypsum Wall and Ceiling Board
3. Section 09310: Ceramic Tile
4. Section 10162: Toilet Partitions

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein and as listed in Section 01400. Comply with all applicable criteria of 2007 California Building Code (CBC), Chapter 11B and Title 24, whichever is more restrictive.

B. Qualifications of manufacturers: 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 acceptable to the Architect.

1.03 SUBMITTALS

A. General: Comply with provisions of Section 01330.

1. Product data submit:
   a. A complete materials list of all items proposed to be furnished and installed under this Section.
   b. Manufacturer's catalog cuts with specifications and other data demonstrating compliance with the specified requirements.
   c. Manufacturer's recommended methods of installation, that will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacement: In the event of damage, immediately make repairs and replacements necessary.

PART 2 - PRODUCTS

2.01 GENERAL

A. Anchors and fasteners: Provide anchors and fasteners capable of developing a retaining force commensurate with the strength of the accessory to be mounted and suited for use with the supporting construction. Where exposed fasteners are permitted, provide oval-head fasteners with finish matching the accessory. Provide vandal-resistant type where exposed.

B. Finish: Accessory items shall be stainless steel with satin finish.

C. Design is based on use of products that are manufactured by the Bobrick Company, and catalog numbers of that manufacturer are given as an indication of the quality and style required, unless otherwise noted. Adherence to technical fabrication and quality aspects must be shown for consideration of alternative products. Bradley is an acceptable manufacturer. ASI is not considered an equal product.

2.02 ACCESSORY ITEMS

A. Provide the following in the numbers and locations indicated on the Drawings. Refer also to Legend, mounting heights, interior elevations and additional information on the Drawings.

1. Toilet Seat Cover Dispenser, recessed: Bobrick #B-3013. Provide 1 per toilet.
2. Recessed Multi-roll (2) Toilet Tissue Dispenser: Bobrick #B-3888, stainless steel at each single-occupancy toilet, and toilet stall.
3. Surface-Mounted Soap Dispensers: Bobrick #B-2112, stainless steel, liquid-type. To be provided by the District and installed by the Contractor. Provide one (1) at each lavatory or sink for the entire project.
4. Mirror with Shelf: Bobrick #B-292, glass mirror, sizes as indicated on the Drawings or 24 by 36 inches if not noted.
5. Not Used.
6. Feminine Napkin/Tampon Disposal: Bobrick #B-270, surface-mounted. Provide one (1) at each female water closet.
7. Semi-recessed Paper Towel Dispenser/Waste Receptacle: Bobrick #B-3944.
8. Not used.
9. Grab bar: that one does not work – spec 2 separate – or verify that Bobrick has reconfigured the L- unit.
10. Not used.
11. Not used.
12. Electric Hand Dryer: World "Automatic", surface mounted; Bobrick #B780, 120V AC, 20 amp equal products.
13. Not Used.
14. Coat/Clothes Hook: Bobrick #B-233 stainless steel. Provide one (1) at back of single-occupancy toilet room entry door.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Throughout construction of substrate surfaces, use all means necessary to ensure proper and adequate provision for concealed support devices to receive the work of this Section.

3.03 INSTALLATION

A. Install the work of this Section in strict accordance with the manufacturer's recommendations anchoring all components plumb, level, and square.

B. Provide backing for accessories. Grab bar connections to resist 200 pounds of vertical force.

C. Cleaning: Comply with the provisions as set forth in Section 01710. All stainless steel products shall be finger-mark free. Use solvents and cleaners expressly recommended by the manufacturer.

3.04 SPARE MATERIALS

A. Provide six screwdrivers suitable for removing the vandal resistant screws.

B. Provide keys for accessories.

1. Provide one key for each accessory installed.
2. Attach identical keys to one key ring and affix a permanent label to the ring with the name of the accessory the key serves.
3. Do not leave keys in the accessories.
4. Deliver keys to the District at the completion of the work.

END OF SECTION

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SECTION 10950

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide fire extinguishers as shown on the Drawings, specified herein, and as needed for a complete and proper installation.

B. Related work described elsewhere:

1. Section 06100: Rough Framing
2. Section 09250: Wall and Ceiling Board

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified herein as listed in Section 01035.

B. Qualifications of manufacturers: 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.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01330.

B. Product data, submit:

1. A list of items proposed to be furnished and installed under this Section.
2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.
3. Manufacturer's service bureau name, address, and telephone number.

1.04 PRODUCT HANDLING

A. Protection: Use means necessary to protect the materials of this Section before, during, and after installation and protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make repairs and replacements necessary at no additional cost to the District.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS AND CABINETS

A. Manufactured by Larsen's MP Series or equal.

1. Extinguisher: MP-5, five pound capacity, Class 2-A: 10-BC.
2. Cabinets: Surface mounted G2409-R2, with plain, no lock red enamel doors. Silkscreen white lettering type A "Fire Extinguisher" on door.
3. Trim: 2 1/2 inch
4. Metal mounting hook

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION:

A. Throughout construction of substrate surfaces, use all means necessary to ensure proper and adequate provision for support to receive the work of this Section.

3.03 INSTALLATION

A. Install the work of this Section in accordance with the manufacturer's recommendations anchoring cabinets plumb, level, square, and firmly into position.

B. Install 48 inches above finished floor to center of cabinet. Cabinets may be lowered when conflicting with other wall mounted items, but never lower than 18 inches to the bottom.

C. Mount extinguishers on hook within cabinet.

END OF SECTION

SECTION 15053

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Equipment installation requirements common to equipment sections.
6. Painting and finishing.
7. Concrete bases.
8. Supports and anchorages.

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Escutcheons.

B. Welding certificates.

1.05 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.07 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

2.04 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Metraflex Co.
    d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.05 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. PVC Pipe: ASTM D 1785, Schedule 40.

2.06 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

C. One-Piece, Floor-Plate Type: Cast-iron floor plate.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

M. Sleeves are not required for core-drilled holes.

N. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.

O. Verify final equipment locations for roughing-in.

P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.03 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.05 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 9 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.06 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 12 inches (100 mm) larger on all sides than supported unit.
2. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Install anchor bolts to elevations required for proper attachment to supported equipment.
4. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
5. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.07 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

END OF SECTION

SECTION 15062

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 15 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
3. Division 15 Section(s) "Metal Ducts" for duct hangers and supports.

1.03 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.04 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.

2. Metal framing systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.05 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

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

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2. Manufacturers: Only products with ICC # are acceptable.

2.02 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Grinnell Corp.
3. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

2.03 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.04 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Tolco Inc.
3. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

2.05 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig-minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. Pipe Shields, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.06 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Hilti, Inc.
c. ITW Ramset/Red Head.

2.07 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.08 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.

E. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3.02 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

K. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

3.03 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.04 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

3.05 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.06 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 15074

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Restrained spring isolators.
   2. Spring hangers.
   3. Restraining braces and cables.

1.03 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.04 PERFORMANCE REQUIREMENTS

A. See Structural Drawings.

1.05 SUBMITTALS

A. Product Data: For the following:

   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by OSHPD.
      b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic restraints, and for designing vibration isolation bases.

    a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Division 15 Sections for equipment mounted outdoors.

C. Coordination Drawings: Show coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.

D. Welding certificates.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATORS

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

1. Mason Industries.
2. Amber/Booth Company, Inc.
3. MW Sausse

B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.

2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

C. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.02 SEISMIC-RESTRAINT DEVICES

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

1. Mason Industries.
2. Amber/Booth Company, Inc.
3. MW Sausse

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by OSHPD.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

2. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
3. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
4. Maximum 1/4-inch (6-mm) air gap, and minimum 1/4-inch- (6-mm-) thick resilient cushion.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

F. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

G. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

H. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

2.03 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Division 7 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Equipment Restraints:
   1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
   2. Install seismic-restraint devices using methods approved by OSHPD providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install seismic-restraint devices using methods approved by OSHPD providing required submittals for component.

E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

F. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

H. Drilled-in Anchors:

   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Set anchors to manufacturer's recommended torque, using a torque wrench.
   5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

   1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
   2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.

3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.05 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust active height of spring isolators.

C. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 15077

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.

1.03 SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

1.04 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.02 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Refrigerant Piping:

   a. Background Color: Blue.
   b. Letter Color: White.

END OF SECTION

SECTION 15083

HVAC INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Insulation Materials:

    a. Flexible elastomeric.
    b. Mineral fiber.

2. Adhesives.
3. Mastics.
4. Tapes.
5. Securements.

B. Related Sections:

1. Division 15 Section "Plumbing Insulation."
2. Division 15 Section "Metal Ducts" for duct liners.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

C. Qualification Data: For qualified Installer.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.06 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.07 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket.

1. Products: Subject to compliance with requirements, provide the following:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation.

1. Products: Subject to compliance with requirements, provide the following:

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.

2.02 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2.03 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

2.04 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.05 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide the following:

a. Childers Products; Bands.
b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

2. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

C. Wire: 0.080-inch (2.0-mm) nickel-copper alloy.

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

a. C & F Wire.
b. Childers Products.
c. PABCO Metals Corporation.
d. RPR Products, Inc.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

N. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.04 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

3.05 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.06 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.07 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.08 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.09 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.
2. Mineral-Fiber Board: 1-1/2 inches (38 mm) thick and 2-lb/cu. ft. (32-kg/cu. m) nominal density.

B. Exposed, supply-air duct insulation shall be the following:

1. See Division 15 Section "Metal Ducts"

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 1 inch (25 mm) thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 1 inch (25 mm) thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 2 inches (50 mm) thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 2 inches (50 mm) thick.

END OF SECTION

SECTION 15140

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes domestic water.

B. Related Sections include the following:
1. Section 15145 Domestic Water Piping Specialties.

1.03 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
1. Domestic Water Distribution Piping: 80 psig.

1.04 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Water Samples: Specified in "Cleaning" Article in Part 3.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with "Drinking Water System Components-Health Effects; Sections 1 through 9".

C. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

C. Transition Couplings for Underground Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 COPPER TUBING

A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2.03 ENCASEMENT

A. Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105 PE film, 0.008-inch minimum thickness, tube or sheet.

2.04 VALVES

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.

E. Underground Domestic Water Service Piping: Use the following piping materials for each size range:
   1. NPS 2 and Smaller: Soft copper tube, Type Kcopper pressure fittings; and soldered joints.
   2. NPS 2-1/2 to NPS 3-1/2: Soft copper tube, Type K copper pressure fittings and brazed joint.

F. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
   1. NPS 1-1/2 and Smaller: Hard copper tube, Type K; copper pressure fittings; and soldered joints.
   2. NPS 2: Hard copper tube, Type K; copper pressure fittings; and soldered joints.
   3. NPS 2-1/2 to NPS 3-1/2: Hard copper tube, Type K copper pressure fittings; and soldered joints.

G. Placement and Type
   1. Vertical Piping: MSS Type 8 or Type 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs: According to the following:

      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

   3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   4. Base of Vertical Piping: MSS Type 52, spring hangers.

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

   1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
   2. NPS 1-1/2: 108 inches with 3/8-inch rod.
   3. NPS 2: 10 feet with 3/8-inch rod.
   4. NPS 2-1/2: 11 feet with 1/2-inch rod.
   5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
   6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
   7. NPS 6: 12 feet with 3/4-inch rod.
   8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod..

I. Install unistrut with C-clamp supports for vertical steel piping every 15 feet and per CPC. In addition provide unistrut with C-clamp supports at top, middle and bottom of pipe drops serving all plumbing fixtures.

J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

   1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
   2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
   3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
   4. NPS 2-1/2: 108 inches with 1/2-inch rod.
   5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
   6. NPS 6: 10 feet with 5/8-inch rod.
   7. NPS 8: 10 feet with 3/4-inch rod.

K. Install supports for vertical copper tubing every 10 feet.

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.03 PIPING INSTALLATION

A. Refer to Section 15053 "Common Work Results" for basic piping installation.

B. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.

C. Install underground copper tubing according to CDA's "Copper Tube Handbook."

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.

F. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service.

G. Install water-pressure regulators downstream from shutoff valves. Refer to Section 15430 "Plumbing Specialties" for water-pressure regulators.

H. Install aboveground domestic water piping level with 0.125 percent slope downward toward drain.

I. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

J. Perform the following steps before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.

K. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

L. Check plumbing specialties and verify proper settings, adjustments, and operation.

1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.

M. Energize pumps and verify proper operation.

3.04 JOINT CONSTRUCTION

A. Refer to Section 15050 for basic piping joint construction.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

D. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.05 VALVE INSTALLATION

A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
   1. Install hose-end drain valves at low points in water mains, risers, and branches.
   2. Install stop-and-waste drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Refer to Section 15430 "Plumbing Specialties" for balancing valves.

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Refer to Section 15430 "Plumbing Specialties" for calibrated balancing valves.

3.06 HANGER AND SUPPORT INSTALLATION

A. Refer to Section 15074 for seismic-restraint devices

B. Refer to Section 15062 for pipe hanger and support devices. Install the following:

C. Install supports according to Section 15062.

D. Support vertical piping and tubing at base and at each floor.

3.07 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:
   1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
   2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
   3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.08 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

   1. Do not enclose, cover, or put piping into operation until it is inspected by the inspector of record (I.O.R.).
   2. During installation, notify the inspector of record at least 24 hours before inspection must be made. Perform tests specified below in presence of the inspector of record:

      a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange for final inspection by inspector of record to observe tests specified below and to ensure compliance with requirements.

   3. Reinspection: If the inspector of record finds that piping will not pass test or inspection, make required corrections and arrange for reinspection.
   4. Reports: Prepare inspection reports and have them signed by the inspector of record.

B. Test domestic water piping as follows:

   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
   5. Prepare reports for tests and required corrective action.

3.09 ADJUSTING

A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
2. Adjust calibrated balancing valves to flows indicated.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

END OF SECTION

SECTION 15145

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Post hydrants.
10. Drain valves.
11. Water hammer arresters.
12. Air vents.
13. Trap-seal primer valves.
14. Trap-seal primer systems.

B. Related Sections include the following:

1. Division 15 Section "Meters and Gages" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Division 15 Section "Domestic Water Piping" for water meters.
3. Division 15 Section "Emergency Plumbing Fixtures" for water tempering equipment.
4. Division 15 Section "Drinking Fountains and Water Coolers" for water filters for water coolers.

1.03 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.04 SUBMITTALS

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

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.01 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Mifab
b. Conbraco
c. Watts Industries, Inc.; Water Products Div.
d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MIFAB, Inc.
b. Prier Products, Inc.
c. Woodford Manufacturing Company.
d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.02 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers P-0.2:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Wilkins.
    b. Watts Industries, Inc.; Water Products Div.
    c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Size: per plans
6. Design Flow Rate: 130
7. Selected Unit Flow Range Limits: 150
8. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
9. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
10. Configuration: Designed for horizontal, straight through flow.
11. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.03 WATER PRESSURE-REDUCING VALVES

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

    a. Wilkins
    b. Watts Industries, Inc.; Water Products Div.
    c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: per plans
5. Design Flow Rate: 120
6. Design Inlet Pressure: 90
7. Design Outlet Pressure Setting: 75
8. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
9. Valves for Booster Heater Water Supply: Include integral bypass.
10. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.04 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. NIBCO INC.
   b. Kitz
   c. Apollo
   d. Watts Industries, Inc.; Water Products Div.

2. Type: Globe valve with two readout ports and memory setting indicator.
3. Body: Brass,
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.05 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves P-0.2:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Lawler Manufacturing Company, Inc.
      b. Leonard Valve Company.
      c. Powers; a Watts Industries Co.
      d. Symmons Industries, Inc.

   2. Standard: ASSE 1017.
   3. Pressure Rating: 125 psig.
   4. Type: Exposed-mounting, thermostatically controlled water mixing valve.
   5. Material: Bronze body with corrosion-resistant interior components.
   6. Connections: Threaded union inlets and outlet.
   7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
   8. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.
   9. Tempered-Water Setting: 90
   10. Tempered-Water Design Flow Rate: 40
   11. Selected Valve Flow Rate at 45-psig Pressure Drop: 30
   12. Pressure Drop at Design Flow Rate: 5
   13. Valve Finish: Polished, chrome plated.
   14. Piping Finish: Copper.

2.06 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

   1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
   2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
   3. End Connections: Threaded for NPS 2 and smaller;flanged for NPS 2-1/2 and larger.
   4. Screen: Stainless steel with round perforations, unless otherwise indicated.
   5. Perforation Size:

      a. StrainersNPS 2 and Smaller: 0.020 inch.
      b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
      c. Strainers NPS 5 and Larger: 0.10 inch.

6. Drain: Pipe plug.

B. Icemaker Outlet Boxes P-0.1:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. IPS Corporation.
b. LSP Products Group, Inc.
c. Plastic Oddities; a division of Diverse Corporate Technologies.

2. Mounting: Recessed.
3. Material and Finish: Plastic box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.07 HOSE BIBBS

A. Hose Bibbs P-0.1:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.08 WALL HYDRANTS

A. Moderate-Climate Wall Hydrants P-0.1:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn
b. MIFAB, Inc.
c. Prier Products, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Woodford Manufacturing Company.

2. Standard: ASME A112.21.3M for concealed -outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.

5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011; and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounting with cover.
8. Box and Cover Finish: Chrome plated.
9. Outlet: Exposed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011; and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): Two with each wall hydrant.

2.09 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. MIFAB, Inc.
   c. PPP Inc.
   d. Sioux Chief Manufacturing Company, Inc.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.11 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves P-0.1.:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. MIFAB, Inc.
   b. PPP Inc.
   c. Sioux Chief Manufacturing Company, Inc.

2. Standard: ASSE 1018.

3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Refer to Division 15 Section "Common Work Results" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

D. Install water control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

E. Install balancing valves in locations where they can easily be adjusted.

F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

G. Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 6 Section "Rough Carpentry."

H. Install water hammer arresters in water piping according to PDI-WH 201.

I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 16.

C. Connect wiring according to Division 16 Section "Conduit and Wire."

3.03 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Intermediate atmospheric-vent backflow preventers.
3. Reduced-pressure-principle backflow preventers.
4. Water pressure-reducing valves.
5. Calibrated balancing valves.
6. Primary, thermostatic, water mixing valves.
7. Supply-type, trap-seal primer valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Section "Identification for HVAC piping and equipment."

3.04 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.05 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION

SECTION 15150

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.

B. Related Sections include the following:
1. Section 15155 "Drainage Piping Specialties" for soil, waste, and vent piping systems specialties.

1.03 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.04 SUBMITTALS

A. Product Data: For pipe, fittings, and couplings.

B. Shop Drawings: For sovent drainage system, include plans, elevations, sections, and details.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 CAST-IRON SOIL PIPING

A. Hubless Pipe and Fittings: Trademark of CISPI

1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
   a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.

      1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.

2.03 ENCASEMENT

A. Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch minimum thickness, tube or sheet.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Refer to Section 02220 "Trenching and Backfill" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:

1. NPS 1-1/4 and NPS 1-1/2: Use NPS 1-1/2 hubless, cast-iron soil piping and one of the following:

    a. Couplings: Heavy-duty, Type 304, stainless steel.

2. NPS 1-1/4 and NPS 1-1/2: Steel pipe; cast-iron, threaded drainage fittings; and threaded joints.
3. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:

    a. Couplings: Heavy-duty, Type 304, stainless steel.

D. Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:

1. NPS 1-1/2: Hubless, cast-iron soil piping and one of the following:

    a. Couplings: Heavy-duty, Type 304, stainless steel.

2. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:

    a. Couplings: Heavy-duty, Type 304, stainless steel.

3.03 PIPING INSTALLATION

A. Refer to Section 15050 "Basic Mechanical Materials and Methods" for basic piping installation.

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.

E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.

F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.

H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

3.04 JOINT CONSTRUCTION

A. Refer to Division 15050 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

3.05 HANGER AND SUPPORT INSTALLATION

A. Refer to Section 15242 "Vibration Isolation Controls" for seismic-restraint devices.

B. Refer Section 15060 "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Section 15060 "Hangers and Supports"

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.. In addition provide unistrut with C-clamp supports at top, middle and bottom of pipe drops serving all plumbing fixtures.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.07 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.08 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 15155

DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.
   3. Roof flashing assemblies.
   4. Through-penetration firestop assemblies.
   5. Roof drains.
   6. Miscellaneous drainage piping specialties.
   7. Flashing materials.

B. Related Sections include the following:

   1. Division 15 Section "Plumbing Fixtures" for hair interceptors.
   2. Division 15 Section "Medical Plumbing Fixtures" for plaster sink interceptors.

1.03 SUBMITTALS

   1. Wiring Diagrams: Power, signal, and control wiring.

B. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

1.05 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.01 CLEANOUTS

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

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for adjustable housing cast-iron soil pipe with cast-iron ferrule cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Threaded.
8. Closure: Brass plug with tapered threads Cast-iron plug.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
14. Standard: ASME A112.3.1.
15. Size: Same as connected branch.
16. Housing: Stainless steel.
17. Closure: Stainless steel with seal.
18. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, deep, chrome-plated bronze cover plate with screw.
8. Wall Access: Round, wall-installation frame and cover.

2.02 FLOOR DRAINS

A. Cast-Iron Floor Drains P-0.1:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MIFAB, Inc.
b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Sanitary drain.
4. Body Material: Per plans.
5. Outlet: Bottom.
6. Top or Strainer Material: Nickel bronze.
7. Top of Body and Strainer Finish: Nickel bronze.
8. Top Shape: Round.
9. Trap Material: Cast iron.
10. Trap Pattern: Standard P-trap.
11. Trap Features: Trap-seal primer valve drain connection.

2.03 ROOF FLASHING ASSEMBLIES

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

a. Acorn Engineering Company; Elmdor/Stoneman Div.
b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
1. Low-Silhouette Vent Cap: With vandal-proof vent cap.
2. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.04 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.05 ROOF DRAINS

A. Metal Roof Drains P-0.01:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. MIFAB, Inc.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.2M.
3. Pattern: Roof drain.
4. Body Material: Cast iron.
5. Dimensions of Body: Per P-0.1.
6. Combination Flashing Ring and Gravel Stop: Required.
7. Outlet: Bottom.
8. Dome Material: Cast iron.
9. Extension Collars: Required.
10. Underdeck Clamp: Required.
11. Sump Receiver: Required.

2.06 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.

5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.07 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

G. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

H. Install through-penetration firestop assemblies in plastic conductors at floor penetrations.

I. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 7.

1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

J. Install deep-seal traps on floor drains and other waste outlets, if indicated.

K. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

L. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

M. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

N. Install vent caps on each vent pipe passing through roof.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Division 16 Section "Grounding and Bonding."

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.03 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

H. Provide "Mathane Barrier Boot" for all penetrations through slab. Refer to Mathane Medigation Plans for additional requirements.

3.04 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Section "Mechanical Identification."

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.06 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 15160

STORM DRAINAGE PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes storm-drainage piping inside the building and to locations indicated.

B. Related Sections include the following:
   1. Section 15155 "Drainage Piping Specialties" for storm drainage piping system specialties.

1.03 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

   1. Storm Drainage Piping: 10-foot head of water

1.04 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings: For controlled-flow storm drainage system, include calculations, plans, and details.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 CAST-IRON SOIL PIPING

A. Hubless Pipe and Fittings: Trademark of CISPI

1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral center pipe stop.
   a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
      1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
      2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.

   b. Heavy-Duty, FM-Approved Couplings: ASTM A 666, Type 304, stainless-steel housing; stainless-steel bands; and sleeve.

      1) NPS 1-1/2 to NPS 4: 3-inch- wide housing with 2 bands.

   c. Heavy-Duty, Cast-Iron Couplings: ASTM A 48, 2-piece, cast-iron housing; stainless-steel bolts and nuts; and sleeve.
   d. Heavy-Duty, Type 301, Stainless-Steel Couplings: ASTM A 666, Type 301, stainless-steel shield; stainless-steel bands; and sleeve.

      1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.

2.03 ENCASEMENT

A. PE Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105 PE film, 0.008-inch minimum thickness, tube or sheet.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground Storm Drainage Piping: Use the following piping materials for each size range:
   1. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.

D. Underground Storm Drainage Piping: Use the following piping materials for each size range:
   1. NPS 3 and NPS 4: Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.

      a. Couplings: Heavy-duty, Type stainless steel.

3.03 PIPING INSTALLATION

A. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.

B. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.

   1. Encase piping with PE film according to ASTM A 674 or AWWA C105.

C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.

E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

   1. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.

F. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

   1. Horizontal Storm-Drainage Piping: 1.0 percent downward in direction of flow.

I. Install engineered controlled-flow storm drainage piping in locations indicated.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Do not enclose, cover, or put piping into operation until it is inspected and approved by the inspector of record.

3.04 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

3.05 HANGER AND SUPPORT INSTALLATION

A. Refer to Section 15062 "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3: 60 inches with 1/2-inch rod.
2. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.07 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of inspector of record.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by inspector of record to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If the inspector of record finds that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.08 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 15300

FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, tools, services and miscellaneous and incidental work to complete the design engineering, and installation of a complete wet pipe sprinkler system throughout the building and Type II standpipe where shown, in accordance with this specification and NFPA 13. Sprinkler protection design shall be based on street main pressure. The sprinkler system hydraulic design point shall fall ten percent below the available supply curve.

B. The following documents, including others referenced therein, form part of this Section to the extent designated herein.

C. American Society of Mechanical Engineers (ASME)

D. American Welding Society (AWS)

D 1.1-90 Structural Welding Code – Steel

E. Factory Mutual System (FM)

1999 Edition Approval Guide

F. Federal Standards (FED STD)

FED-STD-595B Colors Used in Government Procurement

G. National Fire Protection Association (NFPA)

13 Installation of Sprinkler Systems, 2002 Edition

H. Underwriters Laboratories (UL)

I. California Building Code (CBC) 2007 "Installation of Automatic Sprinkler Systems".

1.02 SUBMITTALS

A See Division 1 for submittal procedures.

B Approval Required

1. Design/Fabricator drawings: Before fabrication, submit design, fabrication and installation drawings of the sprinkler systems. Prepare drawings under supervision of, and have submittal stamped by a licensed professional fire protection engineer.

2. The fire sprinkler system shall be DSA "Deferred Approval".

C Record drawings: Submit drawings of sprinkler systems as installed.

D NFPA test certificate: Submit completed Contractor's Material and Test Certificate in accordance with NFPA 13.

E Submit evidence of current California C-16 Contractor's license and list of comparable installations required by Section 1.03 herein.

F Submit multiple copies of catalog data sheets for all materials per Section 01300. Submittals shall include, but not be limited to, the following:

1. Sprinkler heads and accessories
2. Pipe and fittings.
3. Valves.
4. Gauges.
5. Alarm flow switches.
6. Hangers and supports.
7. Fire department connections.
8. Post indicator valves.
9. Valve supervisory switches.
10. Hose cabinets.
11. Identification signs.
12. Sprinkler head cabinets.
13. Underground piping plan.

G Submit shop drawings per Section 01330.

1. Detailed working drawings and hydraulic calculations shall be prepared and submitted for review before fabrication of the project. Working drawings shall be submitted in complete sets (partial submission will not be acceptable) and shall bear the Contractor's license stamp, identity of the system designer and computer program used in the calculation of hydraulic information.
2. Fire Marshal approval of submittals is for permission to proceed and does not authorize design, products or installation not conforming to referenced codes and standards and this specification.
3. Upon completion of the work, the contractor shall provide reproducible As-Built Drawings to the Owner's Representative as required by Section 01720 of the Project Specifications. Final approvals are subject to receipt of acceptable As-Built Drawings.
4. California State Fire Marshal (CSFM) listing numbers (alarm and supervisory devices).

H Submittals having any content which is incomplete or unclear will be returned without review.

I Discharge patterns and application data shall be included in submittals for sidewall, water curtain, and similar special purpose sprinklers.

J Operating instructions: Provide instruction charts describing operation and proper maintenance of system equipment per Section 01350.

K. Manufacturer's Data:

1. Submit a material list of items to be furnished and installed under this section.

2. Submit manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.

L. Deferred Approval Drawings:

1. Provide Deferred Approval Drawings and calculations of complete automatic fire sprinkler system, including supports, seismic restraint details, equipment and material specifications, and schedules. A minimum of 5 sets of Drawings and calculations shall be submitted to the Architect for review. Following review by the Architect, the Drawings and calculations shall be submitted to DSA. Following DSA review and approval, the Architect shall return 3 sets of the approved Drawings and calculations.

NOTE: *Refer to the Division of the State Architect's publication "AFSS Plan Review Guidelines" for specific requirements. The submittal will be checked for compliance with these guidelines prior to submittal to D.S.A.*

2. Hydraulically designed systems may be furnished when designed in accordance with the provisions of UBC STD 9.1 and 9.2. Calculations shall be based on a format acceptable to DSA. Calculations shall be performed utilizing no more than 90 percent of the minimum available water supply.

3. For hydraulically designed systems, DSA shall be given a copy of calculations with system Drawings, each signed by a State of California registered engineer. Submit 2 sets of calculations with 2 prints of the Drawings to the Architect. Following approval, corrected copies of calculations and Drawings shall be furnished to the Architect. Transmittal procedure shall then be as noted above.

4. Approval by the fire authorities may include minimum legal requirements and does not supersede more extensive requirements of the Contract Documents.

5. Deferred Approval Drawings shall be same size as the Contract Drawings. Space shall be left in lower right hand corner for insertion of Project title block by the Architect.

6. Deferred Approval Drawings shall be prepared and be signed by a licensed fire protection engineer in the State of California.

7. Installation of fire sprinkler system shall not start until approved Deferred Approval Drawings have been returned. Alignment of fire sprinklers and relationship to ceiling tile locations shall conform to reviewed Deferred Approval Drawings.

M. Record Drawings: Record drawings of installed Work shall be maintained current on the Project site, available for Fire Inspector and the IOR to review. At completion of installation, Project record drawings shall be signed by installer and delivered to the Architect.

Hydraulically designed system Drawings shall bear legible 1/4 inch minimum height notations: "HYDRAULICALLY DESIGNED SYSTEM" and "DESIGN PRESSURE: PSIG".

1.03 COORDINATION WITH OTHER TRADES

A The Contractor shall coordinate work among the trades to avoid any interference with the effectiveness of the fire protection system. Shop drawings shall include elevations of equipment and piping for other trades to assure coordination. The fire protection system shall be coordinated with other trades to assure that conflicts will not arise with structural, mechanical, electrical or architectural features of the building. Any changes required by field coordination, shall be provided and installed at no cost to the Owner.

B The Contractor shall be specifically directed to coordinate with the fire sprinkler and alarm trades to ensure full awareness of the location of all control valves, flow switches, tamper switches, and alarm and signal switches.

1.04 SYSTEM DESCRIPTION

A Design the sprinkler systems in accordance with NFPA 13 for ordinary hazard group 1 occupancy classification.

B System shall include a 6-inch alarm check valve, supplied with standard trim, including retard chamber, fire department connection, flow alarm pressure switch, system main drain valve assembly, water motor alarm gong and electrical connections..

C Components of the system, if not designated in this Section and the Drawings by manufacturer's name and model/figure number, shall be current products and be UL listed in the Fire Protection Equipment Directory or Fire Resistance Directory, or FM approved in the Approval Guide for their intended use.

1.05 QUALITY ASSURANCE

A. Product Qualification: See Division 1 for additional requirements related to product qualification and Contractor/Supplier qualifications.

B. Deliverable Documentation: The following documents and records, required by this Section, shall be delivered in accordance with Section 01720.

Document	Paragraph
Flushing Verification	3.2.B.
Hydrostatic Test Record	3.2.C.

PART - 2 PRODUCTS

2.01 SUBSTITUTES

See Division 1 for substitution.

2.02 MATERIALS

A. Piping

1. Pipe and fittings: Meet the requirements of NFPA 13. Piping shall be schedule 40 steel, and with threaded or grooved type (rubber gasketed) fittings. Rubber gasketed fittings for use with plain end pipe shall not be used.
2. Flexible couplings: Bolted sleeve type for use with grooved-end pipe, with rubber rings for sealing.

B. Reducers: One piece concentric threaded reducers, reducing tees for straight run reduction in pipe sizes or grooved type, rubber gasketed reducing couplings. Hexagonal or face busings shall not be used.

C. Identification Labels: Approximately 2 –1/4 by 14 inches, bearing the words "FIRE PROTECTION WATER", and a direction arrow approximately 2-1/4 by 7 inches. Labels shall have adhesive backing and installed per "Mechanical Identification" section.

D. Expansion Anchors

1. For concrete: Wedge type anchors: Hilti Fastening Systems "Kwik-Bolt II," or ITW-Ramset "Trubolt Wedge Anchor."
2. For filled concrete blocks: Sleeve type anchors; Hilti Fastening Systems "Hol-Hugger," or ITW-Ramset "Dynabolt Sleeve Anchor." If open cells are contacted, use toggle bolts
3. Ceiling hangers at hi-volume ceiling (library) "Epic" metal deck hanging system. . ER3.5 "Wedge Nut" hanging devices shall be installable and relocatable along the length of the interior ribs of the ER3.5A Acoustical Roof Deck units. (at gym only). Manufacturer's product data shall be consulted for minimum spacing, load capacities and proper installation procedure of the ER3.5 "Wedge Nut" hanging devices.

E. Sealant: See Section 07900.

F. Paint: See Section 09900.

G. Signs: Provide permanent "CAUTION" signs worded in accordance with NFPA 13.

H. Hydraulic design information sign: Provide a permanently marked, weatherproof metal or plastic sign, with corrosion-resistant attachments, containing information required by NFPA 13.

I. Escutcheons – Primed, steel.

2.02 EQUIPMENT

A. Water Motor Alarm Gong: Weatherproof mechanical gong with hood, complete with drain and interconnecting piping. Viking Model F-2.

B. Switches
1. Flow alarm pressure switch for installation on wet pipe sprinkler system retard chamber: Pressure operated having built-in adjustable time retard feature which may be set from 0 seconds to 1 minute or more. Retard feature shall recycle instantly and automatically, and have no build-up. Potter Electric Switch #WFSRC.
2. Flow switches installed directly on sprinkler system piping for fire zone or alarm annunciation shall be flexible vane type, with normally open contacts and instantaneous recycling retard adjustable 15 to 60 seconds.
3. Provide position supervisory switches to supervise sprinkler system control valves. Switches shall be tamperproof, alarms when cover is removed, and alarm during first 2 revolutions of valve handwheel in closing direction. Switches shall be SPDT, 120 V ac, rated for pilot duty and provided with suitable mounting hardware.

C. Automatic Sprinklers: Nominal ½-inch diameter orifices, rated for ordinary temperature classification, unless other temperature ratings are required by NFPA 13. For Computer Lab sprinklers shall be rated for 200° F. The sprinklers shall be recessed automatic type. Reliable Model G with chrome finish.
   1. Ceiling Mounted: Pendant type with natural chrome finish and adjustable chrome finish metal escutcheons.
   2. Exposed Piping: Upright except where limited space requires pendant; natural brass finish.
   3. Ceilings below 10'-0": Provide recessed type heads at all locations.

D. Sprinkler Head Guards: Formed wire or forged steel, suitable for use with upright or pendent sprinklers which can be attached or removed without disturbing sprinkler head, where heads are subject to damage or as directed by architect.

E. Sprinkler Cabinet: Provide with required number of sprinkler heads of ratings and types installed, sprinkler wrench, and mount on wall in the fire sprinkler riser room.

F. Fire Department Connection: Polished chrome finish and furnished with self-closing double clapper, plugs and chains, automatic balldrip valve, and escutcheon plate. Connection shall be 4-inch NPT by 2-1/2-inch hose thread by 1-1/2-inch hose thread. Hose threads shall be in accordance with NFPA 1963, 7-1/2 threads/in. Use Potter-Roemer Figure 5021 for vertical installation.

G. Alarm Check valve: 6-inch supplied with standard trim, including retard chamber. Grinnell Figure F2001 Alarm Valve with figure F211 Retard Chamber, Trim Type A.

PART - 3 EXECUTION

3.01 INSTALLATION

A. Install sprinkler systems in accordance with NFPA 13 for ordinary hazard occupancy classification.

B. Coordinate requirements for interruption of existing services and Fire Department stand-by with the Construction Manager.

C. Protect new piping from damage by earthquake by proper clearance around penetration holes, flexible couplings, and sway bracing, in accordance with NFPA 13.

D. Sealing Floor and Wall Penetrations

   1. Nonfire Rated.
      a. Cut minimum size hole for pipe passing through gypsum board walls. Seal both sides with polysulfide sealant.
      b. Pack pipe penetrations through concrete floors and walls with fiberglass or mineral wool packing and seal both sides with minimum 1-inch thick polysulfide sealant.
      c. Seal pipe penetrations through concrete block walls both sides to thickness of web with polysulfide sealant. Provide fiberglass or mineral wool packing as required to prevent filling void.

   2. Fire Rated
      a. Cut minimum size hole for pipe passing through gypsum board walls. Seal both sides with fire rated sealant.
      b. Seal sprinkler pipe penetrations through concrete floors and walls, and filled concrete block walls with sealant to provide a 2 or 3 hour fire resistance rating in accordance with manufacturer's test data.
      c. Seal pipe penetrations through nonfilled concrete block walls with sealant in accordance with manufacturer's test data.

E. Pipe Escutcheons: Install on sides of wall penetrations exposed to view.

F. Repair damaged surfaces. Refinish repaired or defaced surfaces to match adjacent undisturbed areas.

G. Terminate exterior discharge, inspectors test, and auxiliary drain lines with 45 degree elbows, turned down, and extending no more than 4" from wall.

H. Provide suitable splash-pads, at exterior discharge locations, on other than paved surfaces.

I. Install sprinkler head guards where subject to mechanical damage from low elevation or exposure to normal building activities.

J. Paint new system piping exposed to view, with 1 coat of zinc chromate primer and 1 coat of semigloss enamel. Finish color shall be red (No. 21105) shown in FED STD 595. Surface preparation, including cleaning and primer, shall be in accordance with Section 09900.

K. Welding

1. Limit welding to fabrication of supports or braces, if necessary. No other on site welding will be permitted, except as specified in this Section or on the Drawings.
2. Perform welding of sprinkler system piping in accordance with NFPA 13. Welding acceptance criteria shall be in accordance with ASME B31.1, Paragraph 136.4.2.
3. Perform welding of steel structural elements in accordance with AWS D1.1. Perform visual weld examination in accordance with AWSD1.1 Paragraph 6.5.5.
4. Do not perform welding or flame cutting on or within building.
5. Perform dye penetrant weld examination on cover pass of tie-in welds, not to be hydrostatically tested, in accordance with ASME B31.1 Paragraph 136.4

L. Hangers and Supports

1. Hang, support and brace sprinkler system piping from building structural steel members, concrete surfaces, or to metal supports attached to building structure or concrete surfaces in accordance with NFPA 13.
2. Use clamping devices when attaching to structural steel. When clamping is impossible, obtain written authority to weld, punch, drill or cut structural steel members to provide attachment.
3. When required, deliver to the Construction Manager detailed mathematical analysis, by registered professional engineer, of structural integrity where questionable alteration of building structural components are proposed. Analysis may also be required where obvious deformation of structural members are caused by hanging sprinkler piping.

M. Identification Labels

1. Install labels after painting is completed.
2. Locate labels on pipe where they can be easily read. Place labels on bottom quadrant of overhead pipe and top quadrant of pipe lower than eye level.
3. Identify only feed mains, cross mains, and risers 3-inch nominal diameter and larger.
4. Locate line identification at intervals of approximately 40 feet on unobstructed runs, and on each side of partitions and floors.

N. Signs

1. Install "CAUTION" signs at control, drain, test, and alarm valves.
2. Install the hydraulic design information sign, placed in accordance with NFPA 13.
3. Electrical Connections – To be completed per 2007 CEC.

3.02 FIELD QUALITY

A. General
1. Furnish equipment and instruments required to perform flushing and testing operations described below.
2. Conduct flushing and testing operations while witnessed by the Inspector of Record. Manager.
3. Remove and replace pieces of apparatus, material, or work which falls in flushing or testing operations and retest.
4. Repair damage resulting from flushing or testing to satisfaction of the Construction Manager.

B. Flusihing: Flush new sprinkler system piping as described below.

1. Flush sprinkler piping by feeding water into the system through the alarm valve in accordance with NFPA 13.
2. Discharge flushing water from end of cross mains.
3. Discharge flushing water to point designated by the Construction Manager. Flushing shall continue until effluent runs clear and free of foreign matter.
4. Provide documented evidence that flushing has been accomplished in accordance with this Section. Deliver to the Construction Manager before testing.

C. Hydrostatic Testing

1. Hydrostatically test the new sprinkler system in accordance with NFPA 13.
2. Use a hydrostatic test pressure of 200 ib/in ^{2} minimum.
3. Leaks in piping will not be acceptable.

D. Backflow prevention assembly test: Testing shall be at the time of installation, by a State of California, Department of Health Certified Backflow Assembly Tester.

E. Provide two NFPA certificates to the owner, local fire official, and DSA.

END OF SECTION 15300

SECTION 15410

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes plumbing fixtures and related components.

B. Related Sections include the following:

1. Division 15 Section "Drinking Fountains"
2. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

1.03 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities, as per CBC Section 1115B.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated, as per CBC Table 1115b-1 and Section 1118B.

1.04 SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Hand Sinks: NSF 2 construction.
3. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
4. Slip-Resistant Bathing Surfaces: ASTM F 462.
5. Vitreous-China Fixtures: ASME A112.19.2M.
6. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

I. Comply with the following applicable standards and other requirements specified for lavatory faucets:

1. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
2. Faucet Hose: ASTM D 3901.
3. Faucets: ASME A112.18.1M.
4. Hose-Connection Vacuum Breakers: ASSE 1011.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
7. NSF Materials: NSF 61.
8. Pipe Threads: ASME B1.20.1.
9. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
10. Supply and Drain Fittings: ASME A112.18.1M.

J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1M.

3. Manual-Operation Flushometers: ASSE 1037.
4. Plastic Tubular Fittings and Piping: ASTM F 409.
5. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
6. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.

K. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Floor Drains: ASME A112.21.1M.
3. Grab Bars: ASTM F 446.
4. Hose-Coupling Threads: ASME B1.20.7.
5. Hot-Water Dispensers: ASSE 1023 and UL 499.
6. Off-Floor Fixture Supports: ASME A112.6.1M.
7. Pipe Threads: ASME B1.20.1.
8. Plastic Shower Receptors: ANSI Z124.2.
9. Plastic Toilet Seats: ANSI Z124.5.
10. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.06 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Faucet, Laminar-Flow Fittings: Equal to 10 percent of amount of each type and size installed, but not less than 2 of each type and size.
4. Faucet, Flow-Control Fittings: Equal to 10 percent of amount of each type and size installed.
5. Supply, Flow-Control Fittings: Equal to 5 percent of amount of each type and size installed.
6. Shower, Flow-Control Fittings: Equal to 5 percent of amount of each type and size installed.
7. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but not less than 12 of each type.
8. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
9. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. For fixture descriptions in other Part 2 articles where the subparagraph titles manufacturers introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified in other Part 2 articles.

2.02 LAVATORY FAUCETS: See Fixture Schedule on Drawing P0.1

2.03 FLUSHOMETERS: See Fixture Schedule on Drawing P0.1

2.04 TOILET SEATS: See Fixture Schedule on Drawing P0.1

2.05 PROTECTIVE SHIELDING GUARDS: See Fixture Schedule on Drawing P0.1

2.06 FIXTURE SUPPORTS: See Fixture Schedule on Drawing P0.1

2.07 WATER CLOSETS: See Fixture Schedule on Drawing P0.1

2.08 URINALS: See Fixture Schedule on Drawing P0.1

2.09 LAVATORIES: See Fixture Schedule on Drawing P0.1

2.10 SERVICE SINKS: See Fixture Schedule on Drawing P0.1

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

R. Install disposer in outlet of sinks indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

S. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

T. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.03 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.05 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.06 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.07 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 15415

DRINKING FOUNTAINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Drinking fountains.
   2. Fixture supports.

1.03 DEFINITIONS

A. Accessible Drinking Fountain: Fixture that can be approached and used by people with disabilities.

B. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.

C. Fitting: Device that controls flow of water into or out of fixture.

D. Fixture: Drinking fountain or water cooler, unless one is specifically indicated.

1.04 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of fixture indicated.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

C. Maintenance Data: For fixtures to be included in maintenance manuals as described in Division 1.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" Public Law 101-336, “Americans with Disabilities Act”; about fixtures for people with disabilities.

B. Regulatory Requirements: Comply with requirements in the U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

1.06 COORDINATION

A. Coordinate roughing-in and final fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acorn Aqua, Haws or equal.

2.02 DRINKING FOUNTAINS: See Fixture Schedule on Drawing P-0.1

2.03 FIXTURE SUPPORTS

A. Off-Floor, Plumbing Fixture Supports: ASME A112.6.1M, carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.

1. Manufacturers:

   a. Smith, Jay R. Mfg. Co.
   b. Tyler Pipe; Wade Div.
   c. Watts Industries, Inc.; Enpoco, Inc. Div.
   d. Watts Industries, Inc.; Watts Drainage Products Div.
   e. Zurn Specifications Drainage Operation.

2. Type I: Hanger-type carrier with two vertical uprights.
3. Type II: Bilevel, hanger-type carrier with three vertical uprights.
4. Supports for Accessible Fixtures: Rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Use carrier off-floor supports for wall-hanging fixtures, unless otherwise indicated.

B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.03 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.

B. Install fixtures level and plumb.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation.

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install pipe escutcheons at wall penetrations in exposed, locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

F. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Section 15430 "Joint Sealants" for sealant and installation requirements.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 FIELD QUALITY CONTROL

A. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

B. Report test results in writing.

3.06 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

3.07 CLEANING

A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

END OF SECTION

SECTION 15485

ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following electric water heaters:

1. Household, small-capacity electric water heaters.
2. Household, storage electric water heaters.
3. Household, collector-to-tank, solar-electric water heaters.
4. Household, collector-to-tank, heat-exchanger-coil, solar-electric water heaters.
5. Flow-control, instantaneous electric water heaters.
6. Thermostat-control, instantaneous electric water heaters.
7. Light-commercial electric water heaters.
8. Commercial electric booster heaters.
9. Commercial, storage electric water heaters.
10. Compression tanks.
11. Water heater accessories.

1.03 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Product Certificates: For each type of **[commercial]** **[and]** **[instantaneous]** electric water heater, signed by product manufacturer.

D. Manufacturer Seismic Qualification Certification: Submit certification that commercial water heaters, accessories, and components will withstand seismic forces defined in Division 15 Section "Mechanical Vibration and Seismic Controls." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Source quality-control test reports.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.05 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:

a. Household Electric Water Heaters:

1) Storage Tank: **[Five] [Six] [10] <Insert number>** years.
2) Controls and Other Components: **[Two] [Three] <Insert number>** years.

b. Instantaneous Electric Water Heaters: **[One] [Two] [Five] <Insert number>** year(s).
c. Light-Commercial Electric Water Heaters:

1) Storage Tank: **[Three] [Five] <Insert number>** years.
2) Controls and Other Components: **[Two] [Three] <Insert number>** years.

d. Commercial Electric Water Heaters:

1) Storage Tank: **[Three] [Five] <Insert number>** years.
2) Controls and Other Components: **[Three] [Five] <Insert number>** years.

e. Compression Tanks: **[One] <Insert number>** year(s).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 HOUSEHOLD ELECTRIC WATER HEATERS

A. Household, Small-Capacity Electric Water Heaters: Comply with UL 174.

1. **[Available]**Manufacturers:

a. American Water Heater Company.
b. Bradford White Corporation.
c. Controlled Energy Corporation.
d. Electric Heater Company (The); Hubbell Heaters Division.
e. GSW Water Heating Company.
f. In-Sink-Erator Div.; Emerson Electric Co.
g. Lochinvar Corporation.
h. Rheem Water Heater Div.; Rheem Manufacturing Company.
i. Ruud Water Heater Div.; Rheem Manufacturing Company.
j. Smith, A. O. Water Products Company.
k. **<Insert manufacturer's name.>**

2. Storage-Tank Construction: Corrosion-resistant metal **[or steel with corrosion-resistant coating]**.

a. Tappings: ASME B1.20.1 pipe thread.

b. Pressure Rating: 150 psig (1035 kPa).
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Drain Valve: ASSE 1005, if tank has drain outlet. Provide hose-end drain valve in piping for water heaters without drain outlet. Hose-end drain valves are specified in Division 15 Section "Plumbing Specialties."
b. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
c. Jacket: Steel with enameled finish.
d. Heating Element: Electric, screw-in immersion type.
e. Temperature Control: Adjustable thermostat.
f. Safety Control: High-temperature-limit cutoff device or system.
g. Power Supply Cord: 24 to 72 inches (610 to 1830 mm) with plug.
h. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

4. Capacity and Characteristics:

a. Capacity: <**Insert** gal. (L).>
b. Recovery: <**Insert** gph (L/s)> at [100 deg F (56 deg C)] <**Insert** deg F (deg C)> temperature rise.
c. Heating Element:

1) Number: One.
2) Power Demand: <**Insert kilowatt.**>

d. Temperature Setting: [125 deg F (52 deg C)] <**Insert temperature**>.
e. Electrical Characteristics:

1) Total Power Demand: <**Insert kilowatt.**>
2) Volts: [**120**] [**240**] <**Insert value**>.
3) Phases: Single.
4) Hertz: 60.
5) Full-Load Amperes: <**Insert value.**>
6) Minimum Circuit Ampacity: <**Insert value.**>
7) Maximum Overcurrent Protection: <**Insert value.**>

B. Household, [**Standard**] [**Tabletop**], Storage Electric Water Heaters: Comply with UL 174.

1. [**Available**]Manufacturers:

a. American Water Heater Company.
b. Bradford White Corporation.
c. Electric Heater Company (The); Hubbell Heaters Division.
d. GSW Water Heating Company.
e. Heat Transfer Products, Inc.
f. HESco Industries, Inc.
g. Lochinvar Corporation.
h. Maytag Corp.; Water Heating Appliances Div.
i. Rheem Water Heater Div.; Rheem Manufacturing Company.

j. Ruud Water Heater Div.; Rheem Manufacturing Company.
k. Smith, A. O. Water Products Company.
l. State Industries, Inc.
m. Vaughn Manufacturing Corporation.
n. **<Insert manufacturer's name.>**

2. Storage-Tank Construction: Steel.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig (1035 kPa).
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
c. Drain Valve: ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
e. Jacket: Steel with enameled finish.

1) Standard: Cylindrical shape.
2) Tabletop: Rectangular shape, with flat-top work surface and raised back.

f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
g. Heating Elements: Two; electric, screw-in immersion type with 12 kW or less total, and wired for nonsimultaneous operation, unless otherwise indicated.
h. Temperature Control: Adjustable thermostat for each element.
i. Safety Control: High-temperature-limit cutoff device or system.
j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

4. Capacity and Characteristics:

a. Capacity: **<Insert** gal. (L).**>**
b. Recovery: **<Insert** gph (L/s)**>** at [100 deg F (56 deg C)] **<Insert** deg F (deg C)**>** temperature rise.
c. Jacket: **[Cylindrical]** [**Tabletop, rectangular**] shape.
d. Heating Elements:

1) Number: Two.
2) Power Demand Each: **<Insert kilowatt.>**

e. Temperature Setting: [125 deg F (52 deg C)] **<Insert temperature>**.
f. Electrical Characteristics:

1) Total Power Demand: **<Insert kilowatt.>**
2) Volts: **[120]** [**240**] **<Insert value>**.
3) Phases: **[Single]** [**Three**].
4) Hertz: 60.
5) Full-Load Amperes: **<Insert value.>**
6) Minimum Circuit Ampacity: **<Insert value.>**

7) Maximum Overcurrent Protection: **<Insert value.>**

C. Household, Collector-to-Tank, Solar-Electric Water Heaters: Comply with UL 174 with piping and electrical connections for UL 1279 solar collector system.

1. **[Available]**Manufacturers:

a. American Water Heater Company.
b. Bradford White Corporation.
c. Rheem Water Heater Div.; Rheem Manufacturing Company.
d. Ruud Water Heater Div.; Rheem Manufacturing Company.
e. **<Insert manufacturer's name.>**

2. Storage-Tank Construction: Steel.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig (1035 kPa).
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Sensor electrical connections and tank stud for sensor.
b. Anode Rod: Replaceable magnesium.
c. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
d. Drain Valve: ASSE 1005.
e. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
f. Jacket: Steel with enameled finish.
g. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
h. Heating Element: One; electric, screw-in immersion type with 6 kW or less.
i. Temperature Control: Adjustable thermostat for each element.
j. Safety Control: High-temperature-limit cutoff device or system.
k. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

4. Capacity and Characteristics:

a. Capacity: **<Insert** gal. (L).**>**
b. Recovery: **<Insert** gph (L/s)**>** at **[**100 deg F (56 deg C)**]** **<Insert** deg F (deg C)**>** temperature rise.
c. Heating Element:

1) Number: One.
2) Power Demand: **<Insert kilowatt.>**

d. Temperature Setting: **[**125 deg F (52 deg C)**]** **<Insert temperature>**.
e. Electrical Characteristics:

1) Total Power Demand: **<Insert kilowatt.>**
2) Volts: **[120] [240]** **<Insert value>**.
3) Phases: **[Single] [Three]**.
4) Hertz: 60.

5) Full-Load Amperes: <**Insert value.**>
6) Minimum Circuit Ampacity: <**Insert value.**>
7) Maximum Overcurrent Protection: <**Insert value.**>

D. Household, Collector-to-Tank, Heat-Exchanger-Coil, Solar-Electric Water Heaters: Comply with UL 174 with integral coil-type heat exchanger.

1. [**Available**]Manufacturers:

a. Alternate Energy Technologies, LLC.
b. Electric Heater Company (The); Hubbell Heaters Division.
c. Therma-Flow/Everhot.
d. Vaughn Manufacturing Corporation.
e. <**Insert manufacturer's name.**>

2. Storage-Tank Construction: Steel.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig (1035 kPa).
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
c. Drain Valve: ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
e. Jacket: Steel with enameled finish.
f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
g. Heat Exchanger: Corrosion-resistant-metal immersion coil.
h. Heating Element: One; electric, screw-in immersion type with 6 kW or less.
i. Temperature Control: Adjustable thermostat for each element.
j. Safety Control: High-temperature-limit cutoff device or system.
k. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

4. Capacity and Characteristics:

a. Capacity: <**Insert** gal. (L).>
b. Recovery: <**Insert** gph (L/s)> at [100 deg F (56 deg C)] <**Insert** deg F (deg C)> temperature rise.
c. Heating Element:

1) Number: One.
2) Power Demand: <**Insert kilowatt.**>

d. Heat-Exchanger Coil Surface: <**Insert** sq. ft. (sq. m).>
e. Temperature Setting: [125 deg F (52 deg C)] <**Insert temperature**>.
f. Electrical Characteristics:

1) Total Power Demand: <**Insert kilowatt.**>

2) Volts: [**120**] [**240**] <**Insert value**>.
3) Phases: [**Single**] [**Three**].
4) Hertz: 60.
5) Full-Load Amperes: <**Insert value.**>
6) Minimum Circuit Ampacity: <**Insert value.**>
7) Maximum Overcurrent Protection: <**Insert value.**>

2.03 INSTANTANEOUS ELECTRIC WATER HEATERS

A. Flow-Control, Instantaneous Electric Water Heaters: Comply with UL 499 for tankless electric (water heater) heating appliance.

1. [**Available**]Manufacturers:

a. Chronomite Laboratories, Inc.
b. Controlled Energy Corporation.
c. Eemax, Inc.
d. Hot Aqua, Inc.
e. IMI Waterheating, Ltd.
f. Stiebel Eltron, Inc.
g. <**Insert manufacturer's name.**>

2. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.

a. Connections: ASME B1.20.1 pipe thread.
b. Pressure Rating: [150 psig (1035 kPa)] <**Insert psig (kPa)**>.
c. Heating Element: Resistance heating system.
d. Temperature Control: Flow-control fitting.
e. Safety Control: High-temperature-limit cutoff device or system.
f. Jacket: Aluminum or steel with enameled finish or plastic.

3. Support: Bracket for wall mounting.
4. Capacity and Characteristics:

a. Temperature Control: Flow-control fitting.

1) Flow-Control Fitting: <**Insert** gpm (L/s).>
2) Water Temperature Rise: <**Insert** deg F (deg C).>

b. Electrical Characteristics:

1) Power Demand: <**Insert kilowatt.**>
2) Volts: [**120**] [**240**] [**277**] [**480**] <**Insert value**>.
3) Phases: [**Single**] [**Three**].
4) Hertz: 60.
5) Full-Load Amperes: <**Insert value.**>
6) Minimum Circuit Ampacity: <**Insert value.**>
7) Maximum Overcurrent Protection: <**Insert value.**>

B. Thermostat-Control, Instantaneous Electric Water Heaters: Comply with UL 499 for tankless electric (water heater) heating appliance.

1. [**Available**]Manufacturers:

a. Chronomite Laboratories, Inc.
b. IMI Waterheating, Ltd.
c. Keltech, Inc.
d. Niagara Industries, Inc.
e. **<Insert manufacturer's name.>**

2. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.

a. Connections: ASME B1.20.1 pipe thread.
b. Pressure Rating: [150 psig (1035 kPa)] **<Insert psig (kPa)>**.
c. Heating Element: Resistance heating system.
d. Temperature Control: Thermostat.
e. Safety Control: High-temperature-limit cutoff device or system.
f. Jacket: Aluminum or steel with enameled finish or plastic.

3. Support: Bracket for wall mounting.
4. Capacity and Characteristics:

a. Temperature Control: Adjustable thermostat.

1) Flow Rate: **<Insert gpm (L/s) minimum.>**
2) Temperature Setting: **<Insert deg F (deg C).>**

b. Electrical Characteristics:

1) Power Demand: **<Insert kilowatt.>**
2) Volts: [**120**] [**240**] [**277**] [**480**] **<Insert value>**.
3) Phases: [**Single**] [**Three**].
4) Hertz: 60.
5) Full-Load Amperes: **<Insert value.>**
6) Minimum Circuit Ampacity: **<Insert value.>**
7) Maximum Overcurrent Protection: **<Insert value.>**

2.04 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS

A. Description: Comply with UL 174 for household, storage electric water heaters.

1. [**Available**]Manufacturers:

a. American Water Heater Company.
b. Bradford White Corporation.
c. Electric Heater Company (The); Hubbell Heaters Division.
d. GSW Water Heating Company.
e. Heat Transfer Products, Inc.
f. Lochinvar Corporation.
g. Rheem Water Heater Div.; Rheem Manufacturing Company.
h. Ruud Water Heater Div.; Rheem Manufacturing Company.
i. Smith, A. O. Water Products Company.
j. State Industries, Inc.
k. **<Insert manufacturer's name.>**

2. Storage-Tank Construction: Steel, vertical arrangement.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig (1035 kPa).
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
c. Drain Valve: ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
e. Jacket: Steel with enameled finish.
f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
h. Temperature Control: Adjustable thermostat for each element.
i. Safety Control: High-temperature-limit cutoff device or system.
j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

4. Special Requirements: NSF 5 construction with legs for off-floor installation.
5. Capacity and Characteristics:

a. Capacity: <**Insert** gal. (L).>
b. Recovery: <**Insert** gph (L/s)> at [100 deg F (56 deg C)] <**Insert** deg F (deg C)> temperature rise.
c. Heating Elements: <**Insert kilowatt**> each.
d. Temperature Setting: [125 deg F (52 deg C)] [140 deg F (60 deg C)] <**Insert** deg F (deg C)>.
e. Electrical Characteristics:

1) Power Demand: <**Insert kilowatt.**>
2) Volts: **[120] [240]** [277] [480] <**Insert value**>.
3) Phases: **[Single] [Three]**.
4) Hertz: 60.
5) Full-Load Amperes: <**Insert value.**>
6) Minimum Circuit Ampacity: <**Insert value.**>
7) Maximum Overcurrent Protection: <**Insert value.**>

2.05 COMMERCIAL ELECTRIC WATER HEATERS

A. Commercial Electric Booster Heaters: Comply with UL 1453 requirements for booster-type water heaters.

1. [**Available**]Manufacturers:

a. Bradford White Corporation.
b. Coates Heater Co.
c. Electric Heater Company (The); Hubbell Heaters Division.
d. Hatco Corporation.
e. Lochinvar Corporation.

f. Rheem Water Heater Div.; Rheem Manufacturing Company.
g. Ruud Water Heater Div.; Rheem Manufacturing Company.
h. Smith, A. O. Water Products Company.
i. **<Insert manufacturer's name.>**

2. Storage-Tank Construction: **[Corrosion-resistant metal] [Corrosion-resistant metal or steel] [Steel]**.

   a. Tappings: ASME B1.20.1 pipe thread.
   b. Pressure Rating: 150 psig (1035 kPa).
   c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

   a. Anode Rod: Replaceable magnesium.
   b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
   c. Insulation: Comply with ASHRAE/IESNA 90.1.
   d. Jacket: Rectangular shaped, with stainless-steel front panel, unless otherwise indicated.
   e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.

      1) Option: Booster heaters with 9 kW or less total may have 2 or 3 elements.
      2) Staging: Input not exceeding **[18 kW] <Insert kW>** per step.

   f. Temperature Control: Adjustable thermostat, to setting of at least 180 deg F (82 deg C).
   g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
   h. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3, combination temperature and pressure relief valve. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
   i. Gages: Combination temperature and pressure type or separate thermometer and pressure gage.

4. Special Requirements: NSF 5 construction with **[brackets for undercounter] [legs for floor]** installation.
5. Capacity and Characteristics:

   a. Capacity: **<Insert** gal. (L).>
   b. Recovery: **<Insert** gph (L/s)> at [40 deg F (22 deg C)] [50 deg F (28 deg C)] [100 deg F (56 deg C)] **<Insert** deg F (deg C)> temperature rise.
   c. Temperature Setting: [140 deg F (60 deg C)] [180 deg F (82 deg C)] **<Insert** deg F (deg C)>.
   d. Number of Heating Elements: **[Two] [Three] [Six] [Nine] <Insert number>**.

      1) Number of Stages: **[One] [Two] [Three] [Four] <Insert number>**.
      2) Kilowatt per Stage: **<Insert kilowatt.>**

   e. Electrical Characteristics:

      1) Power Demand: **<Insert kilowatt.>**
      2) Volts: **[120] [240] [277] [480] <Insert value>**.

3) Phases: **[Single] [Three]**.
4) Hertz: 60.
5) Full-Load Amperes: **<Insert value.>**
6) Minimum Circuit Ampacity: **<Insert value.>**
7) Maximum Overcurrent Protection: **<Insert value.>**

B. Commercial, Storage Electric Water Heaters: Comply with UL 1453 requirements for storage-tank-type water heaters.

1. **[Available]**Manufacturers:

a. American Water Heater Company.
b. Bock Water Heaters, Inc.
c. Bradford White Corporation.
d. Cemline Corporation.
e. Electric Heater Company (The); Hubbell Heaters Division.
f. GSW Water Heating Company.
g. HESco Industries, Inc.
h. Lochinvar Corporation.
i. Precision Boilers.
j. PVI Industries, LLC.
k. RECO USA.
l. Rheem Water Heater Div.; Rheem Manufacturing Company.
m. Ruud Water Heater Div.; Rheem Manufacturing Company.
n. Smith, A. O. Water Products Company.
o. State Industries, Inc.
p. Vaughn Manufacturing Corporation.
q. **<Insert manufacturer's name.>**

2. Storage-Tank Construction: **[ASME]** **[Non-ASME]**-code, steel **[horizontal]** **[vertical]** arrangement.

a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.

1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

b. Pressure Rating: **[150 psig (1035 kPa)] <Insert psig (kPa)>**.
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
c. Insulation: Comply with ASHRAE/IESNA 90.1.
d. Jacket: Steel with enameled finish.
e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.

1) Staging: Input not exceeding **[18 kW] <Insert kW>** per step.

f. Temperature Control: Adjustable thermostat.
g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
h. Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3, for combination temperature and pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

4. Special Requirements: NSF 5 construction.
5. Energy Management System Interface: Normally closed dry contacts for enabling and disabling water heater.
6. Capacity and Characteristics:

a. Capacity: <**Insert** gal. (L).>
b. Recovery: <**Insert** gph (L/s)> at [40 deg F (22 deg C)] [50 deg F (28 deg C)] [100 deg F (56 deg C)] <**Insert** deg F (deg C)> temperature rise.
c. Temperature Setting: [140 deg F (60 deg C)] [180 deg F (82 deg C)] <**Insert** deg F (deg C)>.
d. Number of Heating Elements: [**Two**] [**Three**] [**Six**] [**Nine**] <**Insert number**>.

1) Number of Stages: [**One**] [**Two**] [**Three**] [**Four**] <**Insert number**>.
2) Kilowatt per Stage: <**Insert kilowatt.**>

e. Electrical Characteristics:

1) Power Demand: <**Insert kilowatt.**>
2) Volts: [**120**] [**240**] [**277**] [**480**] <**Insert value**>.
3) Phases: [**Single**] [**Three**].
4) Hertz: 60.
5) Full-Load Amperes: <**Insert value.**>
6) Minimum Circuit Ampacity: <**Insert value.**>
7) Maximum Overcurrent Protection: <**Insert value.**>

2.06 COMPRESSION TANKS

A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

1. [**Available**]Manufacturers:

a. AMTROL Inc.
b. Armstrong Pumps, Inc.
c. Flexcon Industries.
d. Honeywell Sparco.
e. Myers, F. E.; Pentair Pump Group (The).
f. Smith, A. O.; Aqua-Air Div.
g. State Industries, Inc.
h. Taco, Inc.
i. Watts Regulator Co.
j. Wessels Co.
k. <**Insert manufacturer's name.**>

2. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

3. Capacity and Characteristics:

a. Working-Pressure Rating: [100 psig (690 kPa)] [150 psig (1035 kPa)] **<Insert psig (kPa)>**.
b. Capacity Acceptable: [2 gal. (7.6 L)] [4 gal. (15.1 L)] [7 gal. (26.5 L)] [10 gal. (37.9 L)] **<Insert volume>** minimum.
c. Air Precharge Pressure: **<Insert system pressure.>**

2.07 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than water heater working-pressure rating.

C. Water Heater Stand and Drain-Pan Units: High-density-polyethylene-plastic, 18-inch- (457-mm-) high, enclosed-base stand complying with IAPMO PS 103 and IAS No. 2. Include integral or separate drain pan with raised edge and NPS 1 (DN 25) drain outlet with ASME B1.20.1 pipe thread.

D. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.

E. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

F. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN 20).

G. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that are capable of isolating each water heater and of providing balanced flow through each water heater.

H. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

I. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig- (172.5-kPa-) maximum outlet pressure, unless otherwise indicated.

J. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

2.08 SOURCE QUALITY CONTROL

A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test[**commercial**] water heater storage tanks before shipment to minimum of one and one-half times pressure rating.

C. Prepare test reports.

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.

1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
2. Concrete base construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install seismic restraints for[**light-commercial and**] commercial water heaters. Anchor to substrate.

D. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install[**combination temperature and**] pressure relief valves in water piping for water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 15 Section "Plumbing Specialties" for hose-end drain valves.

G. Install thermometer on outlet piping of water heaters. Refer to Division 15 Section "Meters and Gages" for thermometers.

H. Install thermometers on inlet and outlet piping of household, collector-to-tank, solar-electric water heaters. Refer to Division 15 Section "Meters and Gages" for thermometers.

I. Install pressure gage(s) on[**inlet and**] outlet of commercial electric water- heater piping. Refer to Division 15 Section "Meters and Gages" for pressure gages.

J. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet. Refer to Division 15 Section "Valves" for general-duty valves and to Division 15 Section "Meters and Gages" for thermometers.

K. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.

L. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

M. Fill water heaters with water.

N. Charge compression tanks with air.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 16 Section "Grounding and Bonding."

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect[, **test, and adjust**] field-assembled components and equipment installation, including connections[, **and to assist in field testing**]. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain [**commercial**] [**and**] [**instantaneous**] electric water heaters. Refer to Division 1 Section "[**Closeout Procedures**] [**Demonstration and Training**]."

END OF SECTION 15485

SECTION 15738

SPLIT-SYSTEM AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.03 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Units shall be designed to operate with HCFC-free refrigerants.

1.05 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Roof Accessories."

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.
2. Fan Belts: One set of belts for each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

1. Carrier Air Conditioning; Div. of Carrier Corporation.
2. Trane Company (The); Unitary Products Group.
3. York International Corp.

2.02 CONCEALED EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

1. Insulation: Faced, glass-fiber duct liner.
2. Drain Pans: Galvanized steel, with connection for drain; insulated.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Fan Motors: Comply with requirements in Division 15 Section "Motors."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Disposable Filters: 1 inch (25 mm) thick, in fiberboard frames.

F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.03 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Scroll.
2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
3. Refrigerant Charge: R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).

H. Mounting Base: Polyethylene.

2.04 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install units level and plumb.

B. Install ground-mounting, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base; 4 inches (100 mm) larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

C. Install roof-mounting compressor-condenser components on equipment supports specified in Division 7 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Install seismic restraints.

E. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch (25 mm). Refer to Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."

F. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Duct Connections: Duct installation requirements are specified in Division 15 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 15 Section "Duct Accessories."

D. Ground equipment according to Division 16 Section "Grounding and Bonding."

E. Electrical Connections: Comply with requirements in Division 16 Sections for power wiring, switches, and motor controls.

3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section "Closeout Procedures Demonstration and Training."

END OF SECTION

SECTION 15815

METAL DUCTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1.04 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.

2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

D. Welding certificates.

E. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

PART 2 - PRODUCTS

2.01 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.02 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

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

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.03 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

2.04 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

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

    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Owens Corning.
    d. Maximum Thermal Conductivity:

        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm (12.7 m/s) or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch (2.4-mm) diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.05 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.06 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.07 SEISMIC-RESTRAINT DEVICES

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

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Mason Industries.
5. TOLCO; a brand of NIBCO INC.
6. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by the Office of Statewide Health Planning and Development for the State of California.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.01 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

J. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 15 Section "Duct Accessories" for fire and smoke dampers.

K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.02 SEAM AND JOINT SEALING

A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.

1. For static-pressure classes 1- and 1/2-inch wg (250 and 125 Pa), comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class C, except as follows:
   a. Ducts that are located directly in zones they serve.
   b. Return-air ceiling plenums.

3.03 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.04 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
2. Brace a change of direction longer than 12 feet (3.7 m).

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by the Office of Statewide Health Planning and Development for the State of California.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.05 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 15 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.06 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

B. Finish for exposed ducts: See Division 9 "Painting".

3.07 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual."
2. Test the following systems:

    a. Supply air.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before insulation application.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.08 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 15 Section "Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.09 DUCT SCHEDULE

A. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

B. Liner:

1. Supply- and Return-Air Ducts: Fibrous glass, Type I, 1 inch (25 mm) thick.

C. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Velocity 1000 fpm (5 m/s) or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm (7.6 m/s) or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.

D. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

   a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
   c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

SECTION 15820

DUCT ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Duct-mounted access doors.
4. Flexible connectors.
5. Duct accessory hardware.

B. Related Sections:

1. Division 15 Section "Intake and Relief Ventilators" for roof-mounted ventilator caps.

1.03 SUBMITTALS

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

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

D. Source quality-control reports.

E. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.02 BACKDRAFT DAMPERS

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

1. Air Balance Inc.; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm (10 m/s).

D. Maximum System Pressure: 1-inch wg (0.25 kPa).

E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners.

F. Blades: Center-pivoted, maximum 6-inch (150-mm) width, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Felt.

I. Blade Axles:

1. Material: Nonferrous metal.
2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Aluminum.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Front of rear screens.
6. 90-degree stops.

N. Sleeve: Minimum 20-gage (1.0-mm) thickness.

2.03 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

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

   a. Air Balance Inc.; a division of Mestek, Inc.
   b. McGill AirFlow LLC.
   c. Ruskin Company.

2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:

   a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch (1.62 mm) thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.04 FLANGE CONNECTORS

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

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.05 DUCT-MOUNTED ACCESS DOORS

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

1. Ductmate Industries, Inc.
2. Greenheck Fan Corporation.
3. McGill AirFlow LLC.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel.
   d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

   a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches.
   d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

2.06 FLEXIBLE CONNECTORS

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

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.07 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install

dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Downstream from manual volume dampers, control dampers, and equipment.
3. At each change in direction and at maximum 50-foot (15-m) spacing.
4. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

J. Label access doors according to Division 15 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. Install duct test holes where required for testing and balancing purposes.

3.02 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.

END OF SECTION

SECTION 15838

POWER VENTILATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.

1.03 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.04 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.

4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.07 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.08 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.01 CENTRIFUGAL ROOF VENTILATORS

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

1. Loren Cook Company
2. Greenheck.
3. Penn Ventilation.

B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

E. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.

F. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

G. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches (300 mm).
3. Pitch Mounting: Manufacture curb for roof slope.
4. Metal Liner: Galvanized steel.

2.02 MOTORS

A. Enclosure Type: Totally enclosed, fan cooled.

2.03 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 7 Section "Roof Accessories" for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 15 Section "Mechanical Identification."

3.02 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 16 Section "Grounding and Bonding."

D. Connect wiring according to Division 16 Section "Conduit and Wire."

3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.

7. Verify lubrication for bearings and other moving parts.
8. Verify that manual volume control dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.04 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 15855

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.03 SUBMITTALS

A. Product Data: For each product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 GRILLES AND REGISTERS

A. Adjustable Bar Grille:

1. Manufacturers:

   a. Titus.
   b. Anemostat; a Mestek Company.
   c. Krueger.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Adjustable horizontal spaced 1/2 inch (13 mm) apart.
5. Rear Blade Arrangement: Adjustable vertical spaced 1/2 inch (13 mm) apart.
6. Frame: 1-1/4 inches (32 mm) wide.
7. Mounting: Countersunk screw.
8. Accessories: Front-blade gang operator.

2.03 CEILING DIFFUSER OUTLETS

A. Louver Face Diffuser:

1. Manufacturers:

   a. Titus.
   b. Anemostat; a Mestek Company.
   c. Price Industries.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Size: See Schedule.
5. Mounting: Surface with beveled frame.
6. Pattern: Four-way, core style.
7. Accessories:

   a. Square to round neck adaptor.
   b. Adjustable pattern vanes.
   c. Plaster ring.

2.04 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.03 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 15856

INTAKE AND RELIEF VENTILATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following types of roof-mounting intake and relief ventilators:

1. Roof hoods.

B. Related Sections include the following:

1. Division 15 Section "Power Ventilators" for roof-mounting exhaust fans.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Intake and relief ventilators shall be capable of withstanding the effects of gravity loads, wind loads, seismic loads, and thermal movements without permanent deformation of components, noise or metal fatigue, or permanent damage to fasteners and anchors.

1.04 SUBMITTALS

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

B. Shop Drawings: For intake and relief ventilators. Include plans, elevations, sections, details, and ventilator attachments to curbs and curb attachments to roof structure.

C. Coordination Drawings: Roof framing plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members to which roof curbs and ventilators will be attached.
2. Sizes and locations of roof openings.

D. Samples for Verification: For each type of exposed finish required for intake and relief ventilators.

E. Welding certificates.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain ventilators through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of intake and relief ventilators and are based on the specific equipment indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

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

1. AWS D1.2, "Structural Welding Code--Aluminum."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.06 COORDINATION

A. Coordinate installation of roof curbs and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 ROOF HOODS

A. Manufacturers:

1. Loren Cook Company.
2. Greenheck.
3. Penn Ventilation.

B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 5-6 and 5-7.

C. Materials: Galvanized-steel sheet, minimum 0.064-inch- (1.62-mm-) thick base and 0.040-inch- (1.0-mm-) thick hood; suitably reinforced.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches (300 mm).

E. Bird Screening: Galvanized-steel, 1/2-inch- (12.7-mm-) square mesh, 0.041-inch (1.04-mm) wire.

F. Galvanized-Steel Sheet Finish:

1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install intake and relief ventilators level, plumb, and at indicated alignment with adjacent work.

B. Secure intake and relief ventilators to roof curbs with cadmium-plated hardware. Use concealed anchorages where possible. Refer to Division 7 Section "Roof Accessories" for installation of roof curbs.

C. Install intake and relief ventilators with clearances for service and maintenance.

D. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation.

F. Label intake and relief ventilators according to requirements specified in Division 15 Section "Mechanical Identification."

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.02 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories.

END OF SECTION

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

a. Constant-volume air systems.

2. HVAC equipment quantitative-performance settings.
3. Reporting results of activities and procedures specified in this Section.

1.03 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. NC: Noise criteria.

F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

G. RC: Room criteria.

H. Report Forms: Test data sheets for recording test data in logical order.

I. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

J. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

K. TAB: Testing, adjusting, and balancing.

L. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

M. Test: A procedure to determine quantitative performance of systems or equipment.

N. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.04 SUBMITTALS

A. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

B. Sample Report Forms: Submit two sets of sample TAB report forms.

C. Warranties specified in this Section.

1.05 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC or Independent NEBB.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems."

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems."

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.06 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.07 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.08 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine equipment for installation and for properly operating safety interlocks and controls.

N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.02 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air duct system.

3.05 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

   a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

   a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.06 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

3.07 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.08 PROCEDURES FOR HEAT-TRANSFER COILS

A. Refrigerant Coils: Measure the following data for each coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.09 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Heating-Water Flow Rate: 0 to minus 10 percent.
4. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems

found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.

g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches (mm), and bore.
i. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
j. Number of belts, make, and size.
k. Number of filters, type, and size.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Filter static-pressure differential in inches wg (Pa).
f. Preheat coil static-pressure differential in inches wg (Pa).
g. Cooling coil static-pressure differential in inches wg (Pa).
h. Heating coil static-pressure differential in inches wg (Pa).
i. Outside airflow in cfm (L/s).
j. Return airflow in cfm (L/s).
k. Outside-air damper position.
l. Return-air damper position.
m. Vortex damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch (mm) o.c.
f. Make and model number.
g. Face area in sq. ft. (sq. m).
h. Tube size in NPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Air pressure drop in inches wg (Pa).
d. Outside-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Water flow rate in gpm (L/s).
i. Water pressure differential in feet of head or psig (kPa).
j. Entering-water temperature in deg F (deg C).
k. Leaving-water temperature in deg F (deg C).
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig (kPa).
n. Refrigerant suction temperature in deg F (deg C).
o. Inlet steam pressure in psig (kPa).

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches (mm), and bore.
h. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm (L/s).
    b. Total system static pressure in inches wg (Pa).
    c. Fan rpm.
    d. Discharge static pressure in inches wg (Pa).
    e. Suction static pressure in inches wg (Pa).

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

    a. System and air-handling unit number.
    b. Location and zone.
    c. Traverse air temperature in deg F (deg C).
    d. Duct static pressure in inches wg (Pa).
    e. Duct size in inches (mm).
    f. Duct area in sq. ft. (sq. m).
    g. Indicated airflow rate in cfm (L/s).
    h. Indicated velocity in fpm (m/s).
    i. Actual airflow rate in cfm (L/s).
    j. Actual average velocity in fpm (m/s).
    k. Barometric pressure in psig (Pa).

J. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.
    c. Test apparatus used.
    d. Area served.
    e. Air-terminal-device make.
    f. Air-terminal-device number from system diagram.
    g. Air-terminal-device type and model number.
    h. Air-terminal-device size.
    i. Air-terminal-device effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm (L/s).
    b. Air velocity in fpm (m/s).
    c. Preliminary airflow rate as needed in cfm (L/s).
    d. Preliminary velocity as needed in fpm (m/s).
    e. Final airflow rate in cfm (L/s).
    f. Final velocity in fpm (m/s).
    g. Space temperature in deg F (deg C).

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.

c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm (L/s).
b. Entering-water temperature in deg F (deg C).
c. Leaving-water temperature in deg F (deg C).
d. Water pressure drop in feet of head or psig (kPa).
e. Entering-air temperature in deg F (deg C).
f. Leaving-air temperature in deg F (deg C).

L. Packaged Chiller Reports:

1. Air-Cooled Condenser Test Data (Indicated and Actual Values):

a. Refrigerant pressure in psig (kPa).
b. Refrigerant temperature in deg F (deg C).
c. Entering- and leaving-air temperature in deg F (deg C).

M. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, or water-cooled condensing units, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Unit make and model number.
d. Compressor make.
e. Compressor model and serial numbers.
f. Refrigerant weight in lb (kg).
g. Low ambient temperature cutoff in deg F (deg C).

2. Test Data (Indicated and Actual Values):

a. Inlet-duct static pressure in inches wg (Pa).
b. Outlet-duct static pressure in inches wg (Pa).
c. Entering-air, dry-bulb temperature in deg F (deg C).
d. Leaving-air, dry-bulb temperature in deg F (deg C).
e. Condenser entering-water temperature in deg F (deg C).
f. Condenser leaving-water temperature in deg F (deg C).
g. Condenser-water temperature differential in deg F (deg C).
h. Condenser entering-water pressure in feet of head or psig (kPa).
i. Condenser leaving-water pressure in feet of head or psig (kPa).
j. Condenser-water pressure differential in feet of head or psig (kPa).
k. Control settings.
l. Unloader set points.
m. Low-pressure-cutout set point in psig (kPa).
n. High-pressure-cutout set point in psig (kPa).
o. Suction pressure in psig (kPa).
p. Suction temperature in deg F (deg C).
q. Condenser refrigerant pressure in psig (kPa).
r. Condenser refrigerant temperature in deg F (deg C).

s. Oil pressure in psig (kPa).
t. Oil temperature in deg F (deg C).
u. Voltage at each connection.
v. Amperage for each phase.
w. Kilowatt input.
x. Crankcase heater kilowatt.
y. Number of fans.
z. Condenser fan rpm.
aa. Condenser fan airflow rate in cfm (L/s).
bb. Condenser fan motor make, frame size, rpm, and horsepower.
cc. Condenser fan motor voltage at each connection.
dd. Condenser fan motor amperage for each phase.

N. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Measure sound levels at two locations.
e. Measure space pressure of at least 10 percent of locations.
f. Verify that balancing devices are marked with final balance position.
g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner.
3. Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 15950

SECTION 16010

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to, the following:

1. Examine all other sections for work related to those other sections and required to be included as work under this section.

2. General provisions and requirements for electrical work.

1.02 SUBMITTALS

A. General

1. Review of contractors submittals is for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for quantities; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of work with that of all other trades and satisfactory performance of their work.

2. The Contractor shall review each submittal in detail for compliance with the requirements of the contract documents prior to submittal to the Architect. The Contractor shall "Ink Stamp" and sign each item of the submittal with a statement "CERTIFYING THE SUBMITTAL HAS BEEN REVIEWED BY THE CONTRACTOR AND COMPLIES WITH ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS".

3. Where the construction documents indicate specific manufacturer(s) for any given product, it shall be considered a substitution if the contractor proposes to use any manufacturer other than those specifically named. The Contractor shall clearly and specifically identify each individual proposed substitution or proposed deviation from the requirements of the contract documents with a statement "THIS ITEM IS A SUBSTITUTION".

B. Material Lists and Shop Drawings:

1. Submit material list and equipment manufacturers for approval within 35 days of award of contract. Give name of manufacturer and where applicable, brand name, type and/or catalog number of each item. Listing of more than one manufacturer for any one item of equipment, or listing items "as specified", without both make and model or type designation, is not acceptable. Shop drawings shall not be submitted

before approval of manufacturers list. The right is reserved to require submission of samples of any material whether or not particularly mentioned herein.

2. Within three weeks after approval of the material and equipment manufacturers list, submit shop drawings for approval. Shop drawings shall be submitted in completed bound groups of materials (i.e., all lighting fixtures or all switchgear, etc.). Shop drawing shall be prepared by factory authorized representatives. Departure from the above procedure will result in resubmittals and delays.

3. Submittals which are intended to be reviewed as substitution or departure from the contract documents must be specifically noted as such or the requirements of the contract documents will prevail regardless of the acceptance of the submittal.

4. Shop drawings shall include dimensioned plans, elevations, details, wiring diagrams and descriptive literature of components parts where applicable.

5. The Contractor shall verify dimensions of equipment and be satisfied as to fit and that they comply with all code requirements relating to clear working space about electrical equipment prior to submitting shop drawings for approval.

6. Shop drawings shall include the manufacturer's projected days for shipment from the factory of completed equipment, after the equipment is released for production by the Contractor. It shall be the responsibility of the Contractor to insure that all material and equipment is ordered and installed in time to provide an orderly progression of the work, and to allow full occupancy and full operation of the facility at the scheduled completion date. The Contractor shall notify the Architect of any changes in delivery which would affect the project completion date.

C. The Contractor shall be responsible for incidental, direct and indirect costs resulting from the substitution of specified contract materials or work.

D. Maintenance and Operating Manuals

1. The Contractor shall furnish three copies of typewritten maintenance and operating manuals for all electrical equipment, fire alarm equipment, sound system equipment, etc., to the District and instruct District's personnel in correct operation of all equipment at completion of project.

2. Where these specifications indicate to provide District personnel with instructional training sessions, the Contractor shall videotape all such instructional sessions. The Contractor shall provide all equipment and personnel required to create a color VHS video and audio recording and shall turn over to the District a total of two (2) copies of each tape prepared.

3. Maintenance and operating manuals shall be bound in three-ring, hard-cover, plastic binders and shall be delivered to the District with letter of transmittal, carbon copy to the Architect.

E. Portable or Detachable Parts: The Contractor shall retain in his possession, and shall be responsible for all portable and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of contract work. These parts shall then be delivered to the District or his authorized representative and an itemized receipt obtained, with copies of receipt sent to the Architect.

F. Record Drawings

1. Provide and maintain in good order at the job site a complete set of electrical contract prints. Changes to the contract to be clearly recorded on this set of prints. No pay request by the Contractor will be granted without verification that the jobsite prints are up-to-date and current with the project construction. At the end of the project, the Contractor shall transfer all changes to one set of transparencies to be delivered unfolded to the Architect. Transparency drawings shall be prepared in an organized and clearly legible fashion by persons skilled in drafting techniques.

2. The actual location and elevation of all buried lines, boxes, monuments, vaults, stub-outs and other provisions for future connections shall be referenced to the building lines or other clearly established base lines and to approved bench marks. All measurements shall be witnessed by the job inspector who shall make his own record of the dimensions. Before the inspector signs the record drawings, he shall check his own dimensions against those on the drawings. If any necessary dimensions are omitted from the record drawings, the Contractor shall, at his own expense, do all excavation required to expose the buried work and to establish the correct locations.

3. The Contractor shall keep the "record" prints up to date and current with all work performed.

4. A mandrel shall be pulled through each conduit upon completion of the duct bank. All mandrelling must be done in the presence of the job inspector.

1.03 GENERAL SUMMARY OF ELECTRICAL WORK

A. The specifications and drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

B. Refer to the drawings and shop drawings of other trades for additional details which affect the proper installation of this work. Diagrams and symbols showing electrical connections are diagrammatic only. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.

C. Before submitting a bid, the Contractor shall familiarize himself with all features of the building drawings and site drawings which may affect the execution of the work. No extra payment will be allowed for failure to obtain this information.

D. If there are omissions or conflicts between the drawings and specifications, clarify these points with the Architect before submitting bid.

1.04 LOCATIONS OF EQUIPMENT

A. The drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structure conditions encountered.

B. Where outlets are placed on a wall, locate symmetrically with respect to each other and other features or finishes on the wall.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or

equipment, such changes made without cost, providing the change is ordered before the conduit runs, etc., and work directly connected to same is installed and no extra materials are required.

D. Lighting fixtures in mechanical spaces are shown in their approximate location only. Do not install light outlets or fixtures until mechanical piping and duct work is installed, then install lights in a location to provide best lighting.

E. The locations of existing utilities, building, equipment and conduit shown on the drawings is approximate. Verify exact locations and routing of existing systems in the field. Include all costs in contract price for adjustment required to accommodate existing conditions.

F. Coordinate and cooperate in every way with other trades in order to avoid interference and assure a satisfactory job.

1.05 AIR CONDITIONING, HEATING, PLUMBING EQUIPMENT WIRING

Provide electrical work, materials, and control components required for proper operation of the air conditioning, heating and plumbing systems.

1.06 QUALITY ASSURANCE

A. Work and materials in full accordance with the latest rules and regulations of the California Code of Regulations Title 24, Part 3 "California Electrical Codes", Title 8 "Division of Industrial Safety" the National Life Safety Code, and other applicable Federal and State laws and regulations.

B. All material and equipment shall be new and shall be delivered to the site in unbroken packages. All material and equipment shall be listed and labeled by Underwriters Laboratories or other recognized testing laboratories, where such listings are available. Comply with all installation requirements and restrictions pertaining to such listings.

C. Work and material shown on the drawings and in the specifications is new and included in the contract unless specifically indicated as existing or N.I.C. (not-in-contract).

D. Keep a copy of all applicable codes available at the job site at all times while performing work under this section. Nothing in plans or specifications shall be construed to permit work not conforming to the most stringent of codes.

1.07 CLEANING EQUIPMENT, MATERIALS, PREMISES

All parts of the equipment shall be thoroughly cleaned of dirt, rust, cement, plaster, etc., and all cracks and corners scraped out clean. Surfaces to be painted shall be carefully cleaned of grease and oil spots and left smooth, clean and in proper condition to receive paint finish.

1.08 JOB CONDITIONS - PROTECTION

Protect all work, materials and equipment from damage from any cause whatever and provide adequate and proper storage facilities during the progress of the work. All electrical equipment shall be stored in a weather-tight structure. Provide for the safety and good condition of all the work until final acceptance of the work by the District and replace all damaged or defective work, materials and equipment before requesting final acceptance.

1.09 CUTTING AND PATCHING

Perform cutting and patching of the construction work which may be required for the proper installation of the electrical work. Patching shall be of the same material, thickness, workmanship and finish as existing and accurately match surrounding work to the satisfaction of the Architect. Cutting of structural members shall not be done without notifying the Architect and obtaining DSA approval.

1.10 IDENTIFICATION

A. Panelboards, terminal cabinets, circuit breakers, disconnect switches, starters, relays, time switches, contactors, pushbutton control stations, and other apparatus used for the operation or control of feeders, circuits, appliances, or equipment shall be properly identified by means of descriptive nameplates or tags permanently attached to the apparatus and wiring.

B. Nameplates shall be engraved laminated phenolic. Shop drawings with dimensions and format shall be submitted to the Architect before installation. Attachment to equipment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates shall not be used.

C. Plates: All cover and device plates shall be furnished with engraved or etched designations under any one of the following conditions:

1. Three gang or larger gang switches.

2. Keyed and/or locking switches.

3. Pilot light switches.

4. Switches in locations from which the equipment or circuits controlled cannot be readily seen.

5. Manual motor starting switches.

6. Switches which serve other than lighting loads.

7. Where so indicated on the drawings.

8. As required on all control circuit switches, such as heater controls, etc.

9. Where receptacles are other than standard duplex receptacles to indicate voltage and phase.

D. Provide black-on-white laminated plastic nameplates engraved in minimum 1/4" high letters to correspond with the designations on the drawings. Provide other or additional information on nameplates where indicated.

E. For equipment containing or operating on circuits of more than 240 volts nominal, provide red-on-white laminated warning signs engraved in 1/2" high letters to read: "CAUTION - 480 (or as applicable) VOLTS AUTHORIZED PERSONNEL ONLY".

F. Wire and Cable Identification

1. Provide identification on individual wire and cable including sign systems, fire alarm, electrical power systems (each individual phase, neutral and ground), empty conduit pull ropes, and control circuit.

2. Identification shall be provided at each termination location, splice location, pullbox, junction box and equipment enclosure.

   a. Individual wire and cable larger than #6 AWG or 0.25 inch diameter, shall be provided with polypropylene identification tag holders, with yellow polypropylene tags interchangeable black alpha/numeric characters. Character height 0.25 inch or TECH Products-"EVERLAST" series. Attach identification tags with plastic "tie" wraps, minimum of two for each tag. As manufactured by Almetek Industries-"EZTAG" series.

   b. Individual wire and cable #6 AWG and smaller or smaller than 0.25 inch diameter, shall be provided with water and oil resistant, flexible, pressure sensitive machine embossed plastic tags that wrap a minimum of 360 degrees around the wire/cable diameter. The entire tag shall then be covered with a clear flexible waterproof plastic cover wrapped a minimum of 540 degrees around the wire/cable diameter and completely covering the identification.

   c. Each identification tag location shall indicate the following information: circuit number, circuit phase, source termination and destination termination equipment name (or outlet number as applicable).

   d. Provide permanent identification tags to all underground conduit runs at pullbox and at building entrance indicating purpose and location of other end.

3. Install identification after installation/pulling of wire/cable is complete, to prevent loss or damage to the identification.

G. Cardholders and cards shall be provided for circuit identification in panelboards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be typewritten on card. Circuit description shall include name or number of circuit, area, and connected load.

H. Junction and pull boxes shall have covers marked with circuit numbers according to panel schedule. Data shall be lettered in a conspicuous manner with a color contrasting to finish.

I. Miscellaneous Electrical Equipment: Identify individually mounted starters, transformers, pullboxes, junction boxes, and related items as required by the use of such equipment with plates as for panelboards. All junction boxes shall be marked to indicate panel of origin, voltage, and circuit numbers within the box.

J. Auxiliary Systems, including Communications: Label to indicate function, routing and termination point of panelboard. Also, label any circuits providing power to this equipment and the panel of origin.

1.11 TESTING

A. The Contractor shall obtain an independent NETA certified testing laboratory that will provide all instrumentation and tests on the electrical system and equipment as hereinafter described and further directed by the Architect. The test shall be performed after the completion of all electrical systems. All tests shall be recorded and documented and submitted to the Architect for review.

B. The Testing Laboratory shall meet Federal OSHA criteria for accreditation of Testing Laboratories Title 29 Part 1907. Membership in the National Electrical Testing Association shall constitute proof of meeting aid criteria, for testing of electrical system.

1. Test for Phase to Ground Condition:

a. Open main service disconnect.

b. Isolate the system neutral from ground by removing the neutral disconnect link located in the service switchboard.

c. Close all submain disconnects.

d. Close all branch feeder circuit breakers.

e. Measure the resistance of each phase to ground. A properly calibrated "megger" type test instrument to be used. The test voltage shall be 500 volts.

f. Record all readings after one minute duration and document into a complete report.

2. Isolating Grounds: In the event that low resistance grounds are found in the system, they shall be isolated and located by testing each circuit individually as outlined above. Make proper corrections to restore the resistance values to an acceptable value.

C. Method of obtaining ground resistance shall be in accordance with the latest edition of the James G. Biddle (Plymouth Meeting, Pennsylvania) manual published on this subject.

1. Perform "fall-of-potential" tests on each grounding electrode of system per IEEE Standard No. 81, Section 8.2.1.5. When suitable locations for test rods are not available, a low resistance dead earth or reference ground will be utilized.

2. Perform the two-point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance at each ground bus in distribution boards and distribution panels and transformer neutrals.

D. All instrumentation and personnel required for testing shall be furnished by the Contractor.

E. The testing, calibrating and setting of all ground and ground fault equipment circuit breakers, device protection relays, and meters adjustable settings shall be by an independent testing laboratory. Set as recommended by the respective manufacturer and coordination study so as to be coordinated with other protection devices within the electrical design. Four (4) bound and tabulated copies of the test and settings shall be sent to the ARCHITECT.

F. Ampere and voltage measurements:

1. Take and record ampere and line voltage measurements under full load on all panel feeders, switchboard and switchgear feeders, motor control centers and motor circuits provided in the contract. Record measurements at the equipment tested and submit to the ARCHITECT for review.

2. Ampere voltage readings shall be:

a. Phase A-B, A-C and B-C.
b. Phase A-Neutral, B-Neutral and C-Neutral.

3. The ampere and voltage readings shall be not less than 20 minutes duration for each test. Record and submit the measured minimum, maximum and 20 minute average for each ampere and voltage value and test location. Voltage and ampere measurements shall occur at the connected load end of each respective feeder, not at the source of supply end of each feeder.

4. Test equipment shall be accurate within plus or minus 1-percent.

5. Branch circuit devices 40 ampere or less and motor boards 10 horsepower or smaller are excluded from ampere and voltage testing requirement.

G. If, in the opinion of the Architect, the voltages and regulations are not met within acceptable limits, make arrangements with the serving utility for proper electrical service and then verify that such has been provided.

1.12 SERIES RATED EQUIPMENT

Circuit protective devices identified as "Series Rated" or "Current Limiting" (i.e., CLCB - current limiting circuit breaker; CLF - current limiting fuse; etc.) shall be series rated and tested (UL 489 and CSA5) by the manufacturer with all equipment and circuit protective devices installed down stream of the identified series rated or current limiting devices. Provide nameplates on all equipment located down stream, including the CLCB and CLF devices, to comply with N.E.C. paragraphs 110-22 and 240-83 "CAUTION SERIES RATED SYSTEM - NEW DEVICE INSTALLATIONS AND REPLACEMENTS SHALL BE THE SAME MANUFACTURER AND MODELS."

1.14 SPARE FUSES

Provide (3) three spare fuses for each size and type to match the installed fuses where the fuses are provided as part of the contract.

1.15 WALL MOUNTED ELECTRICAL EQUIPMENT

A. Provide multiple horizontal sections of metal “C” channels for support and attaching wall mounted equipment to walls. Channels shall provide “turned lips” at longitudinal edges to hold “lock-in” fasteners and shall comply with ANSI-1008 and ASTM-A569 latest revision. The channels shall be steel hot dip zinc galvanized. As manufactured by Unistrut or Kindorf.

B. The “C” channels shall be positioned horizontally within 3 inches of the top and bottom of each, equipment section cabinet and located behind each equipment vertical section. Provide additional intermediate “C” channels at not less than 36 inches on center between the “top” and “bottom” “C” channel positions, located behind each equipment vertical section.

C. The “C” channels shall be of sufficient length to provide connection to not less than two (2) vertical structural wall framing elements separated by not less than 16 inches; but in no case shall the “c” channel length be less than the width of the respective equipment section.

D. Attach the “C” channels to the wall structural elements after the wall, finish surface, installation (including painting) is complete.

E. Attach the "C" channels with fasteners to the building wall framing structural elements as follows: welded to steel framing; bolted to wood framing; cast in place concrete inserts for masonry and concrete construction; drilled "afterset" expansion anchors for existing masonry and concrete construction.

F. Attach the equipment to the "C" channels with threaded and bolted fasteners to "prelocate" and lock into the channel "turned lips" and channel walls.

1.16 ELECTRICAL WORK CLOSEOUT

A. Prepare the following items and submit to the Architect before final acceptance.

1. Two copies of all test results as required under this section.
2. Two copies of local and/or state code enforcing authorities final inspection certificates.
3. Copies of as-built record drawings as required under the General Conditions, pertinent Division One Sections and Electrical General Provisions.
4. Two copies of all receipts transferring portable or detachable parts to the District when requested.
5. Notify the Architect in writing when installation is complete and that a final inspection of this work can be performed. In the event any defect or deficiencies are found during this final inspection they shall be corrected to the satisfaction of the Architect before final acceptance can be issued.

B. The Contractor shall complete the following work before any electrical equipment is energized:

1. All equipment shall be permanently anchored.
2. All bus connections shall be tightened per manufacturer's instructions and witnessed by the DSA Inspector.
3. All ground connections shall be completed and identified. Perform and successfully complete all required megger and ground resistance tests.
4. All feeders shall be connected and identified.
5. The interiors of all electrical enclosures including busbars and wiring terminals shall be cleaned of all loose material and debris, paint, plaster, cleaners or other abrasive's overspray removed and equipment vacuumed clean. The DSA Inspector shall observe all interiors before covers are installed.
6. All dry wall work and painting shall be completed within the electrical rooms.
7. All doors to electrical equipment rooms shall be provided with locks in order to restrict access to energized equipment.
8. Electrical rooms shall not be used as a storage room after power is energized.
9. The coordination study shall be complete, circuit breakers ground relays set, tested and calibrated accordingly.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein.

1. Examine all other sections for work related to those other sections and required to be included as work under this section.

2. Comply with general provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit product data sheets for all outlet boxes, floor boxes, wiring devices, device plates, relays, contactors, timeswitches, fuses, mounting accessories for outlet boxes and safety switches.

B. Submit detailed shop drawings including dimensioned plans, elevations, details, schematic and point-to-point wiring diagrams and descriptive literature for all component parts for transformers, relays, time clocks, and photocells.

C. Submit transformer test reports.

PART 2 - PRODUCTS

2.01 OUTLET AND JUNCTION BOXES

A. Flush or concealed outlet and junction boxes: Pressed steel, hot-dip galvanized, knockout type with conduit entrances sized to match conduits. Provide boxes of proper code size for the number of wires or conduits passing through or terminating therein, but in no case shall box be less than 4 inches square by 2 1/8" deep. Provide extension rings on flush outlets to finish flush with finished surfaces.

1. Provide fixture supporting device in outlet boxes for surface mounted fixtures as required.

2. Provide solid gang boxes for three or more switches, for mounting behind a common device plate.

3. Computer, intrusion detection, television and telephone outlets: 4 11/16" square by 2- 1/8" deep with a 1/2" minimum single-gang plaster ring.

B. Surface mounted outlet boxes: Cast iron type FS or FD, with threaded hubs as required. Provide plugs in all unused openings. Provide weatherproof gaskets for all exterior boxes.

2.02 FLOOR BOXES AND OUTLETS

A. Boxes in concrete floors shall be rectangular and concrete-tight with cast iron body, brass flange, leveling screws, and adjustment mechanism to permit leveling of the box after the concrete pour:

1. Single-gang: Hubbell B-2537 or Walker 880CSI

B. Floor box covers shall be rectangular brass and shall be provided on each floor box.

1. Duplex receptacle: Hubbell S-3825 or Walker 828R
2. Signal system outlet: Hubbell S-2625 or Walker 89CK-1

C. Boxes in stage/platform wood flooring system shall be rectangular, 2 13/16" deep maximum, with leveling screws, shallow formed steel body, bottom knockouts, and brass fringe.

1. Single-Gang: Hubbell B2429 or Walker 880M1
2. Two-Gang: Walker 880M2
3. Three-Gang: Walker 880M3

2.03 SHEET STEEL PULL BOXES

A. Sizes as indicated on the drawings and in no case of less size or material thickness than required by the governing code.

1. General purpose sheet steel pull boxes: Install only in dry protected locations with removable screw covers. Manufacturer's standard baked enamel finish.

2. Weatherproof sheet steel pull boxes: Fabricate of code gauge, hot-dip galvanized steel with gasketed weathertight cover of same material. Primed, paint to match surrounding surface.

2.04 CONCRETE PULLBOXES 2'-0" X 3'-0" AND LARGER

A. Pullboxes shall be reinforced concrete with concrete bases and conduit knockouts on all walls.

B. Each concrete precast section shall be identified by having the manufacturers name and address cast into an interior face or permanently attached thereto. Associated Concrete Products-Quikset, Brooks Products or equal.

C. Pullboxes shall be provided with one precast concrete 6" extension grade ring "tongue and groove" mating surfaces.

D. Pullbox sizes shall be as indicated on drawings but in no case less than required by applicable codes. Minimum depth of the pullbox shall not be less than 30".

E. Provide floor sump extending through the concrete floor into the gravel bedding below the pullbox. Provide cast iron grate over sump.

F. Cover and frame assemblies:

1. Traffic rated cover shall be hot dip galvanized steel flush fitting with threaded flush, slotted head, stainless steel studs.

2. Top ring frame shall be hot dip galvanized steel angle frame where the pullbox is installed in paving or concrete work. Assembly shall be rated for H-20 bridge loading.

3. Top ring frame shall be armor bank type where the pull box is installed in exposed earth or landscaping. Assembly shall be rated from H-20 loading.

4. Covers for 2'-0" x 3'-0" pullboxes shall be a single plate assembly Quikset TE-1000 series or equal.

5. Covers for 3'-0" x 5'-0" pullboxes shall be a double leaf, torsion spring-assisted hinged assembly. Quickset TL-400 Series or equal.

6. Covers shall be permanently marked in the cover metal as follows:

   a. "Electric" for covers on structures containing power circuits

   b. "Signal" for covers containing signal circuits.

   c. "Name of system" where pullbox is used for single, signal system.

G. Concrete pull boxes: After cables have been pulled and inspected, seal box between cover and frame with a mastic compound similar to Parmagum or Dukseal.

H. Furnish complete with galvanized pull irons, cable racks, hooks and porcelain insulator cable cradles.

2.05 CONCRETE PULL BOXES SMALLER THAN 2'-0" X 3'-0"

Boxes shall be reinforced concrete with base and drainage sump. Provide traffic steel bolt down cover permanently marked as described for 2'-0" x 3'-0" and larger pullboxes.

2.06 SWITCHES

A. Provide circuit switches totally enclosed, Bakelite or composition base, toggle type with 277 volt A.C. rating for full capacity or contacts for incandescent or fluorescent lamp loads. Switch ratings shall be 20 ampere only. Color as selected by Architect.

B. Where switches are mounted in multiple gang assembly and are operating 277 volts and 120 volts mounted in same outlet box, there shall be a barrier installed between each switch.

C. Switches shall be any of the following products. Catalog numbers shown below are to establish the quality of the device only and are not necessarily the color required by the Architect.

1. Single Pole Switches

	Toggle Type	Lock Type
Make	20 Amps	20 Amps
Hubbell	#1221	
P & S	#20AC1	#20AC1-KL
Sierra	#5021	

Leviton	#1221	
General Electric	#GE-5951	
Arrow	#1991	

2. Double Pole Switch

Hubbell	#1222	
P & S	#20AC2	#20AC2-KL
Sierra	#5022	
Leviton	#1222	
General Electric	#GE-5952	

3. Three-Way Switches

Hubbell	#1223	
P & S	#20AC3	#20AC3-KL
Sierra	#5023	
Leviton	#1223	
General Electric	#GE-5953	
Arrow	1993	

4. Momentary Contact Switches - 20A at 277V

Make	3-Position Toggle Type	3-Position Lock Type
Hubbell	#1557	
P & S	#1251	#1251-KL
Sierra	#5120	
Leviton	#1251	
General Electric	#GE-5935	

5. Maintained Contact Switches (Double Throw, Center Off), 20A at 277V.

Make	Toggle Type		Lock Type	
	1-Pole	2-Pole	1-Pole	2-Pole
P & S	#1225	#1226	#1225-KL	#1226-KL
Hubbell	#1385	---		
Sierra	#5122	---	.....	---
Leviton	#1385	#1386	.....	---
General Electric	#5957	---	.....	---

6. Pilot lights used in conjunction with circuit switches shall be neon type with red jewel, P & S #2151 Red (120 volt) or equal.

2.08 RECEPTACLES

A. Receptacles in flush type outlet boxes shall be installed with a bonding jumper to connect the box to the receptacle ground terminal. Grounding through the receptacle mounting straps is not acceptable. The bonding jumper shall be sized in accordance with the branch circuit protective device as tabulated herein under "Grounding". Bonding jumper shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws 6-32 or larger (except isolated ground receptacles). For receptacles in surface mounted outlet boxes direct metal-to-metal contact between receptacle mounting strap (if it is connected to the grounding contacts) and outlet box may be used.

Catalog numbers shown below are intended to establish the quality of the device only and are not necessarily the color required. Receptacles with stainless steel coverplates shall be gray.

B. Duplex convenience receptacles shall be grounding type, 120 volt, 20 ampere, and shall have two current carrying contacts and one grounding contact which is internally connected to the frame. Outlet shall accommodate standard parallel blade cap and shall be side wired. Color by Architect.

1.	P & S	#5362.
2.	Leviton	#5362.
3.	Hubbell	#5362.
4.	Sierra	#1460.
5.	General Electric	#GE-4108.

C. Ground fault convenience receptacles: Provide separate ground fault receptacle at each location indicated on drawings.

1.	Leviton	#6898
2.	Hubbell	#GF5362
3.	P & S	#2091-S

D. Weatherproof receptacle: Ground fault type duplex receptacle, mounted in a flush hinged door enclosure with lock and key. Enclosure shall be a P & S #4600-26 with a P & S #1591 receptacle or equal by C.W. Cole. On roofs weatherproof ground fault type receptacle as herein before specified, installed in "FS" box with one of the following spring door type covers:

1.	P & S	#4511
2.	Hubbell	#RCV1-GFR

E. Special outlets shall be as indicated on the drawings.

2.09 PLATES

A. Provide 0.04" brushed stainless steel coverplates for every switch, receptacle, telephone, television, microphone, and speaker jack outlet unless indicated otherwise. All plates shall be Type 302 allow composed of 18% chromium and 8% nickel. Plates shall be manufactured by P&S, Hubbell, Leviton, General Electrical or equal.

2.10 STRUCTURAL AND MISCELLANEOUS STEEL

Structural and miscellaneous steel used in connection with electrical work and located out-of-doors or in damp locations, to be hot-dip galvanized unless otherwise specified. Included are underground pull box covers and similar electrical items. Galvanizing average 2.0 ounce per square foot and conform to ASTM A123.

2.11 RELAYS AND CONTACTORS

A. Contactors and/or relays for control of lighting and/or feeders and/or panels shall be 600 volt A.C., electrically operated, mechanically held units, open type for panel mounting with number of poles and of size as indicated on the drawings. Provide auxiliary control relay for operation of each contactor and/or relay with a two-wire and/or three wire control circuit as described on the plans.

B. Contactors and/or relays shall be mounted in panelboards in barriered section under separate hinged lockable doors or in contactor and/or relay cabinets as called for on the drawings. Contactors and/or relays shall be installed on Lord sound absorbing rubber mounts.

C. Contactors and/or relays shall be Automatic Switch Co. (ASCO) Bulletin #920 Series for 2 and 3 pole, and Automatic Switch Co. Bulletin 917 Series for contactors and/or relays containing 4 or more poles. Coil control circuit shall be independently fused, sized to protect coil.

D. Contactors and/or relays shall be equipped with a switch, in the proper configuration, to disconnect the control circuit controlling the coil of the respective device. Control circuit disconnect switch shall be labeled showing function of device.

2.12 TIMESWITCHES AND PHOTOCELLS

A. All timeswitches shall have synchronous motor drive for operation on 120 or 277 volts, 60 Hertz, A.C. and shall be furnished with a ten-hour, spring-driven, reserve-power motor. Contacts shall be rated 40A per pole.

1. Timeswitches for lighting control shall be Astronomic, 7 day, 24 hour with day-omitting device, DPST, Tork 7200Z series or equal by Paragon or Intermatic.

B. All timeswitches shall be mounted in NEMA surface lockable enclosures unless indicated otherwise.

C. Photocell with rating of 2000 watts, 16.6 amps, 120V, 60Hz AC. Suitable for -30°F to 158 °F and weatherproof. Load to remain "ON" in case of cell failure and a time delay of 15 seconds Tork 2001/2002 Series or Paragon CW201 Series or equal unless herein specified otherwise, photocell to face north.

2.13 CONTACTORS AND/OR RELAY CABINET

A. Contactors and relays, not indicated to be mounted in electrical panels shall be mounted in a cabinet, size as required, with hinged lockable door keyed same as panelboards. Construction of cabinet shall be similar to terminal cabinets.

B. Contactor cabinets shall be of the same manufacturer as the panelboards.

2.14 SAFETY SWITCHES

Switches shall be rated 600 or 250 volt A.C. as applicable, NEMA Type HD, quick-make, quick-break, h.p.- rated, nonfusible or fusible, Class "R", in NEMA Type I enclosure, lockable in the "open" and "closed" positions with number of poles and amperage as indicated on the drawings. Where enclosure is located exterior, where water is present or indicated W.P. (weatherproof) switches shall be raintight NEMA Type 3R enclosure, lockable. Maximum voltage, current and horsepower rating clearly marked on the switch

enclosure and switches having dual element fuses shall have rating indicated on the metal plate.

2.15 TRANSFORMERS

A. Provide dry type transformers constructed to meet Underwriters' Laboratories Specification UL 506 and tested in accordance with USAS I and NEMA Standards. Performance on transformers equal to or better than ANSI, NEMA, IEEE and N.E.C. published criteria. Insulation shall be U.L. Class 220°C.

B. Transformers shall have a grounded electrostatic aluminum shield between the primary and secondary windings to attenuate common mode and transverse mode electrical noise. Transformer shall be U.L. listed K-4 for high harmonic non-linear loads per IEEE C57.110. Temperature rise shall be 115°C. in 40°C. ambient at 100% continuous kVA rating. Provide lugs and/or bus structures to accommodate all line and load side conductors indicated.

C. Transformers shall be equipped with four 2-1/2% full capacity taps, 2 above and 2 below normal voltage. Primary and secondary terminals to be accessible, located behind removable front cover plate.

D. Transformers mounted per Korfund Literature for weight of transformer, and connected by one of the following methods:

1. Underground conduit resulting in no rigid connections to transformer. (Use ground strap for equipment ground.)

2. Sealtite flexible conduit. (Use ground wire for equipment ground).

3. Pullbox or wireways from transformer which are isolated from transformer with an approved sound absorbing neoprene gasket. (Use ground strap for equipment ground.)

E. Transformers shall be anchored to concrete slab.

F. Test Requirements: The transformers furnished to this specification shall be subjected to the following production tests:

1. Applied Potential

2. Induced Potential

3. No Load Loss.

4. Voltage Ratio.

5. Polarity

6. Continuity

G. The manufacturer shall have performed the following additional tests on units identical to the design type being supplied to this specification. Proof of performance of these tests in the form of test data sheets shall be provided at the time shop drawings are submitted.

1. Sound Level

2. Temperature

3. Full Load Losses

4. Regulation

5. Impedance

H. Transformer shall contain a built-in vibration dampening system to minimize and isolate sound transmission.

I. Sound levels shall be guaranteed by the manufacturer not to exceed the following values:

9 kVA and below	40 db
10 kVA to 50 kVA	45 db
51 kVA to 150 kVA	50 db
151 kVA to 300 kVA	55 db

J. Transformer windings shall be copper.

K. Transformers shall be manufactured by the same manufacturer as the main switchboard - Westinghouse, Siemens, General Electric, or Square D Co.

2.17 PLYWOOD BACKBOARDS

A. Plywood backboards shall be 3/4 inch thick marine "A-C" grade. Provide backboard on the wall for equipment racks, incoming cable raceways and terminal blocks. Plywood shall extend from the finish floor to 8 ft. above the finish floor. "A" side of plywood shall be exposed and painted. Attach plywood to wall structural framing with mechanical fasteners a minimum 6 inches on center vertically on walls at each framing vertical member, and along the length of the wall, but not less than 16 inches on center horizontally along the length of the wall.

2.18 CONCRETE WORK

A. Prepare concrete for use as electrical equipment footings and equipment slabs on grade, in accordance with pertinent sections of Specification Section 03300.

B. Non-reinforced concrete for duct/conduit encasement shall be 2.00 sacks (94 pounds each) of cement per cubic yard of 3/8" pea gravel with sufficient water to make a workable slurry mix.

PART 3 - EXECUTION

3.01 OUTLET AND JUNCTION BOXES

A. Accurately place boxes and securely fasten to structural members. Where outlets are shown at same location but at different mounting heights, install outlets in one vertical line. Where outlets are shown at same location and mounting height, mount outlets as close together as possible. Where switches are shown on wall adjacent to hinge side of doors, box shall be installed to clear door when door is fully opened.

B. Flush mounted boxes shall be attached to two studs or structure members by means of metal supports so that all boxes are rigid with no deflection under 100 lb. horizontal force.

C. Boxes above accessible ceilings shall be attached to structural members. Where boxes are suspended, they shall be supported independently of conduit system by means of preformed steel channels. Boxes shall be supported independently of all piping, duct work, equipment, ceiling hanger wires and suspended ceiling grid system.

D. Where surface exposed conduit is connected to an outlet box, the outlet box shall be surface mounted.

E. Surface mounted outlets shall be attached to concrete or masonry walls by means of expansion shields.

F. Floor boxes shall be installed square and level with finish floor and within adjustable limits of floor ring. Where outlets are shown at same or adjacent location, use recessed combination power/signal floor boxes.

G. Outlet boxes installed flush in walls shall be horizontally separated by not less than 24 inches from device outlet boxes and rings in common wall surfaces located on the opposite (back) side of the same wall. Where the separation cannot be maintained, provide a solid backing behind the outlet box. The backing shall extend the width of the wall cavity (i.e. between "Studs") behind the box and 12 inches above and below the outlet box center line. The backing shall consist of 5/8 inch thickness gypsum board anchored in place for "stud" wall construction.

H. Provide pullboxes, pulling ells, junction boxes, and condulets on metallic conduit runs whose total number of bends is 360 degrees or greater. Pulling and splicing enclosures shall be located in accessible ceiling spaces.

I. In fire rated walls and ceilings provide fire rated “box-wrap” around the outside of each outlet box placed in fire rated wall or ceiling inside the wall, to maintain the fire rating of wall with the installed outlet boxes.

3.02 CONCRETE PULLBOXES

A. Excavate for installation of precast structures remove excess excavated material from the site. Saw cut existing paving and concrete as required for excavation.

B. Provide a minimum of 36-inch deep bedding base of crushed rock 3/8" - 1/2" size in the bottom of the excavation. Bedding shall be level and well compacted by a minimum of four passes with a plate type mechanical vibrator.

C. Back fill and compact earth around precast structure after installation of the structure to 90% minimum compaction in 12-inch lifts. Replace paving concrete, landscaping above structure to match existing.

D. Install precast structures per manufacturers recommendations to provide a dry watertight installation. Set cover flush with existing grade or finish surface. Where precast structure is installed in pedestrian walkway or vehicular traffic way with a sloping finish grade. Slope cover to match existing.

E. Install structures to avoid surface water drainage flow lines, and existing utilities.

F. Entrances of conduits/ducts shall terminate with endbells inside the precast structure.

3.03 SWITCHES AND RECEPTACLES

Install all receptacles and switches securely to the backbox or wall surface, using the device strap mounting screws. Provide adequate wall surface or extension rings, where required to properly support the mounting strap. Use of the coverplate screws to support the device is not acceptable.

3.04 GROUNDING (ADDITIONAL REQUIREMENTS)

A. Grounding shall be executed in accordance with all applicable codes and regulations, both of the State of California and local authorities having jurisdiction.

B. Each pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

3.05 CONCRETE WORK

A. Comply with provisions of 03300.

END OF SECTION

SECTION 16111

CONDUIT AND WIRE

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein.

1. Examine all other sections for work related to those other sections and required to be included as work under this section.

2. Comply with general provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit product data sheets for all wire, conduit, fittings and splicing materials.

PART 2 - PRODUCTS

2.01 CONDUIT

A. GENERAL

1. The interior surfaces of conduits and fittings shall be continuous and smooth, with a constant interior diameter. Conduits and conduit fittings shall provide conductor raceways of fully enclosed circular cross section. The interior surfaces of conduits and fittings shall be without ridges, burrs irregularities or obstructions. Conduits and fittings of the same type shall be of the same uniform weight and thickness.

2. Type of conduit, type of conduit fittings and conduit supports shall be suitable for the conditions of use and the conditions of location of installation, based on the manufacturer's recommendations and based on applicable codes.

3. All fittings for metal conduit shall be suitable for use as a grounding means, pursuant to the applicable code requirements. All metal conduit and metal conduit fittings shall provide 3 second duration ground fault current carrying ratings, when installed and connected to the respective conduit, as follows:

a. RMC and EMT conduit fittings.

1) 0.5 inch through 1.5 inch conduit/fitting size - 10,000 ampere RMS.

2) 2.0 inch and larger conduit/fitting size - 20,000 ampere RMS.

b. FMC and LTFMC Conduit Fittings

1) 0.5 inch through 1.25 inch conduit/fitting size-1,000 ampere RMS (without external bonding jumper).

2) 1.5 inch through 4.0 inch fitting size-10,000 ampere RMS with bonding jumper.

4. Protective corrosion resistant finish for metal conduit fabricated from steel and metal conduit fittings fabricated from steel, shall be as follows:

   a. Clean all metal surfaces (including metal threads) with acid bath "pickle" prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.

   b. Hot-dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.

   c. Threads shall be hot-dip zinc coated after machine fabrication.

   d. Exterior metal surfaces shall be finished with clear organic polymer top coat layer, after galvanizing.

   e. The inner metal surfaces shall be finished with a lubricating top coat after galvanizing, to facilitate conductor pulling through the conduit/fitting.

5. Threads for metal conduit and metal conduit fittings shall be taper-pipe-thread, National Pipe Standards(NPS) and shall comply with ANSI-B1.20.1.

6. Metal conduit termination connector fittings shall be provided with a manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks and abrasion during conductor installation and electrical load "cycling" after installation is complete. The bushing shall comply with UL 94V-0 flammability.

7. Provide conduit bonding/grounding jumper from metal enclosures with "concentric ring" knockouts, to positively ground/bond each respective conduit(s) to the metal enclosure.

B. Rigid metal conduit (RMC)

1. Rigid metal, round tubing, machine threaded at both ends.

   a. The conduit and conduit fittings shall comply with the requirements for a equipment grounding conductor, pursuant to applicable codes.

   b. The conduit shall be watertight and airtight without cracks and pinholes.

2. RMC raceway types shall be as follows:

   a. Rigid galvanized steel conduit (RGS), minimum yield strength shall be 35,000 PSI. Shall comply with NEMA standard 5-19 (latest revision); ANSI C80.1 and ANSI-C80.4 (latest revision); U.L. 514-B and UL 6 (latest revisions); National Pipe Standard Specification (latest revision).

   b. Intermediate steel conduit (IMC). Shall comply with NEMA Standard 5-19 (latest revision) ANSI-C80.6 (latest revision); UL 2142 (latest revision).

3. RMC Fittings

   a. Fittings shall be compatible with RGS and IMC.

b. Fittings shall be rated "liquid tight".

c. Fittings imbedded in concrete shall be rated "liquid tight" and "concrete tight".

d. Connectors and couplings for terminating, connecting and coupling to RMC conduit shall be threaded metal.

e. Fittings shall comply with ANSI C80.4 and ANSI C33-84 (latest revision); NEMA FB1 (latest revision); UL 514 (latest revision).

f. Conduit Seal Fittings

1) Conduit seals shall prevent the passage of gasses, liquids and vapors past the location of the seal installation in the conduit.

2) Conduit seals shall be suitable for installation in both vertical and horizontal conduit locations.

3) Conduit seals shall be visible and accessible for inspection after installation is complete.

4) Conduit seals shall be rated for the following locations:

a) Wet locations
b) Classified hazardous locations materials NEC Class 1 Division 1.
c) Temperature ranges from 0 degrees centigrade through 90 degrees centigrade.

5) Conduit seals, sealing compound and sealing compound dam shall be the product of the same manufacturer.

4. RMC Fittings as manufactured by:

a. For threaded enclosure, termination connection.

1) Thomas & Betts - 106 Series bonding locknut, 5302 series sealing ring with stainless steel retainer.

b. For non threaded enclosure, termination connector.

1) Thomas & Betts - 370 Series watertight threaded sealing hub, 106 series threaded bonding lock nut, Sta-Con Series enclosure bonding jumper and 3870 Series threaded ground bushing.

2) OZ/Gedney-CHMT/CHT watertight threaded hub with bonding locknut and GH50G Series enclosure bonding jumper.

c. For RMC to RMC conduit-to-conduit coupling

1) Erickson - 674 (threaded) Series

2) OZ/Gedney Type 4 (threaded) Series

3) Threaded RMC conduit couplings, product of the same manufacturer as the RMC conduit.

d. For RMC Conduit Seals

1) OZ/Gedney-EYA and EYAM (threaded) Series

2) Appleton-EYF and EYM (threaded) Series

C. Electrical Metallic Tubing (EMT)

1. Rigid metal round tubing, "thin wall" steel construction, with non threaded ends.

a. The conduit and conduit fittings shall comply with the requirements for a equipment grounding conductor pursuant to applicable codes.

b. The conduit shall be watertight and airtight without cracks and pinholes.

2. EMT shall be allowed for conduit size ranges from 0.75 inch through 4.0 inch.

3. Comply with ANSI C80.3, C80.4, and ANSI C33.98 (latest revisions); UL 594 and UL 797 (latest revisions); CEC Section 12500 (latest revision).

4. EMT Fittings

a. Connectors and couplings for terminating, connecting and coupling to EMT conduit, shall be non threaded metal.

b. EMT termination connector fittings shall be as follows:

1) Set screw type "concrete tight" when installed in dry interior locations.

2) Compression type "raintight" and "concrete tight" when installed in wet or damp locations, outdoors and in concrete or masonry construction.

c. Fittings shall comply with ANSI C33.84 (latest revision); UL 514 (latest revision); NEMA FB-1.

5. EMT Fittings as manufactured by:

a. For threaded and non threaded enclosure, termination connector:

1) Thomas & Betts-TC5031 (set screw type) Series (with locknuts).

2) OZ/Gedney-4000ST (set screw type) Series.

3) Thomas & Betts-5123 (compression type) Series (with 2 locknuts).

4) OZ/Gedney-7000ST (compression type) Series (with locknut).

5) Thomas & Betts-4240 (compression type) Series (90 degree angle with locknut).

6) OZ/Gedney-8000WT (compression type) Series (90 degree angle with locknut).

b. For EMT to EMT conduit-to-conduit coupling:

1) Thomas & Betts-TK121 (set screw type) Series (with locknut).

2) OZ/Gedney-5000 (set screw type) Series (with locknut).

3) Thomas & Betts-5120 (compression type) Series.

4) OZ/Gedney-6000S (compression type) Series.

c. For EMT to RMC conduit to conduit combination coupling:

1) Thomas & Betts-HT221 (set screw type) Series.

2) OZ/Gedney-ESR (set screw type) Series.

3) Thomas & Betts-530 (compression type) Series.

4) OZ/Gedney-ETR (compression type) Series.

D. Flexible Metal Conduit (FMC):

1. Round flexible conduit, fabricated from a single continuous steel strip. The steel shall be factory formed into continuous interlocking convolutions to form a complete lock between steel strips and provide raceway flexibility.

2. Metal to metal grounding contact shall be maintained throughout the length of the FMC conduit.

3. FMC shall be allowed for conduit size ranges from 0.75 inch through 3.0 inch.

4. FMC shall comply with ANSI-C.33.84 and ANSI C33.92; NEMA FB-1; CEC 12-1100.

5. FMC Fittings

a. FMC fittings shall be malleable iron construction or steel construction.

b. Fitting shall automatically cause the FMC raceway throat opening to be centered with respect to the fitting throat opening.

c. Straight and angled connector termination fittings shall be threaded on one end and shall include a threaded locknut, suitable for connection to threaded and unthreaded enclosures.

d. The attachment of the fittings to FMC shall be angled saddle type, to engage and interlock with the FMC spiral groove, and shall be unaffected by vibration. Direct bearing screw type fittings shall not be used.

e. Direct FMC conduit-to-FMC conduit coupling of FMC shall not be permitted.

f. Shall comply with ANSI C33.9, and ANSI C33.92 (latest revision); NEMA FB1 (latest revision); U.L. 514.

6. FMC connectors shall be Bridgeport #520-DCI/521-DCI series or equal by Efcor.

E. Liquid Tight Flexible Metal Conduit (LTFMC)

1. The metal conduit core of LTFMC shall comply with the same requirements as FMC conduit, with the addition of a thermoplastic exterior flexible jacket over the metal core.

2. The exterior jacket shall be positively locked to the metal core to prevent jacket "sleeving".

3. The LTFMC shall be rated for installation and operating service temperatures of between 0 degrees centigrade through plus 90 degrees centigrade.

4. The LTFMC jacket shall be suitable for continuous exposure to sunlight, rainwater, water vapor, mineral oils and liquid solvents, without penetrating into the conduit and without deteriorating the jacket.

5. LTFMC sizes from 0.75 inch through 1.25 inches shall include an additional internal ground conductor, fabricated by the manufacturer, as a integral part of the conduit core.

6. Direct LTFMC conduit-to-LTFMC conduit coupling of LTFMC shall not be permitted.

7. LTFMC shall be allowed for conduit size ranges from 0.75 inch through 4.0 inches.

8. In addition to the requirements for FMC conduit, LTFMC shall also comply with ANSI C-33.84 (latest revision); NEMA-FB1 (latest revision); CEC 12-1400 (latest revision).

9. LTFMC fittings

   a. Fittings shall include an external mechanical ground/bond wire connector.

   b. The attachment of the fitting to LTFMC shall be threaded compression type onto the conduit core with locknut and liquid tight jacket compression seal. The fitting shall automatically prevent "sleeving" of the jacket.

   c. Straight and angled termination connector fittings shall be threaded on one end and shall include locknut suitable for connection to threaded and unthreaded enclosures.

10. LTFMC Fittings as manufactured by:

    a. Termination connector fittings:

	Straight Angle Connectors	45 and 90 Degree
1)	Thomas & Betts-5331 GR Series.	Thomas & Betts-5341 GR and 5351GR Series.
2)	Appleton-STB Series; STN-L Series for use preformed "knockouts".	Appleton-STB-L Series; STN-L Series. Series for use with use with preformed "knockouts".
3)	OZ/Gedney-4QLT Series.	OZ/Gedney-4QLT Series.

b. LTFMC to RMC conduit to conduit combination coupling fittings:

1) Thomas & Betts-5271 GR Series.

2) OZ/Gedney-4QFML Series

F. Rigid Non Metallic Conduit (RNMC)

1. General

a. Conduit and fittings shall be 90 degree centigrade conductor rated. Fabricated from homogeneous material, free from visible cracks holes or foreign inclusions, with integral "end-bell". The conduit and conduit fittings shall be watertight and airtight.

b. Conduit, conduit fittings and conduit fitting assembly "solvent cement" shall all be the product of the same manufacturer. Conduit fittings shall be solvent cement welded watertight.

c. Conduit and fittings shall be identified with legible markings showing ratings, size and manufacturer's name.

d. RNMC and fitting shall be corrosion resistant, watertight.

e. Conduit shall be suitable for conductor operating temperatures from minus 20 degrees centigrade to 90 degrees centigrade.

f. RNMC shall comply with NEMA TC-2 (PVC 40 conduit, latest revision) NEMA TC-6 (EB conduit latest revision) and NEMA TC-3 (fittings, latest revision); UL 514 and UL 651 (latest revision).

2. Polyvinyl Chloride (PVC)-RNMC

a. PVC-schedule 40 heavy wall construction.

G. Expansion Joint, Deflection Joint and Seismic Joint conduit fittings.

1. Expansion Conduit Fitting - Fitting shall provide for a minimum of two (2) inches straight line movement between two connecting conduits in each direction (total four (4) inches conduit expansion and contraction) parallel to the respective conduit lengths. Fitting shall be watertight.

2. Deflection Conduit Fitting - Fitting shall provide for a minimum of 30 degrees angular deflection movement ("Shear" deflection) between two connecting conduits, in any direction perpendicular to the length of the respective conduits. Fitting shall be watertight.

3. Combination Expansion/Deflection Conduit Fitting - Fitting shall provide the combined "expansion" and "deflection" movement capacity between two connecting conduits as described for separate "expansion" and "deflection" conduit fittings. Fitting shall be approved for installation concealed in both masonry/concrete construction and exposed non-masonry/concrete construction. Fitting shall be watertight.

4. Fittings shall comply with U.L.

5. Fittings:

   a. Conduit expansion fittings exposed or concealed locations as manufactured by:

      1) OZ/Gedney - AX8 Series for RMC conduit.

      2) OZ/Gedney - TX Series for EMT conduit.

      3) Appleton - XJ8 Series for RMC conduit and EMT conduits. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion fitting.

   b. Combination expansion/deflection conduit fittings exposed or concealed conduit locations as manufactured by:

      1) OZ/Gedney - AXDX Series for RMC conduit.

      2) OZ/Gedney - AXDX Series for EMT conduit. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion/deflection fitting.

   c. Conduit expansion/deflection fittings for FMC and LTFMC conduit.

      1) Provide a minimum of 12 inches of "slack" LTFMC in each FMC or LTFMC conduit at building and structure seismic or expansion joint conduit crossings.

      2) Note: Each FMC "slack" expansion/deflection location, shall be considered as not less than a 90 degree conduit bend location, for compliance with the maximum quantity of conduit bends allowed in a raceway.

6. Conduit Fitting Bonding Jumper

   a. The grounding/bonding path of metal conduit shall be maintained by the fitting.

   b. Provide a bonding jumper at each expansion, deflection and combination expansion deflection conduit fitting.

   c. The jumper shall be a bare flexible copper "braid". The copper braid electrical current carrying capacity shall be equal to the metal conduit.

   d. Provide a factory terminated ground clamp on each end of the braid with adjusting steel conduit grounding clamps and connect to each respective conduit end.

   e. The jumper braid length shall be eight (8) inches longer than the respective conduit fitting.

   f. Bonding jumper for FMC and EMT fittings as manufactured by:

      1) OZ/Gedney - BJ Series

      2) Appleton - XJB Series

I. Conduit Bodies Conduit Fitting

1. Conduit bodies shall provide conductor access with a removable conduit body cover and wiring area enclosed in metal housing. The conduit body shall facilitate pulling conductors.

2. In-line form "C" conduit bodies shall be prohibited.

3. The interior space "length" of 90 degree "elbow" conduit bodies shall not be less than 6 times the diameter size of the largest conduit connecting to the conduit body.

4. Conduit body covers shall be removable, gasketed, watertight "domed" metal cover with threaded screw attachment to the conduit body.

5. Lubricated, reusable, wire roller guards inside the conduit body shall protect wire from insulation damage during wire "pulling".

6. Conduit body fittings shall comply with UL 514.

7. Conduit bodies as manufactured by:

a. For RMC Conduit

OZ/Gedney - LB 6X/Mogul (90 degree elbow) Series - threaded body.

Appleton - LB/Mogul (90 degree elbow) Series - threaded body.

b. For EMT Conduit

1) Same as for RMC conduit. Provide EMT to RMC conduit combination coupling fitting for each outlet body connection.

2.02 CONDUIT SUPPORTS

A. General

1. Conduit Supports, hangers and fasteners for metal conduit shall be steel, hot dip zinc galvanized.

2. Conduit supports, hangers and fasteners for PVC coated conduit shall be PVC coated to match the conduit PVC coating.

3. Threaded hardware shall be continuous, free running threads.

4. Conduit support systems, including support channels, pipe clamps, braces, anchors, hardware, fasteners, shall be sized to support the full capacity circuit conductors weight, plus the installed conduit weight, plus the conduit fitting weight and support hardware weight, plus a 300 percent additional weight capacity safety factor.

5. Provide lock washer at each "bolted"/threaded connection.

6. Conduit supports, fasteners, channels, braces, hardware, anchors, pipe clamps and hangers as manufactured by Unistrut or Kindorf.

7. Supports shall be free of "BURRS" and sharp edges.

8. Metal supports cut in the field shall be zinc galvanized after cutting.

B. Conduit Hangers

1. Threaded steel hanger rods.

   a. Hanger rods smaller than 0.5 inches in diameter shall not be used for support of individual conduits.

   b. Hanger rods smaller than 0.625 inches in diameter shall not be used for support of multiple conduits.

2. Conduit hanger wires shall be not less than 12 gauge steel.

3. Conduit hangers shall attach to structure fasteners with steel "Clevis" or "Swing" hangers and shall provide a minimum of 45 degrees of angular movement in any direction at the point of the conduit hanger attachment to the structure fasteners.

4. Conduits individually suspended by conduit hangers shall fasten to the respective hangers with "Clevis" type pipe hangers. The pipe hangers shall be steel, adjustable to fit conduit size and shall completely enclose the conduit circumference.

C. Conduit Support Channels

1. "C" channels shall be factory preformed with a minimum 12 gauge thickness metal. The channel shall be factory "punched" with regularly spaced slotted holes for fastener attachments along the length of the channel.

2. The "C" channel shall not deflect more than 0.1 inches between channel supports at maximum installed design load, including required safety factor.

3. Channels shall comply with ANSI-1008 (latest revision) and ASTM-A569 latest revision).

4. Channels shall provide "turned lips" at longitudinal edges to hold (lock-in) fasteners.

5. Conduit support channels suspended from conduit hangers shall attach to conduit hangers with threaded connections. Provide hangers every three feet, minimum, (trapeze style) along length of channel.

6. Non-suspended conduit support channels shall connect to structure fasteners with threaded connectors.

D. Fasteners

1. Channel Fasteners

   a. Channel fasteners shall "prelocate" and lock into the channel "turned lips" and channel "walls".

   b. A separate metal strap shall "tie" each conduit to each channel with conduit channel fasteners.

2. Structure Fasteners

a. Structure fasteners for wall and floor mounted conduit attachments shall attach to existing masonry and concrete structures with structure fasteners using drilled, mechanical, expansion shield anchors.

b. Structure fasteners for wall and floor mounted conduit attachments shall attach to new masonry and concrete structures with structure fasteners using steel threaded inserts precast into the structures.

E. Brace Connectors

1. Provide lateral brace connectors to resist horizontal, lateral and vertical movement of suspended conduits during seismic earthquakes.

2. The braces shall connect from each conduit support, attach as close to the conduit as possible, and attach to fixed rigid, nonsuspended building "main" structural elements with fixed anchoring.

3. Brace attachment connectors and fasteners shall be rigid preformed steel channels or flexible #10 gauge steel hanger wire.

4. Connect and attach the brace connectors to fixed structural elements in the same manner as conduit support hangers. The connection of braces to structural elements shall be independent of the conduit support hanger structure fasteners.

2.03 WIRE AND CABLE

A. All wire and cable shall be copper, 600 volt, #12 AWG minimum unless indicated otherwise. Conductors #10 AWG and smaller shall be solid. Conductors #8 AWG and larger shall be stranded. Type of insulation as noted on drawings and as follows:

1. Type THHN/THWN insulation used for #10 AWG and smaller.

2. Type THHN/THWN or THW insulation used for branch circuits using #8, #6, or #4 AWG except as noted otherwise.

3. Type THHN/THWN or XHHW used for all feeders.

4. Type THHN/THWN insulation used for circuit conductors installed in fluorescent lighting fixture raceways, for conductors connected to the secondary of metal halide fixture ballasts or other hot locations.

5. Type THHN/THWN or XHHW insulation shall be used where conductors are installed in conduit exposed to the weather.

6. The following color code for branch circuits:

Neutral . . . . White (Tape feeder neutrals with white tape near connections) where separate neutral conductors are indicated for branch circuits, color code the white neutral conductor with a colored stripe corresponding to the phase of the respective line conductors.

a. Normal Power

120/208 Volt		480/277 Volt	
Neutral	White	Neutral	White
Ground	Green	Ground	Green
Phase A	Black	Phase A	Brown
Phase B	Red	Phase B	Orange
Phase C	Blue	Phase C	Yellow

B. Emergency power same insulation color as normal power except as follows:

120/208 Volt	480/277 Volt
Provide continuous color stripe on each conductor insulation, orange or yellow except ground	Provide continuous stripe on each conductor insulation blue or black, except ground

7. Feeders shall be identified as to phase or leg in each panelboard with printed identifying tape.

8. Fire alarm conductors: See Section 16720.

9. Color coding for mechanical and plumbing control wiring shall be an agreed upon color code between the Mechanical/Plumbing Contractor and the Electrical Contractor, and color code shall be submitted to the Architect in writing for prior to installation.

PART 3 - EXECUTION

3.01 TRENCHING, FOOTINGS, SLEEVES

A. Provide trenching, concrete encasement of conduits, backfilling, and compaction for the underground electrical work, in accordance with applicable sections of this specification.

B. Sleeves

1. Provide sleeves for raceways and conduit passing through building foundations.

2. Sleeves shall be installed to accommodate raceway and conduit routings.

3. The layout and design of raceways and conduit located in or routed through masonry or reinforced beams or walls shall be reviewed by the Architect before any work is performed. All sleeving shall be accomplished according to the instructions of the Architect.

4. Sleeves, raceways and conduit shall be located to clear steel reinforcing bars in beams.

5. Provide 1/2" continuous clearance between inside of sleeve and exterior of conduits and raceways passing through the sleeve, unless otherwise specified. Where sleeves pass through outside walls below grade, provide full 1" clearance between exterior of conduits and raceways passing through the sleeve.

6. Sleeve material shall be Schedule 40 black steel pipe, seal outer surface watertight.

3.02 GROUNDING

A. Grounding shall be executed in accordance with all applicable codes and regulations, both of the State of California and local authorities having jurisdiction.

B. The Contractor shall install the proper sized copper ground wire in all conduits having circuits operating at more than 100 volts to ground, for use as an equipment ground. The electrical metallic raceway system shall be grounded to this ground wire.

C. The maximum resistance to ground from any outlet shall not exceed 25 ohms.

D. In branch circuit conduits, a green insulated, copper ground wire, sized in accordance with the following table, shall be installed. Install ground wire in each conduit with phase conductors.

1.

Branch Circuit Protection	Ground Wire Size
20 Amp	#12
30 to 60 Amp	#10
70 to 100 Amp	#8

E. Ground conductors for branch circuit wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.

F. Each panelboard, switchboard, pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

G. The interior metal water piping system shall be bonded to the electrical equipment in each respective building.

3.03 CONDUIT

A. The sizes of the conduits for the various circuits shall be as indicated on the drawings and as required by code for the size and number of conductors to be pulled therein. Conduits to be concealed except as noted otherwise.

B. Rigid steel conduit shall be used in the following locations:

1. Exposed on interior of buildings below seven feet.

2. Exposed on exterior of building.

3. Exposed on roofs.

4. Embedded in concrete of masonry.

Rigid galvanized steel conduit shall not be installed in direct contact with earth or sand.

C. PVC Schedule 40 nonmetallic conduit shall be used for all underground. Nonmetallic conduit shall not be run in slabs or walls, above ceilings or exposed. End bells shall be provided at conduit terminations.

D. Elbows and risers on underground conduit runs shall be PVC Schedule 40 below grade and rigid galvanized steel where the run daylights above finished floor. Provide inside threaded coupling flush with finish surface.

E. Electrical metallic tubing up to and including 4 inch may be installed as permitted by codes except as otherwise referenced within these specifications.

F. Flexible Steel Conduit:

1. The use of flexible steel conduit above ceilings shall be limited to final connections to lighting fixtures from outlet boxes or to clear obstructions above ceilings.

2. Flexible steel conduit may be used where concealed horizontally in metal or wood stud walls. Runs exceeding 48" shall be rigid electrical metallic (EMT) conduit.

3. Homerun conduits shall not be flexible steel conduit.

G. Liquid-tight flexible conduit shall be used for final connection to motors, control devices mounted on vibrating or rotating equipment, mechanical items and in all areas where exposed flexible connections are used.

H. Conduit Installation:

1. Securely and rigidly support all conduits from building structure. Provide supports maximum of ten feet on centers and within three feet of all bends, outlets, junction boxes, cabinets, panels and fittings. Minimum of two connections per conduit run over 5 feet. Conduits shall be supported independent of all piping, duct work, equipment ceiling hanger wires, and suspended ceiling grid systems. Secure by means of UL listed and approved pipe clamps, "C" channels, fasteners, or straps.

2. Individual suspended conduits shall be supported by means of hanger rods and pipe clamps. Multiple suspended conduits shall be supported by means of trapeze type hangers and pipe clamps. Conduits and conduit trapeze support systems shall be guyed to prevent swaying in any direction.

3. Individual conduits placed against brick, masonry or concrete walls or slabs shall be secured with pipe clamps and expansion shields. Individual conduits placed against dry wall or plaster construction shall be secured by means of pipe clamps and screws attached to studs or other structural members. The use of toggle bolts is prohibited. Provide preformed channel supports for all multiple conduits placed against walls or slabs.

4. Rigid steel conduit or electrical metallic tubing shall not be strapped or fastened to equipment subject to vibration or mounted on shock absorbing bases.

5. Conduit run exposed shall be run at right angles or parallel to the walls or structures. All changes in directions, either horizontally or vertically, shall be made with conduit outlet bodies as manufactured by Crouse Hinds or equal. Conduits run exposed shall be painted to match surrounding surfaces.

6. Provide two locknuts and an insulated bushing at threaded metallic conduit terminating at outlet boxes, junction boxes, terminal cabinets, switchboards and panelboards.

7. Provide insulated bushing at each metallic conduit stub location. Bushings shall have ground lugs when installed on a metallic extension of PVC conduit run.

8. Conduit risers from underground conduit runs to panelboards, terminal cabinets, and control panels shall be enclosed in a 2-inch high concrete housekeeping pad which extends at least 1 inch beyond all conduits enclosed.

9. Underground conduits entering concrete pullboxes shall enter the side walls of the pullbox unless indicated otherwise. Provide end bell fitting on the end of each conduit 2-inches or larger entering the pullbox. Provide waterproof sealant after conductors have been installed.

10. Provide metallic or plastic caps on all conduit during construction until installation of conductors.

11. Provide expansion and deflection fittings, and bonding jumper at all building expansion crossings, seismic joint crossings, and where conduits cross the separation between adjacent relocatable classrooms.

12. Provide all trenching, excavation, shoring and backfilling required for the proper installation of underground conduits. Make trenches a minimum of 6 inches wider than the duct bank.

13. Install underground conduit, except under buildings, not less than 24-inches below finished grade in nontraffic areas and 30-inches below finished grade in traffic areas, including roads and parking areas. Install long radius bends in all underground conduits in excess of 100 feet long.

14. Conduit below slab on grade or underground exterior to building shall be spaced a minimum of 3-inches between identical systems and 12-inches between power and all other systems (vertically and horizontally) except at termination points. Multiple conduits in common trenches shall be racked on prefabricated plastic spacers a minimum of 10 feet on center over the length of the trench. Utility company conduits shall be installed in a separate trench.

15. All conduits below grade shall be fully encased in concrete.

16. Where concrete encasement is specified, provide a minimum of 3-inches of concrete between each conduit, the top, bottom and sides of the duct bank.

18. The Contractor shall demonstrate the usefulness of underground raceways installed as part of this contract, 1-inch conduits or larger. A round tapered rigid mandrel with a diameter approximately 1/4-inch smaller than the diameter of the raceway shall be pulled through after the raceway installation is completed. Conduits which stubout only, shall have the mandrel pulled before and after the concrete encasement is completed, but prior to completing the backfill. The raceway testing for usability shall be witnessed by the District representative and by a representative of the respective utility company where applicable. Contractor shall repair/replace any conduit which will not readily pass the mandrel test.

19. Provide a red magnetic detector tape over the entire length of all underground conduits and ductbanks shown on site electrical plans. Place tape in backfill at a depth not to exceed 12 inches below finish grade or as required by the manufacturer.

20. All ductbanks shall be backfilled to within 12 inches of finished grade with damp sand. Remainder of backfill to be native having no stones or aggregate greater than 3-inch. Do not backfill until installation has been approved and as-built drawings are up to date. Promptly install all conduits after excavation has been done, so as to keep the excavations open as short a time as possible. All excess soil from trenching shall be removed from the site.

21. Conduits which are installed at this time and left empty for future use shall have polyvinyl rope left in place for future use. Provide a 3/8-inch minimum rope for Utility Company conduits per their requirements.

22. Conduits stubbed outside of building line for future use shall be terminated a minimum of five feet clear of building or adjacent concrete walks or A.C. paving and capped. Provide concrete monuments , 6-inch x 6-inch x 15-inch deep, buried flush with grade over the capped ends. The face of monument shall be furnished with 3-inch square brass plates securely mounted and engraved with the number and size of conduits and type of service (i.e., "POWER", "TEL.", etc.).

23. A mandrel shall be pulled through each conduit upon completion of the duct bank. All mandrelling must be done in the presence of the job inspector.

3.04 WIRE AND CABLE

A. Branch circuit and fixture joints for #10 AWG and smaller wire shall be made with UL-approved connectors listed for 600 volts, approved for use with copper and/or aluminum wire. Connector to consist of a cone-shaped, expandable coil spring insert, insulated with a nylon shell and 2 wings placed opposite each other to serve as a built-in wrench or shall be molded one-piece as manufactured by "Scotchlok".

B. Branch circuit joints of #8 AWG and larger shall be made with screw pressure connectors made of high strength structural aluminum alloy and UL-approved for use with both copper and/or aluminum wire as manufactured by Thomas & Betts. Joints shall be insulated with plastic splicing tape, half-lapped and at least the thickness equivalent to the conductor insulation. Tapes shall be fresh and of quality equal to Scotch.

C. Use U.L. listed pulling compound for installation of conductors in conduits.

D. Correspond each circuit to the branch number indicated on the panel schedule shown on the drawings except where departures are reviewed by the Architect or the District's inspectors.

E. Control wiring to conform to the mechanical and plumbing specifications and wiring diagrams shown on the drawings and the manufacturer's wiring diagrams.

F. All splices in exterior pull boxes shall be cast resin encapsulated. Power conductor splices - 3M scotchcast Series 82/85/90; Plymouth or equal. No underground splices shall be made in control or signal circuits.

G. Neatly group and lace all wiring in panelboards, motor control centers and terminal cabinets with plastic ties at 3-inches on centers. Mark all spare conductors.

3.05 TESTING (ADDITIONAL REQUIREMENTS)

A. Visual and mechanical inspection of cables - 600 volts and less.

1. Inspect cables for physical damage and proper connection.

2. Test cable mechanical connections to manufacturer's recommended values with a calibrated torque wrench.

3. Check cable color coding and labeling of conductors and spares.

B. Electrical Tests of cables - 600 volts and less.

1. Provide "megger" tests on each feeder and power circuit No. 8 AWG and larger with respect to ground and between conductors.

END OF SECTION

SECTION 16141

NAMEPLATES AND WARNING SIGNS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein.

1. Provide nameplates and warning signs as shown on drawings and as specified.

2. Comply with general provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit a nameplates schedule to the Architect for review before the nameplates are installed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fabricated nameplates shall state the following:

1. Manufacturer's name and equipment design ratings including current, voltage (V), kilovoltamperes (KVA), horsepower (HP), revolutions per minute (RPM), bus bracing rating, or as applicable.

2. System usage and purpose, system nominal voltage, equipment rating KVA, amperes, HP and RPM as applicable. Designation data per drawings or supplied with shop drawings.

3. Panel and pullbox designation, voltage phase, wire, source of supply, and room number of the service.

B. Manufacturer's Device Nameplates: Device usage, purpose, or circuit number; manufacturer and electrical characteristic ratings including the following:

1. Circuit Breakers: Voltage, continuous current, maximum interrupting current and trip current.

2. Switches: Voltage, continuous current, horsepower or maximum current switching. If fused, include nameplate stating "Fuses must be replaced with current limiting type of identical characteristics".

3. Contactors: Voltage, continuous current, horsepower or interrupting current, and whether "mechanically held" or "electrically held".

4. High Voltage Sectionalizing Boxes: Voltage, continuous current and maximum current switching, located to be visible after installation.

5. Motors: Raged voltage, full load amperes, frequency, phases, speed, horsepower, code letter rating, time rating, type of winding, class and temperature.

6. Controllers: Voltage, current horsepower and trip setting of motor running overcurrent protection.

C. Equipment nameplates shall be engraved, laminated Micarta type with white letters engraved through the black background, except on emergency systems background shall be red and include the word 'EMERGENCY". Letters shall be 3/8" high for devices, and minimum 1/2" high for equipment and enclosures. Adhesives are not acceptable.

D. All plates for receptacles and switches on emergency circuit shall be engraved 'EMERGENCY" with 3/8" red filled letters.

E. Each outlet shall be engraved with 2/4" black filled letters indicating volts, amperes, circuit number with panel name and equipment fed. Volts and amperes shall not be required for 120V, 20A outlets.

Example: 208V – 20A
L12GA-23
FREEZER

for isolated ground type receptacles next to data outlet equipment name will be "Computer Only". No equipment name for convenience outlet.

F. All conduit and outlet boxes for signal system shall be color coded with 6" wide spray paint in every 6' as follows:

Fire Alarm	Red
Security	Blue
Tel/Data	Light Green
Clock	Yellow
HVAC Control	Light Blue

G. Warning signs shall be minimum 18 gauge steel, white porcelain enamel finish with red lettering. Lettering to read "DANGER – HIGH VOLTAGE", with "DANGER" in 1-1/2" letters and "HIGH VOLTAGE" in 1 inch letters. Warning signs to be included on door or immediately above door of all electrical equipment rooms, vaults or closets containing equipment energized above 150 volts to ground.

H. Marker tape shall be installed the entire length of each conduit installed underground outside the building. Tape shall be constructed of inert polyethylene, resistant to acids, alkalines with a minimum 4 mil thickness. 6" wide, and shall have the words 'CAUTION – ELECTRIC LINE BURIED BELOW", imprinted with contrasting permanent ink. The imprint shall repeat itself for the entire length of the tape. The tape shall be buried at maximum of 18" below finished grade, above a portion of the earth fill and above the conduit or concrete encasement.

I. Marker pen is not acceptable to use for nameplate unless otherwise noted.

J. Provide a full size glass framed photocopy of single line diagram on wall adjacent to main gears in the main electrical room.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Nameplates shall be mounted by steel screws.

B. Signs shall be permanently mounted with cadmium plated, steel screws.

3.02 IDENTIFICATION

A. Panelboards, terminal cabinets, switchboards, panelboards, distribution switchboards, transformers, pullboxes, circuit breakers, disconnect switches, starters, relays, time switches, contactors, pushbutton control stations, and other apparatus used for the operation or control of feeders, circuits, appliances, or equipment shall be properly identified by means of descriptive nameplates or tags permanently attached to the apparatus and wiring.

B. Wire and Cable Identification

1. Provide identification on individual wire and cable including sign systems, fire alarm, electrical power systems (each individual phase, neutral and ground), empty conduit pull ropes, and control circuit.

2. Identification shall be provided at each termination location, splice location, pullbox, junction box and equipment enclosure.

   a. Individual wire and cable larger than #6 AWG or 0.25 inch diameter, shall be provided with polypropylene identification tag holders, with yellow polypropylene tags interchangeable black alpha/numeric characters. Character height 0.25 inch or TECH Products-"EVERLAST" series. Attach identification tags with plastic "tie" wraps, minimum of two for each tag. As manufactured by Almetek Industries-"EZTAG" series.

   b. Individual wire and cable #6 AWG and smaller or smaller than 0.25 inch diameter, shall be provided with water and oil resistant, flexible, pressure sensitive machine embossed plastic tags that wrap a minimum of 360 degrees around the wire/cable diameter. The entire tag shall then be covered with a clear flexible waterproof plastic cover wrapped a minimum of 540 degrees around the wire/cable diameter and completely covering the identification.

   c. Each identification tag location shall indicate the following information: circuit number, circuit phase, source termination and destination termination equipment name (or outlet number as applicable).

3. Install identification after installation/pulling of wire/cable is complete.

C. Cardholders and cards shall be provided for circuit identification in panelboards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be typewritten on card. Circuit description shall include name or number of circuit, area, and connected load.

D. Junction and pull boxes shall have covers marked with circuit numbers according to the panel schedule. Information shall be lettered in a conspicuous manner with a color contrasting to finish.

END OF SECTION

SECTION 16160

PANELBOARD AND TERMINAL CABINETS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein.

1. Examine all other specification sections and drawings for related work required to be included as work under Division Sixteen.

2. Comply with general provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Provide manufacturers catalog data for panelboards, cabinets and circuit breakers.

B. Provide shop drawing showing panelboard circuit arrangements, size, voltage, ampacity, and overcurrent protective devices.

PART 2 - PRODUCTS

2.01 PANELBOARDS

A. Panelboards shall be flush or surface mounting as indicated with circuit breakers as shown on panel schedule, hinged lockable doors, index card holders and proper bussing.

B. Where indicated on the drawings and herein specified, panelboards shall be furnished with subfeed breakers and/or lugs, split bussing, contactors, time switches, relays, etc., as required.

C. All panelboards shall be keyed to match existing school panelboards.

D. All panelboards shall be finished with one coat of zinc chromate and a coat of primer sealer after a thorough cleaning. Prime coated panelboard shall be painted to match surroundings after installation. Panelboards shall be fabricated of sheet steel of the following minimum gauges: Door and trim #12; enclosure - code gauge steel.

E. Panelboards shall have flush locks and keys.

F. Fasten the trim to panelboards by means of concealed, bolted or screwed fasteners accessible only when the door is open.

G. Panelboards 208/120 volt, three phase, 4 wire, S/N or 120/240 volt, single phase, 3 wire, S/N.

Panelboard types as manufactured by:

1. Westinghouse Pow-R-Line Series

2.	General Electric	Type A Series
3.	Square D	Type NQOD
4.	Siemens	Type S Series

H. Panelboards for 480/277 volt, three phase, 4 wire, S/N.

Panelboard types as manufactured by:

1.	Westinghouse	Pow-R-Line Series
2.	General Electric	Type A Series
3.	Square D	Type NEHB
4.	Siemens	Type S Series

I. Panelboard for bussing sizes thru 400 amp shall be 20-inches wide. Recess mounted type shall have a 20-inch wide (maximum) recess metal enclosure with trim plate cover extending 1-inch on all sides of enclosure. Depth shall be 5-3/4" nominal. Height of panel as required for devices.

J. Provide 6-inch additional gutter space in all panels where double lugs are required, or where cable size exceeds bus size. Minimum bottom gutter space shall be 6-inches high.

K. Distribution panelboards with buss sizes 400 ampere and greater shall be 40-inches maximum wide by 12-inch maximum deep units. Distribution panelboards shall be as manufactured by:

1.	Siemens	Type S Series or F Series
2.	General Electric	Type CCB or QMR
3.	Square D Co.	Type HCN or HCM
4.	Westinghouse	Pow-R-Line 4 Series

L. Panelboards with relays, time clocks or other control devices shall have a separate metal barriered compartment mounted above panel with separate hinged locking door to match panelboard. Provide mounting subbase in cabinet for control devices and wiring terminal strips.

M. Panelboard shall have a circuit index card holder removable type, with clear plastic cover. Index card shall have numbers imprinted to match circuit breaker numbers.

N. Panelboard enclosures shall be furnished without prepunched conduit knockouts. Conduit knockouts shall be punched in field.

O. Panelboards shall be manufactured by the same manufacturer as the main switchboard.

2.02 CIRCUIT BREAKERS

A. Breakers shall be molded-case types with a minimum short circuit interrupting rating of 10,000A symmetrical for panelboard voltages thru 240 volt and 14,000A for panelboards

thru 600 volts. Breakers shall have a minimum short circuit of 22,000 A symmetrical for distribution panelboards.

B. Branch circuit breakers in panelboards shall be series-rated with their respective upstream overcurrent devices for the full fault duty rating of those upstream devices.

C. Panelboards and circuit breakers shall be products of the same manufacturer.

D. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the drawings. Circuit numbers of breakers shall be black-on-white micarta tabs. Circuit number tabs which can readily be changed from front of panel will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.

E. Where two or three pole breakers occur in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.

F. Where branch circuit breakers supply the power to motors, the fire alarm control panel, and head end equipment for signal systems, the breakers shall be furnished with lockout clips, mounted in the "on" position. The breakers shall be able to trip automatically with lockout clips in place.

G. Panelboard circuit breakers shall be bolt on type.

2.03 BUSSING

A. Bussing shall be rectangular cross section copper. Bussing shall be the full length of the enclosure.

B. Bussing shall be braced to withstand symmetrical short circuit ratings as follows or as noted on drawings. In no case shall bus short circuit bracing be less than specified circuit breakers:

1. Panelboards:

a. 240 volt and below 10,000 amp.

b. Greater than 240V 14,000 amp.

2. Distribution panelboards: 22,000 Amp.

C. Each panelboard shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

D. Provide space and all hardware and mounting attachments for future devices as indicated on the drawings.

2.04 TERMINAL CABINETS

A. Terminal cabinets shall be fabricated of code gauge sheet steel, size as indicated on the drawing, complete with hinged doors and the number of 2-way screw terminals required for termination of all conductors. The door to terminal cabinets shall be continuously hinged on one side and be the same size as the cabinet so as to allow maximum termination space within the cabinet. Terminal cabinets shall have 3/4"-inch plywood backing finished in black insulating varnish.

B. All terminal cabinets shall be finished with one coat of zinc chromate and a cost or primer sealer after a thorough cleaning. Prime coated terminal cabinets shall be painted to match surroundings after installation.

C. Terminal cabinets shall have flush locks and keys.

D. Terminals for signal systems cabinets to be Cannon Type "SS" or equal unless indicated otherwise.

E. Provide engraved nameplate on each cabinet indicating its designation and system (i.e., "Life Safety System - Panel 2LS").

PART 3 - EXECUTION

3.01 MOUNTING

A. Flush mounted panelboards and terminal cabinets shall be securely fastened to at least two studs or structural members. Trim shall be flush with finished surface.

B. Surface mounted panelboards and terminal cabinets shall be secured to walls by means of preformed steel channels securely fastened to at least two studs or structural members.

C. Panelboards shall be installed to insure the top circuit protective device (including top compartment control devices) are not more than six feet six inches above finish floor in front of the panel and the bottom device is a minimum of 12-inches above the floor. Manufacturer shall specifically indicate on shop drawing submittals each panel where these conditions can not be met.

END OF SECTION

SECTION 16191

SOUND CONTROL

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other sections for work related to those other sections and required to be included as work under this section.

2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Comply with pertinent provisions of Section 260515.

B. Submit product data sheets for vibration isolation devices.

C. Submit detailed shop drawings including dimensioned plans, showing equipment vibration isolation anchoring.

PART 2 - PRODUCTS AND EXECUTION

2.01 QUIETNESS OF OPERATION

Before the work will be accepted as complete, quietness of operation, to a degrees satisfactory to the ARCHITECT, shall be attained for apparatus, equipment, fixtures, etc., included under the electrical work. Provide isolation and vibration protection required.

2.02 VIBRATION ISOLATION FOR ELECTRICAL EQUIPMENT

A. Objective: It is the objective of this specification to provide the necessary design for the avoidance of excessive noise or vibration in the building due to the operation of machinery or transformers, and/or due to interconnected conduit.

1. Furnish and install the vibration isolation devices as specified herein.

2. Do not install any equipment or conduit as specified in the schedule which makes rigid contact with the "building" unless it is approved in this specification or by the ARCHITECT. "Building" includes slabs, beams, studs, walls, lath, etc.

3. Coordinate work with other trades to avoid rigid contact between equipment or conduit as specified in the schedule and the building. Inform other trades following his work, such as plastering, to avoid any contact which would reduce the vibration isolation.

4. Bring to the ARCHITECT'S attention, prior to installation, any conflicts with other trades which will result in unavoidable contact to the equipment or conduit as specified in the schedule, described herein due to adequate space, etc. Corrective work necessitated by conflicts after installation shall be at the responsible CONTRACTOR'S expense.

5. Bring to the ARCHITECT'S attention any discrepancies between the specifications and field conditions, changes required due to installation. Corrective work necessitated by discrepancies after installation shall be at the CONTRACTOR'S expense.

6. Obtain written and/or oral instructions from the vibration isolation manufacturer as to the proper installation and adjustment of vibration isolation devices.

7. Correct, at no additional cost, all installations which are deemed to be defective workmanship or materials by the ARCHITECT.

2.03 CONDUIT INSTALLATION

A. Provide flexible conduit or an approved vibration isolation device between any transformer and the building structure.

B. Secure all electrical panels connected to transformers by flexible conduit to the floor. Do not contact stud or masonry partitions. Isolated panels from the floor as specified herein.

C. Provide flexible conduit connections to all connections to air conditioning, plumbing, etc., or any rotating or oscillating equipment requiring electrical motors. Base the length of flexible conduit required for each motor upon the requirements for a 360 degrees loop in the conduit between the electrical motor and electrical box.

D. As an alternative to the 360 degrees loop, a Neoprene or rubber bushing between the conduit and the electric motor to break the metal-to-metal contact may be used. Provide a flexible ground strap to complete the electrical ground.

END OF SECTION

SECTION 16480

MOTOR CONTROL EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for, and incidental to, performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein.

1. Examine all other specification sections and drawings for related work required to be included as work under Division Sixteen.

2. Comply with general provisions and requirements for electrical work.

PART 2 - PRODUCTS

2.01 INDIVIDUAL STARTERS

A. Manual Motor Starters:

1. Provide flush or surface mounting manual motor starters with number of poles and size of thermal overload heaters as required for the motor being controlled (equipped with overload heaters, one for each motor lead). Back boxes shall be supplied with all flush mounting starters whether they are toggle type requiring only a 4" square outlet box or the larger type requiring a special box and cover designed to accept the particular unit.

2. Unless otherwise noted on the drawings, all manual starters for single phase motors, smaller than 1 h.p., shall be the compact toggle type. Manual starters for all single phase motors, 1 to 5 h.p., and all three phase motors up to 5 h.p. shall be the heavy duty type.

3. Where manual motor starter is shown with pilot light, the pilot light shall be installed in a separate outlet box adjacent to the starter outlet, and engraved nameplate to indicate function of pilot light.

4. Motor starters as manufactured by the following:

Single Phase Manufacturer	1 h.p. and Below	Others
Arrow Hart	Type RL	Type LL
General Electric	CR 101	Class CR 1062
I.T.E.	Class C10, C11 or C12	Class C20
Square D Company	Class 2510, Type A	Class 2510, Type B & C
Westinghouse	Type MS	Type A100
Allen Bradley	Equal	Equal

B. Individual Magnetic Motor Starters:

1. Three phase magnetic motor starters NEMA size 1 and larger controlling three phase motors 5 horsepower and larger shall provide integral motor single phasing protection. The starter shall automatically "open", turn off electrical power to the connected motor in the event of the loss of one or more circuit phases, lock out and require manual resetting of the single phase protection to restart the magnetic motor starter. Provide single phase annunciator. provide adjustable time delay, minimum range 0-3 seconds for initiating single phase shut down.

2. Magnetic motor starters shall be A.C. line voltage, across-the-line units in NEMA Type I enclosure, unless other types of enclosures are indicated.

3. All starters located outside of a building whether or not indicated shall be W.P. (weatherproof), and all starters noted W.P. shall be furnished in NEMA type 4 cast or stainless steel enclosures.

4. Starters shall be horsepower rated for the motor controlled, and shall be equipped with properly sized overload elements. Every pole shall be with overload element.

5. Verify the exact motor current and voltage characteristics with the supplier of the motor before installation of a starter.

6. Each starter shall be equipped with "Hand-Off-Auto" switch or stop- start pushbutton as required.

7. Coils shall be designed to operate on voltage indicated on control diagrams and have built-in-under the voltage release for coil circuit to drop motor starter off the line when the line voltage drops below normal operating voltage.

8. The coil control circuit shall be independently fused, sized to protect coil.

9. Starters to be equipped with running pilot light indication with a "Push-to-Test" feature.

10. Magnetic starters shall have a minimum of two auxiliary contacts. Additional auxiliary contacts shall be provided as required to comply with the requirements of the wiring diagrams on the Electrical, Mechanical and Plumbing drawings and the description of the function in the Mechanical and Plumbing Sections of the Specifications.

11. Minimum starter size shall be NEMA size I unless indicated otherwise.

12. Magnetic motor starters as manufactured by the following:

Manufacturer	Type
General Electric	Class CR 106
I.T.E.	Class A20
Square D Co.	Class 8536
Westinghouse	Type A200 (Size 4 Max.) or
Class II-200 (Sizes 5 thru 8)	Allen Bradley Equal

2.02 INDIVIDUAL COMBINATION MOTOR STARTERS

A. Combination starter shall incorporate fused disconnect switch and individual magnetic motor starter in a common enclosure. Combination starters shall be mounted in general purpose enclosures unless otherwise indicated on the plans. Provide oversized enclosures where required to accommodate the components and/or wiring indicated. Starters shall comply with NEMA standards, size and horsepower as indicated on drawings General Electric, Square D, Westinghouse or I.T.E.

B. The disconnect handle used on combination starters shall control the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "ON" or "OFF", and shall include a two-color handle grip, the black side visible in the "OFF" position indicating a safe condition, and the red side visible in the "ON" position indicating an unsafe or danger condition.

C. Each starter shall be equipped with an integral control circuit transformer with secondary voltage or as indicated.

D. All starters used in combination starters shall be manufactured in accordance with the latest published NEMA standards, sizes, and horsepower ratings. These starters shall be furnished with three melting alloy type thermal overload relays.

E. Thermal units shall be of one-piece construction and interchangeable. The starter shall be inoperative if a thermal unit is removed.

2.03 MOTOR CONTROL INTERLOCKS AND CONTROL DEVICES

A. Refer to mechanical and plumbing drawings and specifications and provide all control devices including timeswitches, relays and interconnection of starters as required.

B. Mount all relays and timeswitches in a separate NEMA-I enclosure unless otherwise indicated.

C. Whether shown on mechanical and plumbing drawings or control center schedules or not, where motors are controlled by external devices (i.e., thermostats, relays, float or pressure switches, etc.) or interlocked with other motors, each motor starter to be equipped with a "Hand-Off-Auto" selector switch in starter cover. Other starters equipped with a "Start-Stop" pushbutton station in starter cover.

D. Provide low voltage, 60Hz control power transformer(s), VA as required for HVAC and plumbing controls.

2.04 FUSES

A. Fuses shall be dual element, current limiting type, U.L. Class RK-1 unless otherwise indicated on the drawings. Provide one spare set of fuses of each size and type in each motor control center.

B. Verify the full load amperes of all motors for which fuses are to be provided. Size fuses for the motor full load amps according to the recommendations of the fuse manufacturer.

END OF SECTION

SECTION 16500

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SCOPE

A. Work Included:

All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other specification sections and drawings for related work required to be included as work under Division Sixteen.

2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

1. Submit certification letter from manufacturers of Lamps and Ballasts, stating the specific lamp and ballast combination comply with manufacturer recommendation and approval for the combined use, shown on the drawings.

2. Provide complete manufacturers catalog data information for each light fixture (luminaire), ballast, lamp, materials, auxiliary equipment/devices, finishes and photometrics.

B. Performance Certification

1. Submit manufacturer's certified lamp and ballast tests report data showing compliance with contract document.

2. Submit manufacturer's letter of certification for each fixture type, confirming the proposed combination of specific lamp, ballast and auxiliary components for each light fixture (luminaire)type will function together correctly and perform in compliance with the requirements of the contract documents as follows:

"The proposed lamp(s), lamp ballast(s)(where, applicable), lamp sockets and fixture have been tested as an assembly. The proposed fixture products assembly are certified by the manufacturer to function within the required temperature, lumen output, electrical characteristics and operational life described in the contract documents".

C. Light Fixture Samples

1. If requested by the OWNER'S Representative, provide a sample of each fixture proposed as a substitution for a specified fixture. Sample fixture shall be complete with specified lamps, 3 wire grounding "SO" cord and plug for 120-volt 60 Hz, AC plug-in operation. Sample fixtures shall be delivered to the OWNER'S Representative's office for review, the samples shall be picked up within ten (10)

working days after review comments have been received; any samples left beyond this time will be discarded by the OWNER'S Representative. Decision of OWNER'S Representative regarding acceptability of any lighting fixture is final.

1.03 QUALITY ASSURANCE (ADDITIONAL REQUIREMENTS)

A. Work and materials shall be in full accordance with the latest rules and regulations as follows. The following publications shall be included in the Contract Document requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the requirements describing the more restrictive provisions shall become the applicable contract definition:

1. U.L. – Underwriters' Laboratory

a.	U.L. – 1572:	HID Lighting Fixtures
b.	U.L. – 1570:	Fluorescent Lighting Fixtures
c.	U.L. – 1029:	HID Ballast
d.	U.L. – 935:	Fluorescent Lamp Ballast
E.	U.L. – 542:	Lamp Holders, Starters, and Starter Holders

2. NEMA-LE4

3. United States Federal Government

a. FCC – Part 18: EMI and RFI emissions limitations.
b. EPA: Energy conservation publications and waste disposal regulations.

4. ETL and C.B.M. certified and approved.

5. Electrical installation standards, National Electrical Contractors' Association:

a.	NEIS/NECA & IESNA – 500:	Recommended Practice for Installing Indoor Commercial Lighting Systems.
b.	NEIS/NECA & IESNA – 501:	Recommended Practice for Installing Exterior Lighting Systems.
c.	NEIS/NECA & IESNA – 502:	Recommended Practice for Installing Industrial Lighting Systems.

6. Illuminating Engineering Society – IES:

a. IES – LM41: Photometric and Reporting
b. IES – 587: Transient Surge Protection

7. American National Standards Institute:

a. ANSI – C81
b. ANSI – C82
c. ANSI – C62.41: Transient Withstand
d. ANSI – C78: Lamps

8. State California
Code of Regulations
Title-24: Energy Code

PART 2 - PRODUCTS

2.01 GENERAL

A. Complete Fixture

1. Provide light fixtures complete including lamps, ballasts, lamp holders sockets, housings, ceiling and wall trim "rings" for each ceiling type, mounting and adapter support brackets, diffusers/lenses and outlet boxes.

2. Include an allowance of $300.00 to provide a light fixture for each lighting fixture outlet shown on drawings without a fixture type designation.

B. Specific Fixture Requirements and Fixture Schedule Information

1. The catalog numbers included in the description of the various types of lighting fixtures shall be considered to establish the type or class of the fixture with a particular manufacturer only. The fixture length, number of lamps and lamp types, component materials, accessories, mounting type, ceiling, wall and install adapters, operation voltage, and all other components required to fulfill the total description of the fixture based on all drawing information, branch circuits, voltages, specification information, and shall be included in the contract requirements regardless of whether or not the catalog number specifically includes these components.

2. Lighting fixtures shall be the types as indicated in fixture schedule on the drawings and as described in the specifications.

3. All fixtures of the same fixture type shall be the same manufacturer and of identical finish and appearance, unless indicated otherwise on drawings.

C. Manufacturer Certification of Operation

1. Lamps and lamp ballasts shall be recommended and certified by the respective manufacturer(s), to be "matched" to operate correctly together, within the published characteristics, for efficacy, lamp starting, operating life hours, lumen output, power factor, power input, operating line ampere, sound intensity, and temperature.

2.02 BALLASTS (FOR HID & FLUORESCENT LAMPS)

A. General

1. All ballast, lighting fixtures assemblies and components shall be ANSI, ETL approved C.B.M. certified and UL labeled.

2. Ballasts shall provide Class "P" thermal protection.

3. Ballasts shall comply with FCC Part 18 Class-A and NEMA limits as to EMI or RFI and not interferes with normal operation of electrical or electronic data processing equipment.

4. Ballast open circuit voltage, starting voltage, crest voltage and lamp-operating voltage shall comply with requirements of the respective manufacturer of the installed lamps.

5. Lamp ballasts and transformers shall be for use with the specific lamps provided as part of the Contract.

6. Ballasts and lamps shall be suitable for use with automatic occupancy motion sensing type switching "on-off" control systems, with multiple "on-off" cycles per hour, on a 24 hours a day basis. Operation shall be without loss of performance in ballast and/or lamp operating characteristics described in the Contract Documents.

7. Ballasts Fusing

   a. Each ballast shall be independently fused on the incoming line side within ballast compartment.

   b. Alternately the ballast manufacturer may install the equipment fuse inside the ballast.

   c. Provide a label next to ballast cover reading: "Ballast is fused, check fuse prior to relamping". Provide an additional quantity of 10% spare fuses and deliver to Owner.

8. Ballast sound rating Class-A or better. Where sound rating classification is not published, the ballast sound rating shall be the best of product manufactured. Ballasts, which are judged by the OWNER'S Representative to be excessively noisy, shall be removed and replaced at the CONTRACTOR'S expense with low noise ballasts.

9. Electronic solid-state ballasts shall be the product of ballast manufacturer that have been producing electronic ballasts for a minimum of five consecutive years prior to the date of the contract.

10. Provide low temperature rated ballasts in lighting fixtures installed outdoors; in non-heated building spaces; inside walk-in refrigerators/freezers, cold storage spaces. The minimum starting temperature rating shall be not less than zero-degrees Fahrenheit.

11. Ballast shall be designed and supplied to operate on the incoming line voltage system circuits to which the respective ballasts and fixtures are connected.

12. Ballasts shall not contain any PCB (polychlorinated biphenyl).

13. Ballast power factor shall be not less than 0.90, starting and operating. The ballast lamp starting transient line input ampere shall never exceed lamp normal operating ampere by more than 10-percent.

14. Ballast as manufactured by General Electric, Advance, Philips, Universal, Sylvania/Osram or equal.

B. Solid-State Electronic Fluorescent Lamp Ballast

1. Fluorescent ballasts shall be solid-state electronic type ANSI C82.11.

2. Ballast shall operate lamps at voltage frequency exceeding 40 Kilohertz, without visually detectable flicker, flicker index shall not exceed 3-percent. Shall deliver lamp manufacturers normal rated lamp life.

3. Ballast normal operations and life expectancy shall not be affected by lamp failure or sustained open circuit/short circuit.

4. Ballast shall be surge and transient protected to 6000 volts, ANSI-C62.41, Category-A.

5. Maximum total harmonic distortion (THD) created by operation on the line (input) side of the ballast shall not exceed 20-percent, unless indicated otherwise on the drawings.

6. The ballast shall provide an isolated output to the lamps. Metal ballast case shall be positively grounded to the light fixture metal housing.

7. The ballast shall incorporate transient surge protection to prevent damage to the ballast due to line side transients.

8. The ballast lamp current crest factor shall be 1.7 or less (ratio of peak to RMS current).

9. The ballast factor (BF)shall be not less than 0.87 for normal light output, 0.95 for high light output (HO) operation, unless indicated otherwise on the drawings.

10. Normal rapid start (continuous full filament voltage) Rapid Start - Rapid start ballast shall energize (preheat) the lamp cathode "heater" filament prior to establishing the lamp arc ignition, normal lamp operation shall occur within 1-second after starting. The ballast shall provide approximately 15,000 lamp start "on-off" cycles prior to lamp failure.

11. Instant start - Instant start ballast shall energize the lamp with an initial increased voltage to initiate the lamp arc discharge between the unheated (no preheat) lamp cathodes and ensure the lamps start without delay or flashing, eliminate lamp operating power required for cathode heating. Preheating the lamp cathodes shall not be performed by the ballast. The ballast shall control the lamp start "on-off" cycles to provide approximately 10,000 starts prior to lamp failure.

12. Program Start - Integrated circuit (IC) program start ballast shall energize (preheat) the lamp cathode "heater" filament for a programmed time duration prior to transition phase to lamp arc ignition and immediately deenergize the cathode after arc is established and lamp is operational. The ballast shall precisely control the cathode temperature and duration to increase lamp start "on-off" cycles prior to lamp failure to approximately 35,000 starts. The ballast shall reduce the "black-end" lamp condition resulting from frequent lamp "on-off" cycles. The Program Start ballast shall provide Automatic End of Life (EOL)lamp current shut-off, when a lamp fails.

C. Core & Coil, Non-Solid-State HID Lamp Ballast

1. Ballasts including mercury vapor, metal halide and high-pressure sodium fixtures shall be provided with constant wattage autotransformer(CWA)Ballasts.

2. If a core and coil CWA ballast is not available that complies with the contract documents, then provide solid-state electronic HID ballast.

3. The electromagnetic core and coil shall be Class-H (180° Centigrade) or higher temperature insulation, no exposed energized parts.

4. Capacitor with self-contained internal bleeder resister, UL – 1029, 100 degree C rated, dry capacitor.

5. Igniters shall withstand not less than 10,000 hours of continuous pulsing and 6-months of continuous open circuit operation without failure.

6. Ballast factor (BF) shall be 1.0.

D. Solid-state electronic metal halide lamp ballast.

1. Solid-state electronic for low wattage "probe-start" metal halide type lamp operation.

2. Lamp current crest factor (ratio of peak to RMS current) shall not exceed 1.5.

3. Operate lamps at a frequency of less than 200 HZ to minimize acoustic resonance inside the lamp arc tube and minimize lamp flicker.

4. Ballast factor (BF) shall be 1.0.

5. Automatic ballast thermal protection and automatic shutdown at end of lamp life (EOL) protection.

6. Total harmonic distortion (THD) on the input line side shall not exceed 16-percent.

E. Emergency Lighting

1. Light fixtures shown connected to both normal power and external emergency power branch circuits, shall be furnished with separate lamp ballasts for the normal and emergency power circuits.

2. The ballast(s) for the lamps connected to the external emergency branch circuit shall be in a separate wireway isolated and barriered from the ballast(s) for the lamps connected to the normal power branch circuits. The fixture shall be factory labeled "emergency" and "normal" on the respective wireways and ballasts.

F. Tandem Ballast Connections

1. Ballasts in one (1) or three (3) lamp fluorescent fixtures, when fixture is recessed mounted and within eight (8) feet of each other, or if surface on pendant mounted within (1) one foot of each other, shall be furnished with a tandem wiring harness connected to inboard Ballasts of master fixture, to be field connected to inboard ballast of adjacent fixture. Night-light or emergency light fixtures shall be exempt from this requirement.

G. Tabulation Ballast Performance Requirement

1. Linear Fluorescent Instant Start Lamp Ballast Characteristics – Table #1

Lamp Characteristics			Lamp/Quan. Each Pe Ballast	Ballast Elec. Input Max. Load			
				ANSI Input Watts		Input - VA	
Designation	NOL.	Watts		& BF	& BF	& BF	& BF
				0.87BF		0.87BF	
T12	48"	34	1	31	-	33	-
T12	48"	34	2	60	-	61	-
T12	48"	34	3	91	-	93	-
T12	48"	34	4	-	-	-	-
				0.87BF	1.2BF	0.87BF	1.2 BF
T8	48"	32	1	32	41	34	42
T8	48"	32	2	58	77	61	78
T8	48"	32	3	85	111	86	11 5
T8	48"	32	4	112	-	114	-
				0.98BF		0.98BF	
T5	48"	28	1	30	-	31	-
T5	48"	28	2	60	-	61	-
T5	48"	28	3	-	-	-	-
T5	48"	28	4	-	-	-	-
				1.0BF		1.0BF	
T5-HO/PS	48"	54	1	62	-	64	-
T5-HO/PS	48"	54	2	120	-	121	-
T5-HO/PS	48"	54	3	-	-	-	-
T5-HO/PS	48"	54	4	-	-	-	-

2. Compact Fluorescent Lamp (CFL) Ballast Characteristics – Table #2

Lamp Characteristics			Lamp/ Quan. Each Ballast	Ballast Elec. Input Max. Load			
				ANSI Input Watts		Input - VA	
Designation	NOL.	Watts		& BF	& BF	& BF	& BF
				0.87		0.87	
T5/CFL	22.5"	40	1	40	-	44	-
T5/CFL	22.5"	40	2	72	-	74	-
T5/CFL	22.5"	40	3	103	-	106	-
T5/CFL	22.5"	40	4	-	-	-	-
				0.90BF		0.90BF	
T5/CFL-HO	20.7"	55	1	58	-	61	-
T5/CFL-HO	20.7"	55	2	104	-	107	-
T5/CFL-HO	20.7"	55	3	-	-	-	-
T5/CFL-HO	20.7"	55	4	-	-	-	-

3. High Intensity Discharge (HID) Lamp Ballast Characteristics – Table #3

Lamp Characteristics		Ballast Maximum Electrical Input Load			
Designation	Lamp Watts	ANSI Input Watts		Input - VA	
		Core/Coil	Electronic	Core/Coil	Electronic
		Probe Start Metal Halide			
Metal Halide – MH	35/39	53	45	170	55
Metal Halide - MH	50	70	57	168	61
Metal Halide - MH	70	90	83	229	87
Metal Halide - MH	100	129	113	140	117
Metal Halide - MH	150	189	169	222	170
Metal Halide – MH	175	211	195	218	205
Metal Halide - MH	250	296	-	306	-
Metal Halide - MH	400	461	-	482	-
Metal Halide - MH	1000	1080	-	1083	-
Metal Halide - MH	1500	1615	-	1636	-
PULSE START – HID					
Metal Halide	100	-	-	-	-
Metal Halide	175	208	-	222	-
Metal Halide	200	232	-	250	-
Metal Halide	350	400	-	46	-
Metal Halide	400	452	-	471	-
Metal Halide	750	818	-	840	-
Metal Halide	1000	1080	-	1081	-

4. Ballast Table Notes:

   a. ANSI Watts = Ballast input watts @ 25°C (77°F) ambient; less than 1 ft. per minute air flow; horizontal lamp position. Greater than 9-inch lamp to lamp spacing for fluorescent lamps; Not less than 100 hours (seasoning) on new lamp operation prior to testing; perform test reading 30 seconds after test ballast/lamp operation is initiated.

   b. BF = (Ballast factor). (Lamp lumen output of specified ballast) ÷ (lamp lumen output with test laboratory "reference test ballast"). Lamp ballast factor shall not be less than described in the Contract Documents.

   c. HO = High output rated lamps and ballasts. (Note: All linear fluorescent lamps and ballasts shall be "normal" output rated , unless noted otherwise.)

   d. HPS = High pressure sodium.

   e. PS = Program start rated lamps and ballasts. (Note: all linear fluorescent lamps and ballasts shall be instant start rated, unless noted otherwise.)

2.02 LAMPS

A. General

1. Lamps shall be new, of wattage and type indicated. Each fixture or lighting outlet shall be supplied with the proper lamp(s)

2. Lamps shall comply with the characteristics as described in the lamp tables below, except where indicated otherwise on the drawings.

3. Lamps shall comply with limits on mercury and classification as non-hazardous waste as follows:

   a. Federal EPA – Toxicity Characteristics Leaching Procedures (TCLP).

   b. State of California – Total Threshold Limit Concentration (TTLC).

4. Lamps shall be as manufactured by General Electric, Philips, Osram or Sylvania.

B. Incandescent Lamps

1. General-purpose incandescent "A" style lamps shall be inside frosted, medium base for 200 watts and smaller.

2. Reflector lamps shall be PAR-20, PAR-30 or PAR-38 as required, unless otherwise specified in fixture schedule.

3. Incandescent lamps in non-enclosed fixtures and fixtures without lens/diffuser shall be rated for "open" fixture operation.

C. Fluorescent Lamps

1. Linear fluorescent shall be energy saving type and bi-pin operation. Rapid-start, Program Start or instant start as indicated in the contract documents.

2. Compact fluorescent lamps.

3. Average lamp life shall not be less than the following, based on 3 hours "on" operation and 20-minute "off" for each start cycle, when matched in combination with the specific lamp ballast and with the respective light fixture, unless noted otherwise:

   a. Linear fluorescent 20,000 hours.

   b. CLF – 20,000 hours and as noted in the lamp tables.

   c. HID – as noted in the lamp tables, based on 12-hours "on" operation for each start cycle.

   d. Incandescent – as noted in the lamp tables.

D. High Intensity Discharge Lamps HID

1. Provide proper base up, base down, horizontal, operating configuration for the fixture and lamps being furnished.

2. Lamps in non-enclosed light fixtures shall be equipped with automatic switching device to de-energize the lamp when the lamp outer glass envelope is broken.

3. Metal halide lamps shall be clear or coated as indicated on the drawings.

4. Lamp socket and lamp "burning" position of operation rating (i.e., base-up, base-down, horizontal) shall comply with the actual lighting fixture installation location.

D. Tabulation Lamp Performance Requirement

1. Linear Fluorescent Lamp Characteristics – Table #1
20,000 Hours Average Life @ 3 Hours per Start

Lamp Designation		Lamp	Lamp	Initial	Lamp	Lamp
Diam.	Type	NOL.	Watts	Lumens*	CCT(K)	CRI
T8	FO32/30	48"	32	2850	3000	75
T8	FO32/35	48"	32	2850	3500	75
T8	FO32/41	48"	32	2850	4100	75
T8	FO32/50	48"	32	2650	5000	75
T8	FO32/30/XPS	48"	32	3100	3000	85
T8	FO32/35/XPS	48"	32	3100	3500	85
T8	FO32/41/XPS	48"	32	3150	4100	85
T8	FO32/50/XPS	48"	32	2850	5000	85
T8	FO32/65/XPS	48"	32	2850	6500	85
T5	FP28/30	48"	28	2610 2900	3000	82
T5	FP28/35	48"	28	2610 2900	3500	82
T5	FP28/41	48"	28	2610 2900	4100	82
T5	FP28/50	48"	28		5000	
High Output						
T5	FP54/30/HO	48"	54	4400 5000	3000	82
T5	FP54/35/HO	48"	54	4400 5000	3500	82
T5	FP54/41/HO	48"	54	4400 5000	4100	82
T5	FP51/50/HO	48"	54		5000	

2. Compact Fluorescent Lamp (CFL) Characteristics – Table #2

Lamp Designation		Lamp	Lamp	Initial	Lamp	Lamp
Diam.	Type	NOL.	Watts	Lumens*	CCT(K)	CRI
a. Twin Tube/4-PIN/2G11						
T5/CFL	F40BX/30	22.5"	40	3150	3000	82
T5/CFL	F40BX/35	22.5"	40	3150	3500	82
T5/CFL	F40BX/41	22.5"	40	3150	4100	82
T5/CFL	F40BX/50	22.5"	40	2900	5000	80
b. High Output, Twin Tube/4-PIN/2G11 (12,000-Average Life/Hours)						
T5/CFL	F55BX/30/HO	20.7"	55	4800	3000	82
T5/CFL	F55BX/35/HO	20.7"	55	4800	3500	82
T5/CFL	F55BX/41/HO	20.7"	55	4800	4100	82
T5/CFL	F55BX/50/HO	20.7"	55	4800	5000	80

3. High Intensity Discharge (HID) Lamp Characteristics – Table #3

Lamp Designation		Average	Lamp	Initial	Lamp	Lamp
Identification	Type	Life/Hrs	Watts	Lumens*	CCT(K)	CRI
a. Vertical Lamp ± 15-Degree, for Base-Up and Base-Down Positions, Mogul Base & Socket						
Metal Halide	MH175/HO	10,000	175	13,000	3200	70
Metal Halide	MH250/HO	10,000	250	20,500	3900	70
Metal Halide	MH400/HO	20,000	400	40,000	3700	70
a. Vertical Lamp ± 15-Degree, for Base-Up and Base-Down Positions, Mogul Base & Socket (cont'd)						
Metal Halide	MH1000/HO	12,000	1000	115,000	3800	65
Metal Halide	MH1500/HO	3,000	1,500	167,000	4000	70

3. High Intensity Discharge (HID) Lamp Characteristics – Table #3 (Con't.)

Lamp Designation		Average	Lamp	Initial	Lamp	Lamp
Identification	Type	Life/Hrs	Watts	Lumens*	CCT(K)	CRI
b. Horizontal Lamp Position, Mogul Base & Socket						
Metal Halide	MH175/HO	10,000	175	15,000	3500	70
Metal Halide	MH250/HO	15,000	250	19,700	3600	70
Metal Halide	MH400/HO	22,000	400	36,800	3900	70
Metal Halide	MH1000/HO	9,000	1000	91,800	3400	70
Metal Halide	MH1500/HO	3,000	1,500	153,000	4000	70
c. Low Wattage Lamps, Universal Mounting Position, Medium Base & Socket						
Metal Halide	MH100/HO	15,000	100	9,000	3200	70
Metal Halide	MH100/XP	15,000	100	8,100	4000	75
Metal Halide	MH70/HO	12,000	70	5,500	3200	70
Metal Halide	MH70/XP	12,000	70	4,700	4000	75
Metal Halide	MH50/HO	5,000	50	3,900	3200	70
Metal Halide	MH50/XP	5,000	50	3,100	4000	75
d. Pulse Start (Vertical Base-UP Only, ± 15-Degrees, Operation), Mogul Base & Socket						
Metal Halide	MHP175	15,000	175	17,500	4000	75
Metal Halide	MHP200	-	200	-	-	-
Metal Halide	MHP250	20,000	250	23,000	3900	65
Metal Halide	MHP350	20,000	350	37,000	3900	65
Metal Halide	MHP400	20,000	400	42,000	4000	75
Metal Halide	MHP750	16,000	750	80,000	4000	65
Metal Halide	MHP1000	15,000	1,000	120,000	3800	65

4. Incandescent Lamp Characteristics – Table #4

Lamp Designation		Average	Lamp	Initial	Beam	
Identification	Type	Life/Hrs	Watts	Lumens*	Angle	NOL
a. Tungsten Halogen Medium Base & Socket, Mid Break "A" Lamps, 120 volt – AC						
Halogen	TH/A19/50	3,000	50	860	-	4.4"
Halogen	TH/A19/75	3,000	75	1,300	-	4.4"
Halogen	TH/A19/100	3,000	100	1,800	-	4.4"
Identification	Type	Life/Hrs	Watts	Lumens*	Angle	NOL
b. Tungsten Halogen Medium Base & Socket – PAR, 120 volt – AC						
Halogen	PAR16/60/SP	2,000	60	650	10°	2.9"
Halogen	PAR16/60/M	2,000	60	650	30°	2.9"
Halogen	PAR16/75/SP	2,000	75	900	10°	2.9"
Halogen	PAR16/75/M	2,000	75	900	30°	2.9"
Halogen	PAR38/120/SP	3,000	120	1,800	10°	5.4"
Halogen	PAR38/120/M	3,000	120	1,800	25°	5.4"
Halogen	PAR38/120/FL	3,000	120	1,800	55°	5.4"
c. Tungsten Halogen Two Pin Base & Socket – Clear Glass Lamp with Protective Lens for Use in "Open" Non-Enclosed Fixture Lamp, 12 volt AC, 3000°K, Non-Dichroic Reflector						
				CBCP		
Halogen	MR16/35/SP	4,000	35	7,500	10°	1.9"
Halogen	MR16/35/M	4,000	35	2,900	25°	1.9"
Halogen	MR16/35/FL	4,000	35	800	40°	1.9"
Halogen	MR16/50/SP	4,000	50	9,500	10°	1.9"
Halogen	MR16/50/M	4,000	50	2,800	25°	1.9"
Halogen	MR16/50/FL	4,000	50	1,800	40°	1.9"

Lamp Table Notes:

1. Fluorescent lamp lumen output listed in the tables above are based on lamp ballast, solid-state electronic ballasts, operating at 40kHz or greater.

2. Definition of terms, typical for all lamp schedules.

a.	Average Life/Hrs.	=	Lamp expected average operating hours when 50% of lamps have failed.
b.	Beam angle	=	The angle in degrees for the light dispersion, "narrowspot" (SP), "medium" (M), or "wide flood" (FL).
c.	CCT(K)	=	Lamp operating rated color temperature, chromaticity - Kelvin scale.
d.	CRI	=	Lamp minimum Color Rendering Index.
e.	CBCP	=	Center beam candle power.
f.	Diam.	=	Nominal lamp diameter,
g.	*Initial Lumens, Lumen output after 100 hrs. lamp operation to condition the lamps using a laboratory standardized ballast.	• 25 degrees centigrade (C) ambient operating temperature for fluorescent lamp • 30 degrees centigrade (C) for HID lamp * Two different lamp lumen outputs are listed for T5 linear fluorescent lamps, the 1st is @ 25°C = ambient the 2nd is @ 35°C ambient.	
h.	NOL	=	Nominal length of lamp.
i.	Watts	=	Rated lamp watts, not including ballast @ 25 degrees Centigrade (C) ambient
j.	See ballast table notes for additional definition of terms		

2.03 LIGHT FIXTURES (LUMINAIRES)

A. General

1. Lighting fixtures shall have all parts, ballasts, sockets, support attachments, trim flanges and fittings necessary to complete and properly install the fixture at the indicated installation locations. All fixtures shall be provided with lamps of size and type specified.

2. Ceiling and/or wall surface mounted lighting fixtures shall not have any exposed chase nipples or conduit knockouts visible to view within fixture housing. Lighting fixtures mounted in continuous rows shall have chase nipples or conduit knockouts between lighting fixture housing, but shall not have visible chase nipples/conduit knockouts on the visible ends of the continuous row of lighting fixtures.

3. Where fixture color is indicated to be selected by the ARCHITECT and/or OWNER'S Representative, provide two color chip samples for each color for review.

4. Recessed fixtures with attached junction box shall be provided with a junction box permanently attached to the plaster ring so that the junction box is accessible through the fixture opening when the fixture is removed. Connection between fixture and pull box shall be flexible metal conduit with not less than 16 AWG "AF" or "CF" type fixture rated copper wires, high temperature wire insulation for not less than 600 volts A.C. The flexible conduit shall be sufficient length, so that when the fixture is removed, the pullbox is readily accessible.

5. Recessed fixtures shall be Underwriters' Laboratory approved for recessed installation with plaster frame and attached pull box. Lamp enclosure, reflectors and finish wiring shall not be installed until plastering is completed. Exposed finish trim shall not be installed until finish painting of the adjacent surface is completed.

6. The fixture shall bear Underwriters' Laboratory label of approval for the wattage and installation indicated.

7. Light fixtures installed outdoors, in damp or wet locations shall be U.L. labeled for said location as "damp-location" and "wet-location" for the respective installation location.

8. Fixtures in contact with thermal/building insulation, shall be UL listed and rated for direct contact installation in thermal insulation systems.

9. Lamp auxiliary support brackets shall be heat-resistant, non-dielectric. Alternatively, metal auxiliary lamp support brackets shall be electrically isolated from the fixture, to prevent glass decomposition.

10. Lighting fixtures installed in masonry and/or concrete construction. The fixture housing shall be rated for "concrete-pour" installation location.

11. Provide a permanent label inside each light fixture stating the following relamping information. Not less than 0.125-inch high black alphanumeric characters on white background.

"Replacement lamp(s) installed in this light fixture _must comply with the following criteria:

_: CRI*	*_*: Lamp Watts*
_: CCT-K*	*_*: Lamp Lumens*

Only lamp rated _* type lamp ballast shall be installed in this fixture."

*Insert the value required for the specific lamp required by the Contract Documents for each light fixture.

B. Lens and Diffusers

1. Acrylic plastic or Plexiglas for the light fixture diffusers or fixtures lenses, shall be 100-percent virgin material.

2. Thickness of not less than 0.125-inch, as measured at the "THINIST" portion on the diffuser or lens. However, thickness shall be increased to sufficient construction and camber to prevent the lens and diffusers from having any noticeable sag over the entire normal life of the installation.

3. Diffusers shall be formed from cast sheet by a vacuum and/or pressure technique.

4. Lighting fixtures containing lamps with Dichroic reflectors and light fixtures with non-Dichroic lens/diffuser, shall be rated for high temperature lamp operations resulting from lamp heat redirected (reflected) back into the fixture.

C. Fixture/Luminaire Internal Wiring

1. Provide wiring between fluorescent lampholders and associated operating and starting equipment. Provide ballasts/transformers inside lighting fixture.

2. Where there are two or more fluorescent lamps in a single luminaire, and multiple level intensity control is indicted on specifications or drawings, multiple-lamp ballasts shall be used to the greatest extent possible and the following tandem wiring configurations shall apply:

   a. If "inboard-outboard" wiring or multi-intensity light switching controls are specified for (odd-quantity) multi-lamp luminaires, then the two outboard lamps shall be connected to a single two-lamp ballast within each luminaire. The inboard lamps of two adjacent luminaires shall be tandem wired, that is, connected to a two-lamp ballast within one of the luminaires.

   b. A one-lamp ballast may be used if a luminaire with ballast is separated by more than 10 feet from any other same type luminaire with a ballast, or if the nearest luminaire is on another control circuit. Otherwise, a lamp in one luminaire shall be tandem wired, that is, connected to a multi-lamp ballast in another luminaire.

3. Wire insulation for ballast/lamps employing igniters, shall be rated and U.L. listed for the igniter pulse voltage.

D. Lampholders (Sockets) and Supports

1. Provide fluorescent luminaire lamp sockets that are white, constructed of high temperature heat-resistant plastic or ceramic/porcelain.

2. When electronic solid-state ballasts are provided, fluorescent lamp sockets for 4'-0" lamps shall be of the "knife edge" type. The lamp sockets providing the tightest electrical connection shall be furnished.

3. Lamp supports shall be used as recommended by lamp manufacturer.

4. Rigidly and securely attach lampholder to the luminaire enclosure.

5. Provide lampholders and sockets suitable for specified lamps, and position the lamps in optically correct spacing and relationship to lenses, reflectors, filters, and baffles.

6. Lampholder location shall provide properly located starting aid, as specified by the lamp manufacturer.

7. Lamp sockets in fixtures shall be compatible with the respective specified lamp(s), as recommended by the lamp manufacturer and shall provide specified lamp operational performance.

8. Provide horizontal position(± 15-degree) lamp and lamp socket to automatically ensure lamp position, for lamps requiring horizontal only operation lamps, to ensure correct horizontal lamp install position.

9. Lamp sockets shall be rated for not less than actual volts of the igniter starting of the lamp.

E. Enclosed and Non-Enclosed HID Fixture Operation

1. HID light fixture shall be rated to contain hot lamp fragments (up to 1100°C) resulting from an HID lamp that may shatter (rupture) while operating.

2. HID lens/diffuser shall be rated to filter control short wave ultra violet (UV) from the HID lamp in the event the HID lamp shatters (ruptures). Where the lens/diffuser does not provide UV filter control, provide automatic "cutoff" operation in the light fixture as described below. Enclosed fixtures shall comply with UL-1572.

3. HID lamps, installed in non-enclosed light fixtures or installed in light fixtures not rated to contain hot lamp fragments, the lamp shall be rated for "open" fixture operation. The fixture shall provide automatic "cutoff" of electrical power to the lamp in the event the lamp(s) shatter/rupture.

F. HID Quartz-Restrike (Emergency egress lighting single circuit operation)

1. Provide incandescent tungsten/quartz additional lamp and socket in each high intensity discharge (HID) lighting fixture shown connected to emergency electric power source. Provide automatic Quartz-Restrike control system inside each respective HID lighting fixture shown connected to emergency electric power source. Factory assembled by lighting fixture manufacturer. Typical for emergency egress lighting HID fixtures, unless specifically noted to "omit-quartz-restrike" on the drawings. As manufactured by Thomas Research Products – ESP120/ESP125/MC1 series; Venture Lighting – ETN/MHI/PS series.

2. HID lighting fixtures with "Quartz-Restrike" control system shall provide automatic on/off control of the HID-lamp/ ballast and separate independent incandescent tungsten/ quartz lamp and lamp socket. The system shall operate with both "cold-start" and "hot-start" of HID lamps. The system shall operate with both on/off switching circuits and constant "on" circuits. The control system shall automatically maintain emergency egress illumination on emergency electric source.

3. The quartz-restrike control unit shall monitor both the normal source input electric power and emergency source input electric power. Upon failure of the normal source and initialization of the emergency source, the control unit shall automatically illuminate the internal incandescent lamp from the emergency power source.

4. The control unit shall simultaneously turn on (illuminate) both the incandescent source and HID sources when electrical power source supply to the HID fixtures power source is initially present. After HID lamp initial "cold-strike" or "hot-restrike" has occurred and the HID lamp has reached approximately 50 to 70-percent normal lumen output, the control unit shall automatically "turn-off" the incandescent lamp source and allow the HID lamp to complete return to full 100-percent lumen output and operate continually, without the incandescent lamp being illuminated.

5. Provide HID lighting fixtures containing quartz-restrike controls with multi-voltage ballast windings to allow taping separate HID lamp/ballast voltage and quartz-restrike lamp voltage from a common ballast. The 120 volt electric circuit power voltage source to operate the 120 volt incandescent lamp shall "tap" from the HID ballast. Provide HID lamp ballast with multi-tap "winding" voltage output to operate both the 120 volt incandescent lamp, while maintaining HID lamp/ballast operation at the branch circuit nominal input line voltage.

6. The quartz-restrike lamp shall be positioned inside the light fixture to maximize and direct incandescent lamp light-distribution to the floor area. The incandescent lamp shall not interfere or cause shadows from the HID lamp source.

G. Emergency Ballast Lighting

1. General

a. Self-contained emergency ballast containing batteries, battery charger, solid-state electronic control and lamp/ballast operation, contained within a metal case, red finish case color.

b. UL – 924, listed Emergency Lighting and Power Equipment, for installation inside and/or attached to lighting fixtures.

c. The emergency ballast unit(s) shall be provided inside each respective emergency light fixture by the fixture manufacturer.

d. Normal operating temperature range from 0-degrees Centigrade up to operating ambient temperature inside respective lighting fixture, but not less than 50-degrees Centigrade.

e. Provide a permanent label inside each emergency light fixture stating as follows, not less than 0.125-inch high black alphanumeric characters on a white background:

"Warning – this fixture provides more than one electric power source. Disconnect both normal and emergency sources including battery sources prior to opening fixture. Written permanent records documenting regular (every 30 days) emergency lighting function testing results shall be kept on file by the OWNER."

f. As manufactured by Bodine Inc.; or IOTA-Engineering.

2. Operation

   a. Emergency Mode

      When external AC electrical power fails, the emergency ballast shall immediately and automatically switch to emergency mode. Maintain emergency lamp(s) illumination, while operating from the internal battery/electronics during the power failure for not less than 90-minutes continuous duration.

   b. Normal Mode

      When AC electrical power is restored, automatically switch lamp(s) operation to external AC operation and begin battery charging mode.

   c. Battery Recharge Mode

      The battery charger shall automatically fully recharge discharged batteries in less than 24-hours, and prevent overcharging of the batteries, while maintaining a "float-charge" on the batteries.

   d. The emergency ballast shall operate not less than (2)-lamps in multi-lamp light fixtures and (1)-lamp in single lamp light fixtures. When operating in emergency mode, the lamp lumen output of each lamp shall be not less than 30-percent of the lamp normal full lumen output rating of one lamp. The lamp-lumen output shall be 100-percent of the lamp normal full lumen output rating when operating in normal mode.

   e. The emergency ballast shall provide cold-strike start and hot-restrike operation of the fixture lamp(s).

   f. Periodic automatic, internal self-test, simulating normal power loss and actual operation of emergency lamps on internal battery power. Auto self-test shall occur not more than 30 day intervals. Audible and visual trouble alarm display, with manual alarm reset/silence, for problems identified by autotest functions.

3. Electrical Characteristics

   a. Emergency ballast shall operate on the same input AC voltage as the normally "hot" branch circuit supplying the respective light fixture. Maximum line input load shall not exceed 15-percent more than normal fixture electrical load.

   b. The emergency ballast shall be compatible for correct operation with the specific lamp/ballast combination contained in the respective light fixture.

   c. The emergency ballast shall be compatible with switched (on-off), non-switched (continuously on) and dimmer controlled lighting fixtures/circuits.

4. Components

   a. Sealed nickel cadmium batteries, maintenance-free, rated for continuous operation in high ambient temperature, with 7-10 year operational life expectancy.

b. When standing on the floor below the fixture the emergency ballast test/monitor control panel shall be visible and readily accessible when the fixture is installed. The control panel shall provide:

1) Charging indicator visual annunciator to display the charger and battery status.

2) Momentary test switch/pushbutton to manually simulate power failure test.

2.04 LIGHTING STANDARDS (SUPPORT POLES, POLE MOUNTED LIGHTING FIXTURES AND LUMINAIRES)

A. General

1. Lighting poles, pole bases, pole arms, lighting fixtures (luminaires), supports with all lighting pole attachments and anchors shall be designed and constructed to withstand not less than 100 mile per hour steady horizontal wind loading and 130 mile per hour horizontal wind gust loading, without any damage to the lighting standards.

2. Provide tamper-resistant "hand-hole" and cover on the pole, for access into wiring terminations inside the pole. Provide ground "lug" attachment for equipment bond conductor.

3. Provide factory applied weather protective base undercoat and final finish on all exposed and internal components. Color as indicated or as selected by OWNER'S Representative.

B. Base Plate

1. Provide a base plate at the bottom of each pole to attach and secure the pole to the pole anchor bolts. The base plate shall be permanently attached to the bottom of the pole.

C. Anchors

1. Anchor bolts shall be threaded the entire bolt length, not less than four (4) bolts for each pole equally spaced around the pole base. Provide a minimum of two threaded nuts for each anchor bolt. Install a nut on the top and bottom sides of each base plate anchor bolt location. Not less than three (3) threads shall be exposed after pole is installed and leveled.

PART 3 EXECUTION

3.01 LIGHT FIXTURE INSTALLATION

A. General

1. The CONTRACTOR shall verify actual ceiling and wall construction types as defined on the Architectural drawings and furnish all lighting fixtures with the correct mounting devices, trim rings, brackets whether or not such variations are indicated by fixture catalog number. The CONTRACTOR shall verify depth of all recessed lighting fixtures with Architectural drawings prior to ordering fixtures. Any discrepancies that would cause recessed lighting fixtures not to fit into ceiling shall

be reported to the OWNER'S Representative prior to release of order to the supplier of the fixtures.

2. On acoustical tile ceilings, fixture outlets shall be accurately located in the center, at the intersection of the four corners or at the center of the joints of two tiles.

3. The CONTRACTOR shall aim the exterior adjustable lighting fixtures after dark in the presence of, and at a time convenient to the OWNER'S Representative.

4. Fixtures shall be ordered and furnished to operate correctly on the branch circuit voltage connected to the respective fixture as shown on the site plan and floor plan electrical drawings. The voltages shown on the fixture schedule are for generic fixture information only.

5. Install and connect lighting fixtures to the circuits and control sequences indicated on the drawings and to comply with respective manufacturer's instructions/recommendations.

B. Lighting fixtures installed in ceiling support grids - suspended lay-in "T-bar" and concealed spline ceilings.

1. Provide two seismic clips at opposite ends of each recessed light fixture, the clip shall connect to the ceiling grid main runners and the light fixture. The light fixture with seismic clips and ceiling grid runner connections shall resist a horizontal seismic force equal to the total weight of the light fixture assembly.

2. Each light fixture weighing 40 pounds or less and where the respective ceiling grid system is "heavy duty" type, shall be suspended directly from the ceiling grid or shall be suspended independent of the ceiling grid support system as approved by the AHJ. Each light fixture weighing more than 40 pounds or where the ceiling grid system is not a "heavy duty" type, shall be supported independent of the ceiling grid and independent of ceiling grid support system.

3. Each light fixture supported independent of the ceiling grid system shall be supported with a minimum of four taut independent support wires, one wire at each fixture corner.

4. Each light fixture supported directly from the ceiling grid or ceiling grid support system shall be additionally connected with a minimum of two independent slack safety support wires. One wire at each opposite diagonal fixture corner. Each 3 ft. x 3 ft. and larger light fixture shall be supported in the same manner, except provide a minimum of four independent slack safety wires, one at each fixture corner.

5. Light fixtures surface mounted to a suspended ceiling shall be installed with a one and one-half inch steel – "C" channel which spans across and above a minimum of two parallel main ceiling grid "runners" and concealed above the ceiling. Each channel or angle member shall be provided with a minimum of two threaded studs for attaching to the fixture housing through the lay-in ceiling tile. Two steel "C" channel members shall be installed for each four-foot (or smaller) fixture. Install the channels within six inches of each end of the light fixture to span a minimum of two ceiling grid parallel main runners. Provide two seismic clips connecting the ceiling grid main runners to each steel – "C" channel. Provide a not less than two (2) taut independent support wires connecting to each channel. Bolt the light fixtures to the threaded studs on the channels or angles, to support the light fixture tight to the ceiling surface.

C. Fixture Supports

1. The support wires for light fixture support shall be 12-gauge steel (minimum). The wires including their building and light fixture attachments shall provide support capacity of not less than four times the weight of the light fixture assembly. Provide additional light fixture support wires and building anchors to meet these requirements, as part of the contract. The support wires shall be anchored to the building structural elements above the ceiling.

2. Suspended fixtures weighing in excess of 40 pounds shall be supported independently of the fixture outlet box. Provide "air craft" (minimum 12 gauge) steel hanger cable for suspended fixtures route cable concealed or in pendant where possible. Each cable attachments shall support four times the weight of the fixture assembly. Securely attach the cable to the building structure.

3. Surface mounted fixtures installed on drywall or plaster ceilings and weighing less than 40 pounds may be supported from outlet box. Provide structural supports above drywall or plaster ceilings for installation of fixtures weighing more than 40 pounds and secure fixture to structural supports. The use of toggle bolts is prohibited.

D. Recessed Lighting Fixtures - Fire Rated Building Surfaces

1. Lighting fixtures recessed in ceiling or wall which has a fire resistive rating of 1 hour or more shall be enclosed in a fully enclosed backbox (except over fixture lens/diffuser). The material used to fabricate the "enclosed backbox" shall have a fire rating equal to that of the respective ceiling or wall.

2. The space from the fixture to the box enclosure shall be a minimum of 3-inches.

3. The backbox shall be concealed behind the fire rated ceiling and wall finish surface. The light fixture shall be provided with lamp ballast rated for (normal light output) operation in a "high" ambient temperature.

3.02 LAMPS

A. Fluorescent and HID lamps controlled by dimming equipment shall be operated (aged) for 100 continuous hours without interruption, at 100-percent full lumen output prior to occupancy of the building by the OWNER.

B. Lamps shall be the type and manufacturer as recommended by the dimming system manufacturer.

C. Install all lamps in each light fixture.

D. Lamp and light fixture use during construction:

1. All lamps in lighting fixtures that have been operated (ON) for a total of more than 300 hours prior to final completion of the contract notice of completion, shall be relamped by the CONTRACTOR. Remove the existing lamps with more than 300 hours of illuminated operation and provide new lamps of the type required by the contract documents, install lamps in respective light fixtures, typical for the following lamp types:

a. Linear fluorescent.
b. Compact fluorescent (CLF).
c. H.I.D.
d. Incandescent.

3.03 LENS AND DIFFUSERS

Lens, diffusers, internal reflectors shall be completely cleaned of all dust, dirt and fingerprints after the installation of the light fixtures and lamps, and after all trades have completed work and prior to occupancy of the facility by the OWNER.

3.04 BALLASTS

A. Ballasts remote from the lighting fixture, mounted as shown on the drawings and designed for remote operation. Additional wiring and conduit shall be provided whether shown on the drawing or not, between lighting fixture and remote Ballasts with required quantity of "THHN" wire installed in conduit to operate said fixture(s).

B. Provide proper type and quantity of conductors with conduit system for proper operation of dimming system, whether or not shown on drawings.

C. CONTRACTOR shall tandem wire one (1) lamp or three (3) lamp fluorescent fixtures when fixture is recessed mounted and within eight (8) feet of each other or if surface or pendant mounted within one (1) foot of each other. To accomplish tandem wiring, a tandem wiring harness shall be installed between inboard master ballast and inboard slave lamp located in adjacent fixture. Night-light or emergency light fixtures shall not apply.

3.05 FLUORESCENT LIGHT FIXTURE TANDEM WIRING CONNECTIONS

A. The contractor shall provide tandem wiring whether or not shown on the drawing for fluorescent lighting fixtures conforming to all of the following criteria:

1. Light fixture contains fluorescent lamp ballast.

2. Odd number of lamps in light fixture (i.e., 1 lamp, 3 lamps, 5 lamps, etc.).

3. Light fixtures are recess mounted within 10 ft. of each other; light fixtures are surface mounted or suspended/pendent mounted within 1 ft. of each other.

4. Light fixtures are located in the same room.

B. Provide the tandem wiring connections between respective light fixtures as follows:

1. The tandem wiring harness shall be the product of the respective lighting fixture manufacturer.

2. The tandem connection shall provide pre-assembled wiring harness connecting two (2) fluorescent lamps in adjacent lighting fixtures with a master lamp ballast, remote adjacent fixture slave lamp.

3. The wiring harness shall contain the wiring in flexible steel conduit or enclosed metal raceway/jacket for installation in an air plenum.

C. Delete tandem wiring requirement and provide individual and multi-lamp Ballasts in each respective light fixtures under one or more of the following conditions.

1. Lighting fixtures are shown as night-light or emergency light type fixtures do not require tandem wiring.

2. Fluorescent dimming Ballasts do not require tandem wiring.

3.06 COMMISSIONING LIGHTING FIXTURES (ADDITIONAL REQUIREMENTS)

A. General

1. Verify correct lighting control configurations and operation in each room.

2. Simulate normal source power failure by "opening" (turn off) building main service disconnect and verify connections and operation of each emergency lighting fixture.

3. Confirm "EXIT" sign directional arrows are visible in each "EXIT" sign.

4. Verify light fixture support-hangers, ceiling grid clips and seismic restraints comply with the Contract Documents.

5. Remove protective shipping/installation shields on fixtures. Verify fixtures and lamps are clean and free of construction debris. Clean light fixtures found to be contaminated or dirty.

6. Setup, program and function test lighting control systems to perform each of the indicated control functions, area/room zones and sequences.

B. Sample spot-check in each room the following lighting fixture information:

1. Lamp type and performance data.

2. Ballast type and performance data.

3. Combined lamp/ballast certification of performance and compatibility by respective manufacturer.

4. Verify instructional signage is placed inside each lighting fixture in compliance with Contract Documents.

END OF SECTION

SECTION 16722

FIRE ALARM

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other specifications sections and drawings for related work required to be included as work under Division Sixteen.

2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit eight (8) copies of the following to the Architect for approval.

1. A listing of all fire alarm components and equipment including the California State Fire Marshal (CSFM) listing numbers.

2. CSFM listing sheets of all devices being used.

3. Manufacturers standard catalog data for fire alarm components.

   a. The submittal shall be arranged in the order of the Specification and shall list the specification paragraph number, the name, the proposed model and manufacturer for each item as well as a reference indicating the specific piece of data which can be easily located in the brochure.

   b. The manufacturer's data sheets shall be marked to indicate the specific item being proposed in cases where the sheet covers several types or sizes of item. The data sheet shall completely describe the proposed item.

   c. Where modification to the equipment is necessary to meet the operational requirements of the contract documents, the data sheets shall include complete mechanical and electrical shop drawings detailing the modification.

4. A listing of the outlet rough-in needed for every device and equipment item. The applicable symbol which illustrates that rough-in item on the job plans shall be drawn on the proposal, opposite the description of the rough-in to facilitate locating the data by field personnel.

5. Elevation and dimensional information.

1.03 APPLICABLE STANDARDS

A. The equipment shall be listed, labeled, and approved for the application shown in contract documents, as fire alarm equipment complying with the list of applicable codes indicated on electrical plans.

B. Written certification by the fire alarm equipment manufacturer shall be submitted to the Architect, stating that the system and its component parts are listed and approved by the California State Fire Marshal and the installation has been tested, is operational and conforms to the requirements as set forth in Part 3, Article 24, Title 19, California Code of Regulations.

1.04 EQUIPMENT AND INSTALLING QUALIFICATIONS

A. The equipment shall be manufactured by Notifier to match existing operational and maintenance systems in the District and existing equipment on campus. No other substitutions will be approved.

B. The specification is based on the equipment of manufacturers who have been approved by the District and the manufacturers herein named shall be considered as meeting the requirements of this specification. For all items which are identified by part number and manufacturer the Performance specifications which are published in the most recent manufacturer's data sheets available at the time of bidding this project shall be applicable to the present work as though fully written out herein.

C. All equipment shall conform to all local applicable codes and ordinances, and shall be listed by Underwriters Laboratories.

D. To qualify as an acceptable bidder, whether the bid is submitted to the District, his agent, a general contractor or a sub-contractor, the system bidder or contractor shall be qualified fire alarm contractor and shall hold a valid C10 License issued by the Contractors State License Board of California. The system bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. The Contractor shall be the factory authorized distributor for the branch of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least five years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.

E. Installation Certification

1. Work and material for cables, cable terminations and related components shall be performed by certified installers. The installer shall be certified by the respective product manufacturers.

2. The manufacturers of the indicated work and material, shall provide a installer education/training and certification program for the supplied products.

3. The installers performing the Contract work for the indicated products, shall have attended and successfully completed each of the respective manufacturer's installation training education programs for the specified products.

4. Submit six (6) copies of the manufacturer's certifications for each installer performing the work. The submittal shall be approved prior to initiating any related contract work.

5. Contract material installed and work performed by installers not complying with these requirements shall be removed. Removal of work and material not in compliance with these requirements shall done at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions. New material and work required to replace the non-compiling removed work and material shall be provided at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions.

PART 2 - PRODUCTS

2.01 GENERAL SYSTEM OPERATION

A. System shall be microprocessor-based, addressable, and power-limited with Class A or Class B supervised circuits.

1. The microprocessor shall execute all supervisory and control programming to detect, report the failure or disconnection of any system module or peripheral device and initiate programmed control sequences. An isolated supervision "watchdog" circuit shall monitor the microprocessor and, upon failure, shall activate the system trouble circuits.

2. The automatic fire detection and alarm system shall consist of main control panel, transponder panel(s), notification alarm devices, remote annunciator, automatic detection devices, manual stations, printer, and CRT/keyboard, installed and wired in accordance with the drawings and shall function as specified herein.

3. The system shall be programmable in the field, by a non-computer trained person. All programmed information shall be stored in non-volatile memory.

4. The system shall operate both addressable and non-addressable ionization, thermal and photoelectric detecting devices, manual stations, water-flow switches, and external control modules.

5. The control panel shall provide power, annunciation, supervision and control for the fire detection and alarm system. The system shall be designed such that alarm indications override trouble and control conditions.

6. External circuit supervision shall not require additional wires other than the pair used for detection or alarm (only two wires shall be used from the control panel to each loop of initiating devices and two wires for the notification alarm devices). These two wires shall provide both supervision and notification alarm signals. There shall be no loss of supervision for Class "B" wired addressable devices. Class "A" supervision may be provided by adding an additional pair of wires.

B. Alarm Conditions

1. Actuation of any manual or automatic alarm initiating device, connected to the system shall cause the following automatic functions.

a. All notification alarm signaling units shall activate continuously. Audible notification alarms shall sound the California State coded signal.

b. The respective zone alarm lamp or annunciator alpha numeric readout on the central control panel, and remote annunciator panel, shall be activated.

c. Activate the Digital Alarm Communicator system.

2. Actuation of HV/AC air duct smoke detectors shall stop the designated fans and motors in the building's air distribution system.

3. Notification alarm signal duration shall be capable of continuous sounding or adjustable from three to ten minutes.

4. Perform any additional functions as specified herein or shown on the drawings.

C. Trouble Condition

1. A single open or single trouble condition in a manual or automatic fire initiating wiring circuit shall activate the respective zone trouble lamp or annunciator readout on the fire alarm control panel and sound a trouble signal at the control panel.

2. A single open or single trouble condition in the notification alarm signaling wiring circuit shall activate the trouble lamp or annunciator readout in the control panel and sound a trouble signal at the control panel.

3. 120 volt AC normal power shall be monitored with indication by a "power on" lamp. Upon normal power outage, the system shall activate a power trouble condition lamp or annunciator readout, and indicate a trouble condition.

4. The control panel shall monitor the standby batteries and, upon a low battery condition, activate the low battery battery lamp or annunciator readout and indicate a trouble condition.

5. System ground detection shall be provided for the entire system. Upon ground detection, activate the ground detection lamp or annunciator readout and indicate a trouble condition.

D. Control panels employing alpha numeric readouts shall display the trouble condition along with a prompt to review the list chronologically. The end of the list shall be indicated.

2.02 FIRE ALARM CONTROL PANEL

A. General

1. The fire alarm control panel shall be software programmable, microprocessor controlled, solid state, electronic integrated system. The panel shall be the product of one manufacturer. The control panel shall provide power, annunciation, supervision and control for the detection and alarm system. The detection system shall remain 100% operational, responding to an alarm condition while in the routine maintenance mode.

2. Addressable detection and control devices shall be individually identified by the system, and any quantity of addressable detection devices shall be in alarm and any quantity of addressable control units shall be operable at any time up to the total number connected to the system.

3. The microprocessor shall access the system program, which is stored in non-volatile programmable memory, for all control-by-event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power. Volatile memory shall not be acceptable.

4. A means shall be provided for acknowledging each abnormal condition. Each activation of the appropriate acknowledge button shall sequentially acknowledge every point in the system. After all the points have been acknowledged, the LEDs shall glow steady and the panel audible signal will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be so indicated.

5. An alpha numeric annunciator readout shall indicate on the control panel the activation by type, loop, and address of the specific device, sub-loop or alarm/monitor/control point via an alpha numeric display. An audible alert, shall sound at the control panel and an alarm light shall flash.

6. If the microprocessor fails, the system shall executive a default signaling program. This program shall enable the control panel to sound the audible signals and summon the Fire Department. In addition, a red LED shall light to indicate the communication loop wherein the alarm originated. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.

7. Protected access to the system controls shall be provided to allow the user/operator access to the following system functions:

   a. Status of all addressable points.

   b. Status of all events logged.

   c. Set/change the real-time clock and date.

   d. Perform an operational manual test of the system from the control panel, including actuation of any initiating device and trouble circuit without alarming the remote central station. The panel shall automatically return to normal mode in the event the panel remains unattended in the service mode.

   e. Retrieve from event log the last 300 alarms, or control points and 300 trouble conditions.

8. Individual input (monitor) and output (control) device addressability shall all be performed on the same pair of wires. Wiring shall be Class "A" or "B". When Class "B" wiring is used, no special wiring sequence shall be required on addressable device circuits. An unlimited number of wiring branches shall be permitted with no loss of supervision.

9. A minimum of 300 addressable monitor, trouble and control points shall be provided. Capabilities shall be provided to allow system expansion to a minimum of 900 addressable monitor, trouble and control points.

B. Cabinet

1. A metal tamper resistant cabinet shall contain the control panel components. Panel shall be surface or flush mounting as indicated on the drawings. Provide a full height tamper resistant hinged locking cabinet door. The door shall have transparent, high impact windows to allow visual observation of all indicators and switches without opening the panel door.

2. "In-out" circuit conductors shall terminate on numbered screw-type terminals.

3. All groups of circuits or common equipment shall be clearly marked and shall be expandable by inserting interchangeable units.

C. The control panel shall provide positive protection against the fire alarm system inadvertently being left in a non-operating status. The alarm system shall automatically restore and resound alarms and trouble signals, if subsequent alarm initiating or trouble signals are received under any of the following conditions:

1. After the alarm or trouble silence switch have been activated.

2. Prior to resetting system after previous alarm or trouble conditions.

D. The system indicating and operational control devices shall be mounted on the control panel face behind the panel door and shall provide the following minimum functions:

1. Individual visual indicating pilot lights annunciator or alpha numeric readout to monitor the following alarm system conditions:

a. Input power.

b. System common alarm.

c. System common trouble.

d. Alarm or trouble signal silenced.

e. Ground fault.

f. Battery condition.

g. Each individual alarm, control or initiating zone-activation.

h. Each individual alarm, control or notification zone-trouble.

i. Report, by specific device number, any device removed from an addressable initiating circuit, all other devices shall continue to function.

2. Manual control switches to allow the following system controls:

a. Alarm silence.

b. Trouble silence.

c. Test all indicating pilot lights and readouts.

d. System reset, including remote devices connected to the alarm panel.

e. Alarm test to initiate an alarm condition from the control panel.

f. Alarm disconnect for system testing without activating the Digital Alarm Communicator system.

g. Changing the status of configured circuits (arming or disarming and changing status of relays). If any change in status degrades system operation as configured, a trouble condition shall be reported and remain until system operation again meets configured status.

h. Perform multiple operations at the same time. These operations shall include but not be limited to timed functions and multiple configured sequences.

3. Individual indicating meters for the following information.

a. Battery ammeter.

b. Battery voltmeter.

E. Alarm initiating zone modules.

1. Shall supervise and accept remote alarm actuating device input signals. An alpha numeric readout shall indicate separate zone alarm and trouble indicators for each zone.

2. Zones shall be compatible, and designed to operate with the connected initiating devices either addressable or non-addressabe type.

3. A spare double throw set of software programmable auxiliary alarm relay contacts shall be provided for control of remote devices for each zone. Contacts shall be rated 120 volt-60 HZ 3 Ampere.

4. Each device on the system shall report as its own unique address.

F. Notification alarm signal control.

1. Shall supervise and activate remote notification alarm devices.

2. Notification alarm shall be compatible and designed to properly operate with the connected audio and visual notification alarm devices, with no signal degradation.

3. The notification alarm shall provide group notification signal control of all notification zones.

4. The alarm modules shall be field resettable to provide either continuous or coded notification alarm signals. The coded alarm signal shall provide an intermittent "on-off" pulsed sound activation of audible notification alarm devices.

5. A notification alarm circuit trouble indicating readout shall be provided for each notification zone.

G. Automatic ground detection shall detect either positive or negative voltages when earth connections of 50,000 OHMS or less occur, and activate the ground trouble signal.

1. A ground fault code shall provide indication of either a positive or negative ground fault and shall operate the general trouble devices as specified herein but shall not cause an alarm to be sounded.

2. A short circuit error message shall be a standard feature of the fire alarm control panel. Each communication loop shall be monitored for short circuits and shall have a distinctive error message for visual indication of circuits and operating trouble devices as specified herein but shall not cause an alarm to be sounded.

H. Power Supply

1. The power supply shall be adequately sized to properly operate the equipment, including remotely connected, spare and future indicated equipment with all alarm dvices in alarm condition. Provide 20% spare power supply capacity for future expansion. Provide transfer modules and multiple power supplies as required for proper operation.

2. Input voltage 120/240 volt or 120/208 volt 60 HZ. A.C.

3. Surge transient voltage protection on the input and output phases of the power supply shall be provided.

4. Supervised voltage types (i.e. 120V-60HZ A.C., 24 volt A.C., 24 Volt D.C., etc.)required by special connected equipment shall be supplied, including but not limited to:

   a. Alarm initiating devices.

   b. Door hold-open or closing devices.

   c. Automatic fire doors and dampers.

   d. Notification alarm devices.

   e. Control and annunciator panels.

   f. Fire and smoke dampers.

5. A solid-state power transfer circuit shall provide (UPS) uninterrupted power supply between internal standby power and line power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions).

6. Individual circuit fuses shall be provided for smoke alarm detector power, main power supply notification circuits, battery standby power, and auxiliary output.

I. Battery Back-Up Operation

1. Internal batteries and battery power supplies shall be provided to allow 60 hours continuous automatic normal operation of the entire control panel and fire alarm system after the failure of the incoming utility power. Sufficient battery capacity shall remain at the end of 60 hour period to provide ten minutes of continuous operation of all connected notification alarm devices.

2. Batteries shall be maintenance free, sealed, lead-acid or lead calcium or gelled electrolyte type rated 25% larger than required to provide power for the entire system upon loss of normal 120 VAC power for a period of sixty (60) hours with five (5) minutes of alarm signaling at the end of this sixty-hour (60) period.

3. The battery charger, shall be automatic, dual rate with capacity to recharge completely discharged batteries in 18 hours. Charger shall be temperature compensated.

J. Lighting and transient voltage surge protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits, signal circuits, and telephone line circuit.

K. Circuitry shall be provided in the control panel to permit transmission of trouble and alarm signals over leased or privately owned telephone cables to a remote receiving panel. A reverse polarity or a masterbox circuit as required, shall be provided in the control panel. There shall be a supervised disconnect switch to allow testing of the fire alarm signal without transmitting an alarm signal to the central station.

L. The alpha numeric annunciator (printer and CRT/keyboard) shall list upon request:

1. Alarms with time, date and location.
2. Troubles with time, date and location.
3. Status of output functions, "on" or "off".
4. Sensitivity of addressable smoke detectors.
5. Detection device number, type and location.
6. Status of remote relays, "on" or "off".
7. Acknowledgment time and date.
8. Signal silence time and date.
9. Reset time and date.

M. The system shall also provide the following:

1. Counting the number of addressable detectors within a "zone".

2. Which are in alarm.

3. Counting "zones" which are in alarm.

4. Counting the number of addressable detectors which are in alarm.

5. Alarm on the system.

6. Differentiating among types of addressable detectors such as smoke detectors, manual stations, water-flow switches, thermal detectors.

7. Assigning priorities to types of detectors, zones or groups of detectors.

8. Cross-zoning.

M. CONTROL FUNCTIONS

1. Control functions shall be assigned on the basis of multi-relational system initiation patterns of detection devices including full logic element equations using as "anding" zones, counting zones, counting devices, "anding" groups, conditional "if", "then", "or" programming and "anding" types of detection devices.

2. Control functions shall be assigned on the basis of, cycle, delay, count, time of day, day of week, day of month and with a holiday schedule of up to thirty (30) holidays per year. Each addressable detection device shall report its condition to the system control unit not less than every four (4) seconds in a manner such that failure of the connections to the internal electronics of the device will result in a trouble signal which identifies the specific device involved.

3. The system shall be field programmable for the response of control points to monitored devices.

4. The operating software program shall provide programmable control for the Event-Initiated-Programs (E.I.P.) which shall allow automatic operation of system control points in the event of a alarm condition. To program these E.I.P.'s, the system shall use a specifically designed user friendly programming language, which shall not require a knowledge of computer programming to learn and understand.

5. The operating software shall support the following additional capabilities:

   a. Three levels of designated and unique Priority Alarms for each point.

   b. Designated "Sense Mode" for status interpretation for each point.

   c. Designated Print/No Print/Vectoring Mode for each point.

6. The input statement defines the conditions required to activate the associated output statement. The input statement shall consist of single or multiple monitor point status, subroutine status, time comparison and the utilization of AND, OR, NOT, COUNT, and DELAY logic functions.

7. The output statement defines the action to be taken by the control panel. The output statement shall consist of activation/deactivation of single or multiple control functions, subroutines, and remote Annunciator status LED's. Output statements shall also include the "Alert" messages.

8. The software shall provide an "alert" message, unique to each point in the system, which will provide specific instructions for the operator on duty. These messages shall be up to 5 lines with up to 70 characters in each line. Each system monitor point shall have 5 specific alert messages when in alarm. Control points shall also be assigned alert messages.

9. The hardware and software shall have the capacity to accept up to 64 independent programs. Each program shall have "Edit" or "No Edit" capability. Each program shall be written in an equation format comparable to ladder-logic equations. The Equations shall consist of an input and an output statement.

10. Provide initial programming services for coding, loading and debuging the initial Owner specified programs, as part of the contract.

11. Programming Command Definition

    a. Timing command shall provide time delay and time control functions based on internal clock/calendar by time of day; day of week; day of month; month in year.

    b. Count command shall provide a specific number of events to occur before a control action is initiated.

    c. Pulse command shall provide on control for a specific period of time.

    d. Cycle command shall provide on-off control for preset periods of time.

    e. Print command shall provide printing of specified information after an event occurs.

2.03 MANUALLY ACTIVATED ALARM INITIATING DEVICES

A. An electronic, digital multiplex, addressable module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

B. Devices shall be suitable for use on a class "B", 2-wire supervised alarm initiating circuit.

C. Numbered screw type terminals shall be provided for "in-out" connections of the alarm circuit wiring.

D. The face of the station shall have lettering indicating "FIRE" and operational instructions. Stations shall be tamper resistant, semi-flush mounting.

E. Auxiliary spare switch contact shall be provided for control of remote devices rated 120 volts - 60HZ, AC - 3AMP minimum.

F. Stations shall provide visual indication the station has been activated. A key (and/or special tool) shall be required to gain access into the station to reset the station after being activated.

G. Stations shall be "nonbreak-glass" type.

H. RF and transient filtering shall be provided in the device electronics.

I. Pull stations shall be non-coded double action, requiring a two distinct manual "pulling" actions to initiate the fire alarm system.

J. Stations installed outdoors shall be weather resistant construction, double action to activate the pull station.

2.04 AUTOMATIC ALARM INITIATING DEVICES

A. General

1. An electronic digital, multiplex, addressable module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

2. Devices shall be suitable for use on a Class "B", 2-wire supervised alarm initiating circuit. Where initiating devices are shown connected to an existing system, devices shall operated on two or four wire circuits plus - 2 - wire power circuit as required by the existing equipment.

3. Numbered screw type terminals shall be provided for "in-out" connectors of the alarm circuit wiring.

4. Auxiliary double throw spare relay contact shall be provided for activation of remote rated devices 120V-60Hz, AC - 1 Ampere minimum.

5. RF and transient filtering shall be provided in the initiating device electronics.

6. Initiating devices shall be reset from the control panel and shall not require individual resetting.

B. Smoke Detector

1. Detectors shall comply with U.L. standard 268, 167 and 168, and shall use solid state electronic circuits throughout.

2. The smoke detector shall operate on a total of two circuit wires. Alarm signaling and detector power shall use the same conductors. Detector sensitivity shall be factory set at 1.5%.

3. A fine mesh insect screen shall be provided on all detector openings.

4. The detector shall lock-in on alarm and shall provide a visual alarm/trouble indicator light. An electromechanical test feature shall provide functional testing of the unit without smoke.

5. The detector shall also incorporate a fixed temperature heat detector rated at 135 degrees F. The heat detector shall operate the alarm circuit and alarm/trouble light.

   a. Photo electric type smoke detectors shall employ a light emitting diode (LED) as the detector light source, activated by the presence of combustion smoke products. Failure of the LED shall activate the alarm/trouble light on the detector.

   b. Ionization type smoke detector shall employ the triple chamber (dual chamber) ionization principle, activated by the presence of combustion products. The ionization chamber shall be RF shielded.

   c. Air duct smoke detector photo electric or ionization type for installation on a mechanical air ducts. Two air tubes shall extend into the air duct. The sampling tube shall extend across the entire width of the air duct. The second tube shall allow air to escape back into the duct.

C. Fire Sprinkler Water Flow Detector.

1. Vane-type water flow detectors shall be provided on the sprinkler system piping as shown on the drawings. Detectors shall be designed for mounting on either vertical or horizontal piping, but shall not be mounted in a fitting or within 12 inches of any fitting that changes the direction of water flow.

2. The detectors shall have a sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler head.

3. Detector switch mechanisms shall incorporate an instantly recycling pneumatic retard element with an adjustable range of 0 to 70 seconds. Switches shall have a minimum rated capacity of 7 amp 125 volt A.C. - .25 amp 24 volt D.C. A D.P.D.T. switch shall be actuated by a polyethylene vane extending into the waterway of the piping.

4. Detectors shall be of weatherproof, dust tight construction and shall provide a 3/4 inch conduit entrance. Detector shall be finished in red baked enamel.

5. Flow switch shall be sized to match the fire sprinkler riser pipe diameter.

D. Fire Sprinkler Valve Tamper Switch

1. Tamper switch shall monitor the position of the fire sprinkler shut-off valve. Operation of the valve shall activate the switch and activate a trouble alarm.

2.05 NOTIFICATION ALARM DEVICES

A. General

1. Notification alarm devices shall activate automatically from the control panel. Devices shall operate on a Class "B" (Style Y), 2-wire supervised alarm notification circuit. Series wired alarm devices shall not be used.

2. Numbered screw type terminals shall be provided for "in-out" connections of the alarm circuit wiring.

3. Devices shall be installed in a box, 3 1/2" deep maximum, flush mounting unless indicated otherwise on the drawings. Size as required for the alarm indicating device and wiring connections. Provide a trim ring and metal grill cover assembly. Cover assembly shall be minimum of 1/16" minimum thick flat stainless steel or aluminum. Finish color as selected by Architect. The word "fire" shall appear on the grill minimum 1/2" letters. The grill shall be attached with screws to the box.

4. Each audible notification visual devices shall incorporate a visual alarm indicator. The visual alarm indicating device shall be an integral part of the audible alarm box assembly.

5. Audible notification device and visual notification devices shall be connected to separate notification alarm signal circuits. Do not connect these devices to the same circuit conductors.

B. Audible Alarm Horns

1. Horns installed indoors shall be electronic type.

2. Horn shall provide a minimum sound level of 75 DB at 15 feet, when installed in the field operating conditions shown on the drawings.

3. Outdoor horns shall be electro-mechanical, weatherproof and shall be mounted in a recessed backbox Soundolier 193-8 series.

4. Audible devices shall provide a minimum sound level of 10DB over the ambient level measured 48" above the floor.

C. Visual Alarm Indicator

1. Lamp/Strobe internally illuminated projecting lens assembly, with flasher system. Unit shall flash on and off to provide visual indicating of fire alarm.

2. The word "fire" shall appear on the lens or lens plate.

3. Flash rate, one flash per second, with a flash duration of approximately 0.001 second, flash rate independent of audible device.

4. Light source, Xenon high intensity flash strobe tube white/clear color.

5. Strobe shall have a minimum output of 75 candela with a maximum flash intensity of 120 candela.

6. Strobe shall comply with NFPA requirements.

2.06 REMOTE FIRE ALARM ANNUNCIATOR

A. General

1. The annunciator panel shall be powered and operated from the fire alarm control panel. "In-out" circuit conductors shall terminate on numbered screw-type terminals.

2. A metal tamper resistant weatherproof cabinet shall contain the annunciator components. The panel shall be surface or flush mounted as indicated on the drawings. Provide a full height tamper resistant, hinged locking cabinet door. Door shall have transparent high impact windows to allow visual observation of all indicators and switches.

3. An electronic digital, multiplex, addressable module shall be incorporated into the annunciator. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

B. Each alarm initiating zone (including spares) shall be individually annunciated in the annunciator panel.

C. A common fire trouble alarm shall be annunciated in the annunciator panel from the fire alarm control panel.

D. Annunciator lamp circuits shall be automatically supervised. Provide lamp test switch in the annunciator panel.

E. An audible alarm/trouble buzzer with silence switch and automatic resound for subsequent alarm/trouble signals shall be provided. The annunciator panel shall be automatically reset when the control panel is reset.

F. A keyed switch shall be provided for remote reset of the system. The annunciation panel shall also be automatically reset when the control panel is reset.

G. Provide a floor plan of the facility framed under acrylic and mounted adjacent to the fire alarm annunciator. The floor plan shall be to scale and shall have room numbers clearly displayed on all rooms corresponding to the annunciator for the purpose of easily identifying the fire zones.

2.07 REMOTE EQUIPMENT MONITORING AND CONTROL

A. An electronic digital multiplex addressable module shall be provide at each device or equipment indicated to be controlled by the multiplex system. Multiple addressable control ports shall be provided in each module quantity as required for each point controlled or monitored. The module shall communicate the monitor status control action and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

B. Where multiple points are monitored or controlled, provide digital, multiplex, multipoints, monitor, control panel (MMCP). The panel cabinet shall be self contained NEMA 1 [3R] construction and hinged locking door. Provide tamper switch detection zone on the cabinet door, provide 60 hour battery UPS backup and power supply, the same as required for the fire alarm control panel. Panel shall be expandable using plug-in circuit monitor/control printed circuit cards. Provide barriered numbered terminal strips.

C. Each control point shall provide a supervised "dry" relay contact single pole double throw maintained contact rated 10 ampere, 227 volt, 60 HZ A.C.

D. Each monitor point shall provide not less than one of the following supervised methods of monitoring a remote device or equipment action or status.

1. Remote "dry" contact operation normal open, normally closed or momentary contact operation.

2.08 HARD COPY PRINTER

A. The system shall provide an external hard copy written record of all alarms, troubles, and system activity by means of full carriage width printer. The printer shall print detection device designations and location messages on a single line of up to 128 characters wherein 32 are reserved for device or zone custom identification and the remaining are use programmable.

B. New unacknowledged alarms and troubles shall be distinctively displayed on the printer and differentiated from previous alarms and troubles.

C. The printer output shall be 8 1/2" wide or 13" wide tractor feed continuous form paper. Provide a minimum of 5000 sheets of spare paper for the printer. Provide two spare ink/ribbon replacement units for the printer.

D. Provide a floor standing printer support stand with caster wheels input and output paper trays.

E. Provide conductors to connect the printer to the control panel minimum 50 ft. in length.

PART 3 - EXECUTION

3.01 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. The inside cover of alarm initiating devices shall be marked with the zone initiating number corresponding to the zone number in the control panel. Marking shall be with a felt-tip pen.

B. Each fire alarm terminal cabinet shall be painted red.

C. Provide nameplate: "Power to Main Fire Alarm Control Panel" screwed onto the branch circuit overcurrent device supplying power to the main fire alarm control panel.

3.02 WIRING (ADDITIONAL REQUIREMENTS)

A. Review the total system point-to-point wiring layout to assure that the correct number and type of wires and conduit sizes are installed.

B. Final connections, testing, adjusting and calibration shall be made under the direct supervision of a factory-trained technician of the system supplier.

C. All wiring shall be in conduit.

D. All wiring in cabinets shall be neatly formed, laced and made up on bolt and nut terminal blocks. Tag all spare conductors. All conductors shall terminate on terminal strips with spade lugs, of adequate size for all incoming and outgoing conductors. The strips shall be labeled as to their use and wiring diagram shall be placed on the cabinet door showing connections of all related equipment to these strips.

E. Wiring requirements for shielding certain conductors shall be as recommended by the manufacturer. Provide all conduit, raceways and conductors per manufacturers recommendations and include all material and labor costs in the contract price.

F. The conductors used for digital, multiplex communication between the fire alarm control panel and external remote initiation devices, control points and annunciators, shall be twisted, shielded, multi-conductor cable, #16 AWG copper minimum with a separate internal ground/drain conductor, U.L. listed for fire alarm system use. One spare pair of multiplex conductors shall be provided in all main and branch device/equipment connections for future system use. "Tees" and taps at any junction box location in the communication lines, shall be permitted by the system to additional devices without affecting proper system operation.

G. Wire Size: Wire shall be sized to insure installed circuit voltage drop does not 10% to all devices.

3.03 OUTLET BOXES (ADDITIONAL REQUIREMENTS)

Device outlet boxes shall be flush mounted unless indicated otherwise on the drawings. Provide extension rings to finish flush with finish surface. Where the drawings indicate surface mounted devices, outlet boxes shall be cast metal with threaded hubs. Where the conduit entrances are not exposed for surface mounted devices, provide flush outlet box behind the device box and omit the conduit hubs on the device box. Size device boxes and outlet boxes per manufacturers recommendation and as required by code for wire fill.

3.04 SPECIAL INSTALLATION REQUIREMENTS

A. Air duct smoke detectors shall be installed in the supply air ducts and return air ducts with an air flow of 2000 CFM or greater, coordinate with mechanical contractor. Sampling tube shall extend across entire duct width. Provide 3/4" conduit with 2#12 to respective motor control device to automatically shut down the respective fan motor upon detection of smoke in the air duct.

B. Water flow switches shall be installed on each main fire sprinkler rise pipe, coordinate with the fire sprinkler contractor.

C. Tamper switches shall be installed on each main fire sprinkler shut-off valve, coordinate with the fire sprinkler contractor.

D. Equipment shall be weatherproof gasketed where installed in locations exterior to the building, or where indicated on the drawings. Weatherproof equipment shall be tamper resistant.

3.05 TESTING

A. The entire fire alarm system shall be tested in the presence of the local DSA Inspector and a representative of the manufacturer after the installation is complete. Contractor to provide decibel meter for audibility tests of audible components.

1. Individually activate each manual initiating station and verify correct alarm operation and control panel response.

2. Individually test each automatic initiating device and verify correct alarm operation, control panel response and remote equipment operation.

3. The communication loops and the notification alarm circuits shall be opened in at least two (2) locations per building to check for the presence of correct supervisory circuitry.

B. Test the battery back-up system by disconnecting the incoming normal power and allowing this alarm system to operate 24 hours on battery power. Sound the alarm system for five minutes at the end of 24 hours on battery power.

C. Perform all electrical and mechanical tests required by the equipment manufacturer's certification form. Measure and adjust each automatic detection detector to the maximum stable sensitivity setting. Detector tests shall be performed with the detector at its operational location and under normal operational environmental conditions in the area. Bench settings are not acceptable. An operational check-out test and report shall be performed. Submit six copies of test report results. The tests and report shall include, but not be limited to:

1. A complete list of equipment installed and wired.

2. Indication that all equipment is properly installed and functions and conforms with these specifications.

3. Test of individual zones as applicable.

4. Serial numbers, locations by zone and model number for each installed detector.

5. Voltage (sensitivity) settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.

6. Technician's name, certificate number and date.

7. The completed manual and automatic monitoring and control system shall be tested to insure that it is operating properly. This test will consist of exposing the installed units to a standard fire test.

8. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the contractor shall readjust or replace the equipment and detector(s) and begin another ninety (90) day test period. As required by the Architect, the contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the District has obtained beneficial use of the building under tests.

D. After the testing has been completed to the satisfaction of the inspectors, provide the NFPA certificate of compliance to the District, the local Fire Official, the Architect and DSA.

E. Upon the receipt of Certificate of Compliance, the installer/supplier shall supply the Owner with a written operating, testing and maintenance instructions, point-to-point as-built drawings, and equipment specifications.

3.06 Provide a two (2) hour instructional sessions conducted by a factory-authorized technician at the job site after completion of all tests to instruct School District personnel on the use of the system. The first session shall be videotaped and conducted prior to final acceptance of the project. The second session shall be held within eleven months of final acceptance of the project, when requested by the District.

END OF SECTION

SECTION 16724

INTRUSION DETECTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other specifications sections and drawings for related work required to be included as work under Division 16000.

2. General provisions and requirements for electrical work.

1.02 QUALIFICATION OF BIDDERS AND EQUIPMENT

A. To qualify as an acceptable bidder, whether the bid is submitted to the District, his agent, a general contractor or a sub-contractor, the system bidder or contractor shall be qualified contractor and shall hold a valid License issued by the State of California Department of Consumer Affairs Collection and Investigation Services for the purpose of installing security systems. The system bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. The Contractor shall be the factory authorized distributor for the branch of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least five years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.

B. The equipment specified herein shall be Bosch Security Systems or equal by Ingersoll Rand. Call Bosch at 1-800-289-0096 for a list local factory authorized suppliers.

C. The system shall be serviced by a field supported 2-year warranty.

D. The specification is based on the equipment of manufacturers who have been approved by the District and the manufacturers herein named shall be considered as meeting the requirements of this specification. For all items which are identified by part number and manufacturer the Performance specifications which are published in the most recent manufacturers data sheets available at the time of bidding this project shall be applicable to the present work as though fully written out herein.

E. All equipment shall conform to all local applicable codes and ordinances, and shall be listed by Underwriters Laboratories.

F. Installation Certification

1. Work and material for cables, cable terminations and related components shall be performed by certified installers. The installer shall be certified by the respective product manufacturers.

2. The manufacturers of the indicated work and material, shall provide a installer education/training and certification program for the supplied products.

3. The installers performing the Contract work for the indicated products, shall have attended and successfully completed each of the respective manufacturer's installation training education programs for the specified products.

4. Submit six (6) copies of the manufacturer's certifications for each installer performing the work. The submittal shall be approved prior to initiating any related contract work.

5. Contract material installed and work performed by installers not complying with these requirements shall be removed. Removal of work and material not in compliance with these requirements shall done at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions. New material and work required to replace the non-compiling removed work and material shall be provided at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions.

1.03 PERFORMANCE REQUIREMENTS

A. Provide main control panel, terminal cabinets, keypads, and site underground conduits as indicated.

B. Provide motion sensor(s) in each room having exterior doors, exterior glass, or skylights. Quantity of sensors in each room shall be as required to detect entry through exterior doors, exterior glass, or skylights.

C. Provide a magnetic switch at the entry door to each building, near its respective keypad. Connect to the system to initiate a timing circuit for keypad operation.

D. Provide magnetic switches at roof hatches.

E. Provide all conduits, cabling, and outlet boxes required for a complete and operable system.

F. Meet with representatives of the District at a time and location convenient to the District. Advise the District of programming options and incorporate all requirements onto the shop drawings before submittal to the Architect.

1.04 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit evidence of having met with District representatives as specified herein.

B. Submit product data sheets for all switches, keypads, wiring devices, device plates, controllers, power supplies, cabinets, etc.

C. Submit detailed shop diagrams including dimensioned plans, elevations, details, schematic and point-to-point wiring diagrams and descriptive literature for all component parts and cabinets.

D. Submit six (6) copies redrawn building floor plans showing all components of the intrusion detection system including interconnecting cabling and conduits. Sensors shall be located on the drawings in the location conforming to the requirements stated herein. Drawings shall be prepared to scale and show all exterior glass, exterior doors, all interior

and exterior building walls, roof hatches, architectural and structural elements relevant to the installation of the system. Each zone shall be shown on the plans.

PART 2 - PRODUCTS

2.01 SYSTEM FUNCTIONS

A. Provide a complete and operable supervised intrusion detection system as shown on the plans including but not limited to master control panel, key pad stations, motion detectors, connections to door switches, a State Fire Marshal listed digital communicator, and an automatic dialer.

B. Upon detection of an intruder by initiation of any device in the system, the system shall cause the annunciator LED to light and sound an alarm signal on the school's telecommunication system. Alarm information shall be sent by digital dialer to central station alarm monitoring agency.

C. Systems shall detect the motion of a body taking not more than four steps in an area secured with motion detection equipment where entry doors or windows are possible access.

D. Each building area shall be on a separate zone with each zone controlled separately so that any building area may be secured while others remain unsecured.

E. The system shall be capable of off-site computerized access for remote access, programming and control.

2.02 CONTROL PANEL

A. Control/Communicator panel shall be a Bosch Security System #D9412G control panel with an integral digital communicator and shall be Underwriters Laboratories listed. All external circuit connections shall be UL listed as power limited in accordance with the provisions of Article 760 of the California Electrical Code (CEC).

1. Provide point of protection (POPEX) modules at the control panel for Popit module supervision.

2. Provide point of protection identification transponders (Popit) modules at building terminal cabinets to individually identify each detector in the system.

B. The control/communicator shall be IP based.

C. System shall include the following features:

1. Real time clock and test timer.

2. Battery charging circuit.

3. Battery voltage supervision.

4. Supervised automatic reset circuit breakers.

5. Onboard warning buzzer and diagnostic LEDs.

6. Automatic answer modem.

7. Lightning and RFI protection.

8. Central Station reporting format.

9. Printer/CRT interface module for on-site serial data printer recording or CRT display of events.

10. Quad serial output module for enhanced serial data interface capability for specific accessory modules and devices.

11. Individual zone responses.

12. Custom annunciator text.

13. Audible alarm output, steady or pulsed.

14. Automatic silencing.

15. Attack-Resistant enclosure and lock meeting Underwriters Laboratory Local Burglary requirements.

16. A minimum of eight (8) auxiliary form "C" dry contacts for a variety of programmable responses to alarm and trouble conditions.

17. Transformer enclosure for internal mounting of Class 2 transformer.

18. Two telephone numbers with selective signaling options.

19. Individual zone responses.

20. Automatic test reports.

2.03 Bar-code programmer for diagnostics and programming capability.

2.04 RECEIVER

A. Receiver shall be Bosch Security System #D6600 Series, UL listed for fire and intrusion detection.

B. Provide a 50VA Class 2 plug in transformer for power input.

C. System shall contain 48 hours of standby power utilizing rechargeable sealed lead acid batteries and a battery charger.

D. System shall be FCC approved for telephone connections.

E. An alpha numeric LCD display shall indicate account number, area number, time, date, event, zone or point number, line or group number, status and external devices.

F. 24-hour clock and 128 year calendar.

G. 40 character line internal printer and interface capability with an external serial printer.

H. Transmission verification appropriate with the format utilized.

I. Storage of 249 separate events.

J. Transmission format shall support the control panel.

K. Turn the receiver over to the District for central station or campus monitoring.

2.05 REMOTE ACCOUNT MANAGER

A. System shall be Bosch Security Systems #D5300 series or equal with all equipment necessary for computerized access, programming, diagnostics, and remote control of the system. It shall be possible to remotely change passcodes, locate faults, shunt problem zones, arm and disarm the system, silence alarms, and control the auxiliary output contacts in the control panel.

B. System shall permit remote diagnostics including utility and battery power conditions, phone line condition, event memory by zone, and current clock and calendar settings.

C. System shall be 100% IBM compatible for use with personal computers.

D. System shall include a plug-in modem and software necessary for a complete and operable installation. Furnish the District with a software license agreement for updated software enhancements as they develop.

2.06 KEYPADS

A. Master keypad shall be Bosch Security Systems #D1260 Alpha V Command Center series or equal capable of displaying system status and controlling the alarm system. Unit shall receive its operating power from the main control panel. Keypad shall be flush-mounted on a wall near the entry doors of each Building. Faceplate shall be brass or stainless steel as selected by the Architect.

B. Sub-zone keypads shall be Bosch Security Systems #D720 series or equal to allow individual zones to be bypassed. Keypad shall be flush wall where shown on plans Faceplate shall be brass or stainless steel as selected by the Architect.

2.07 Motion sensors shall be Detection Systems Inc. DS774i; Series for wall-mounted types and DS938Z for ceiling mounted types. Sensors shall be dual performance, dual event devices to minimize false alarms or equal passive infrared devices detecting thermal motion signals. Sensor coverage patterns shall be as required for optimum coverage at each individual location. Sensor shall be adjustable Gimbal mounted with plate and outlet box. Provide an attack resistant enclosure DS AE774 at Multipurpose areas.

2.08 Magnetic switch shall be fully concealed in the door frame, Admeco, Sentrol or equal.

2.09 Each intrusion detection system terminal cabinet shall contain a power supply for motion sensors and/or POPIT/POPEX (Zonex) modules.

2.10 Cabling shall be as required for system operation. All cabling shall be shielded.

PART 3 - EXECUTION

3.01 All connections throughout the system shall be soldered, crimped by means of AMP lugs, fastened with screw type terminals, made by spring tension clip "punch block" terminals or make by standard plugs and receptacles. Each wire twisted pair or cable shall be tagged throughout the site with EZ Markers with the room number it serves. All conductors in terminal cabinets shall be carefully formed and harnessed in a workmanlike manner.

3.02 All system cabling shall be installed in conduit except where wiring occurs above accessible ceilings. Wiring not in conduit shall be UL listed plenum-type cable. All wiring in walls shall be in conduit. All conduits shall be run concealed. Where architecture precludes concealed conduits, run conduits on top of beams or trusses and minimize the exposure to view. Identify on the submittal drawings all locations where conduits must run exposed.

3.03 Locate motion sensors to provide optimum coverage of the space and to avoid conflicts with the architectural aesthetics of the building. Submittal drawings shall show the exact locations of all system sensors and keypads for approval by District's maintenance managers.

3.04 Coordinate concealed door switch installations with finish hardware manufacturer.

3.05 Provide all system programming as required by the District's maintenance managers, including the necessary product handlers, so that all parameters are entered into the system and the annunciator displays a text, which is customized to the facility.

3.06 SYSTEM TESTING AND DOCUMENTATION

A. Before the contract shall be considered complete, the Contractor shall program the system per District requirements and demonstrate the performance of the system in the presence of the District. The Contractor shall provide all test and reception gear required to prove the performance as outlined.

B. Actuate motion sensing devices and verify that the system performs as specified.

C. The communication loops shall be opened in at least two (2) locations per building to check for the presence of correct supervisory circuitry.

D. When the testing has been completed to the satisfaction of both contractor's job foreman and the representatives of the manufacturer and the DSA inspector, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be provided by the contractor and forwarded to the Architect.

3.07 Provide a minimum of two (2) four hour periods to instruct District personnel in proper operation of all systems. The first instructional period shall be held prior to final acceptance of the systems. Instructional training shall be done at the project site and shall be conducted by factory-trained technical personnel. Furnish the District with videotape VHS cassette(s) of the first instruction session. The second instructional period shall be within a period of one year after final acceptance of the systems, upon request of the District.

END OF SECTION

SECTION 16740

CLOCK AND PAGING SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances tools, equipment, facilities transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other sections for work related to those other sections and required to be included as work under this section.

2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit product data sheets and descriptive literature for all component parts.

B. Submit block wiring diagram of the clock and paging systems. Showing headend equipment, terminal cabinets, remote power supplies, and typical clock and speaker for each zone.

1.03 EQUIPMENT QUALIFICATION

A. The specification is based on the equipment of manufacturers who have been approved by the District and the manufacturers herein named shall be considered as meeting the requirements of this specification. For all items which are identified by part number and manufacturer the Performance specifications which are published in the most recent manufacturer's data sheets available at the time of bidding this project shall be applicable to the present work as though fully written out herein.

B. All equipment shall conform to all local applicable codes and ordinances, and shall be listed by Underwriters Laboratories.

C. System shall be as manufactured by Rauland-Borg to match the clock and paging equipment on campus. Add to/modify the existing rack mounted clock paging equipment location in the existing two-story classroom building as required to serve the new Media Center. Provide all conduit, cabling and components for a complete installation.

1.04 QUALIFICATIONS

A. To qualify as an acceptable bidder, whether the bid is submitted to the District, his agent, a general contractor or a sub-contractor, the system bidder or contractor shall be qualified sound contractor and shall hold a valid C61 License issued by the Contractors State License Board of California. The system bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. The Contractor shall be the factory authorized distributor for the brand of equipment offered and shall have been engaged in the business of supplying and installing the specified type of

system for at least five years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

Comply with pertinent provisions of Section 16050 and 16750.

2.02 GENERAL

A. Eight separate paging zones, each of which may be programmed in software to belong to any combination of zones plus all-call. Initially zones shall be provided and programmed as follows:

1. One zone for each interior speaker.
2. One zone for outside speakers by building.

B. The System shall be equipped with one (1) program channel for distribution to any speaker or group of speakers on the system.

C. System shall include inputs for connection of the IP based telephone system so paging can be initiated from telephones.

D. System shall include a separate desk type telephone and desk mounted microphone at receptionist desk for paging and announcements.

E. Equipment shall be housed in a rack constructed of at least 16 ga. heavily steel, heavily reinforced for maximum strength and durability. The rack shall be finished in Baked Enamel and have a hinged and key-locking rear doors for easy access to the equipment by authorized personnel.

F. Power amplifiers shall be UL listed, with the following features:

1. Each amplifier shall have than 1% harmonic distortion at its full rated output. Hum and noise level shall be greater than 105dB (A- weighted) below rated output. Frequency response shall be +1dB, 20-20,000 Hz.

2. Input impedance shall be 20,000 ohms nominal balanced. Controls shall be provided for level control setting. Each amplifier shall be capable of delivering full rated output to 25V or 70.7V constant voltage lines.

3. Exterior building-mounted speakers shall be driven by amplifier(s) separate from the interior speakers. Quantity and output rating of amplifiers driving exterior speakers shall be based on each speaker tapped at 3 watts. Provide spare amplifier capacity for the future addition of 25% additional exterior speakers.

4. Quantity and output rating of amplifiers driving indoor speakers shall be based on each speaker tapped at 1/2 watt. Provide spare amplifier capacity for the future addition of 25% additional interior speakers.

2.03 CABLING

A. Cable run in conduits below grade shall be approved by the manufacturer for the purpose.

B. Cable serving speakers shall be U.L. Category 6.

C. Cable serving clocks shall be 3 conductors shielded solid copper #16 AWG, West Penn 304 or equal.

2.04 SPEAKERS AND ACCESSORIES

A. Interior speakers shall be 8-inch diameter paper cone type with line matching transformer. Frequency range to be 30 to 15,000 Hz. Interior wall-mounted speakers shall be flush mounted in Soundolier #198-8 backbox and metallic screw-on grille or approved equal.

B. Exterior speaker assembly shall consist of an Atlas #APF-15 series loudspeaker with T-11 transformer in a Soundolier #L20-211/VP161-APF backbox and cover or approved equal. Housing shall include a baffle and shall be painted to match surrounding surfaces.

C. Provide power supplies in the system terminal cabinets throughout the project as required to properly operate all speakers indicated.

PART 3 - EXECUTION

3.01 MATERIALS

Comply with pertinent provisions of Section 16050 and 16750.

3.02 WIRING DESIGNATION AND TERMINAL CABINET MAKE UP

A. All connections throughout the system shall be made on barrier screw terminals. All conductors in terminal cabinets shall be carefully formed and harnessed in a workmanlike manner.

3.03 INTERFACE

A. Provide connection between fire alarm control panel and class-passing equipment and between fire alarm control panel and paging system equipment. In the event of fire alarm alert, the fire alarm shall override the class-passing and paging systems.

3.04 PROGRAMMING

A. All programming shall be as directed by the District.

3.05 The Contractor shall provide four (4) copies of the complete as-built drawings and service manuals. The drawings and manuals shall include the following:

1. Identification of all components and cable runs in the system. The identification numbers must match those used in construction.

2. Service manuals and schematic diagrams of all active components used in the system.

3. A complete manual must be assembled and organized to permit easy reference and cross-checking and to facilitate future servicing.

4. A complete block diagram.

5. All information shall be printed or typewritten.

3.06 Provide a minimum of two (2) four hour periods to instruct district personnel in proper operation of all systems. The first instructional period shall be held and video taped prior to final acceptance of the systems. The second instructional period shall be within a period of one year after final acceptance of the systems, upon request of the District.

END OF SECTION

SECTION 16750

COMPUTER NETWORK CABLING SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other specifications sections and drawings for related work required to be included as work under Division Sixteen.

2. General provisions and requirements for electrical work.

B. Provide computer cabling system including fiber optic cables, main and intermediate distribution frames, racks, connectors, accessories, testing, and extended manufacturer's 15-year warranty as described herein and on the drawings.

1. Utilizing the data conduit system indicated on the plans, provide a minimum of 12 strands of multimode and 6 strands of single-mode fiber optic cable from the MDF located in Building C to the IDF located in the new Media Center.

2. Provide Fiber Optic Distribution Enclosures at the IDF.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit block wiring diagrams showing MDF, IDF's and interconnecting cables and connectors.

B. Submit manufacturer's standard catalog data for each component.

C. Submit six (6) copies of the manufacturer's certifications for each installer performing the work. The submittal shall be approved by the OWNER'S REPRESENTATIVE prior to initiating any related contract work.

D. Submit system extended warranty statements from manufacturer.

E. Provide a reference list of at least 10 public works projects, similar in nature to this one, that the contractor has completed in the past three years. Provide customer name, general contractor and phone number (if work done as a sub-contractor), general scope of work, contract amount, contact person and phone number.

F. Provide a copy of contractors current ND&I certificate.

G. Provide a map showing the address and location of the ND&I prime contractor. Show route of travel and distance, in miles, from the job-site.

H. Submit proposed labeling system for cables.

1.03 APPLICABLE STANDARDS

A. The equipment shall be UL listed, labeled, and approved for the application shown in the contract documents.

B. The complete system material, equipment, testing, installation and workmanship shall comply with requirements of:

1. This Technical Specification and Associated Drawings

2. ANSI/EIA/TIA-568 Commercial Building Wiring Standard - July 1991, and Standards Proposal No. 2840-A, Proposed Revision of EIA/TIA-568 Commercial Building Cabling Standard (published as TIA/EIA-568-A)

3. EIA/TIA-TSB-36 Technical Systems Bulletin, Additional Cable Specifications for Unshielded Twisted-Pair Cables - November, 1991

4. TIA/EIA-TSB-40 Telecommunications Systems Bulletin, Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware - January, 1994

5. TIA/EIA-TSB-75 Telecommunications Systems Bulletin, Additional Transmission Specifications for Unshielded Twisted-Pair consolidation points and cabling - January, 1997

6. ANSI/EIA/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces - October 1990

7. ANSI/EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February 1993

8. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994

9. Building Industries Consulting Services, International (BICSI)Telecommunications Distribution Methods Manual (TDMM) - 1996

10. National Fire Protection Agency (NFPA) - 70, National Electrical Code (NEC) -1997

C. The completed computer/data system shall provide electronic data/network multi-channel communications for the following:

1. IEEE 802.3/ETHERNET, 10 Mbps 10Base-T and 100Mbps 100Base-Tx for copper wire; 10Base-FI and 100Base-FX for fiber optics.

2. FDDI - Distributed data interface on fiber or copper wire, 100Mbps.

3. IEEE 802.5/TOKEN RING.

4. CDDI - Copper Distributed Data Interface - 100Mbps.

5. TDDI - Twisted Pair Distributed Data Interface - 100Mbps ANSI - X3T9.5.

6. EIA RS-232.

7. ARC net.

8. APPLETALK (Phone-net).

ANSI - TPPMD 100Mbps and 150Mbps Asynchronous Transfer Mode - ATM.

D. This document describes a system to be installed in accordance with recognized telecommunications industry cabling standards. Although the intent of the standard is to provide an application independent cable system, one or more of the following documents, describing specific network types and topologies, may be pertinent to the overall operation of the system and should be considered associated reference materials.

1. ISO/IEC 8802-3 (IEEE 802.3)

2. ISO/IEC 8802-5 (IEEE 802.5)

3. ANSI ANSI X3T9.5 Fiber Distributed Data Interface (FDDI) Physical Medium Dependent (PMD)

4. ANSI ANSI X3t9.5 Twisted Pair Physical Medium Dependent (TP-PMD)

1.04 EQUIPMENT QUALIFICATIONS

A. The supplier of the equipment shall be the factory authorized distributor and service facility for the brands of equipment provided.

B. Extended Material and Performance Warranties.

1. The contractor shall facilitate a warranty between the manufacturer and the Owner that provides coverage of the installed cabling. An extended component and performance warranty shall be provided which warrants functionality of all components used in the system for a minimum of fifteen years from the date of acceptance. All fiber cable, copper cable, fiber termination hardware and housings, copper termination hardware and trim shall be of one manufacturer to ensure the owner can establish one relationship for the warranty. Any manufacturer's warranties offered by one manufacturer for another manufacturer's product will not be acceptable. A performance warranty of 15 years shall also be provided which warrants the installed 100 MHz horizontal copper and for both the horizontal and the backbone optical fiber portions of the cabling system. Copper links shall be warranted against the link performance minimum expected results defined in the TIA/EIA SP-2840A, Annex E. Fiber optic links shall be warranted against the link and segment performance minimum expected results defined in the TIA/EIA SP-2840A, Annex H. All fiber and copper cabling, termination components, and ancillary devices shall be of one manufacturer to insure no disputes can arise between different manufacturers if performance problems arise. Installers shall be factory trained technicians with a factory trained supervisor overseeing the project.

2. Warranty scope includes network cables and terminations, network workstation plug-in outlets, and patch panel plug-in outlets, cable splices and connectors.

3. Repair or replace the defective material at the project premise, to comply with the performance standards outlined in the contract documents during the warranty period.

C. The system shall be as manufactured by AMP or equal to match the existing system on campus.

1.05 ABBREVIATIONS

Abbreviation	Terminology
dB	Decibel
dBm	Decibel referenced to a milliwatt
ft.	Feet
GHZ	Gigahertz
KM	Kilometer-IKM
kpsi	1000 pounds per square inch
m	Meter=39.37 inches
Mbps	Megabits per second
Mhz	Megahertz
micron	Micrometer
mm	Millimeter=l0-3 meter
NEXT	Near end cross talk
nm	Nanometer=10-9 meter
pF	Picofarad=10-12 farad
STP	Shielded twisted pairs copper wire
ScTP	Shield Screened twisted pairs copper wire
um	Micrometer=10-6 meter
MDF	Main Distribution Frame
IDF	Intermediate

PART 2 - PRODUCTS

2.01 FIBER OPTICS CABLES

A. Fiber optic cables optical fibers, (62.5/125) graded index single and multimode optical glass fibers, 62.5 micron fiber core and 125 micron fiber cladding, 0.275 numerical aperture. Optical fibers shall be 100 kpsi proof tested, with maximum 0.7 micron flaw size for dual operation at 850nm and 1300nm wave lengths. Operating temperature range - 20 degrees centigrade through +60 degrees centigrade. Cables shall be flame retarding.

B. Multimode Strands

a. Minimum bandwidth:

@ 850nm - wave length 160MhZ per KM length
@ 1300nm - wave length 500MhZ per KM length

b. Maximum attenuation:

@ 850nm- wave length 3.5 dB @ 1 KM length
@ 1300nm - wave length 1.5 dB @ 1 KM length

C. Single Mode

a. Minimum bandwidth: greater than 20GHz.

b. Attenuation

@ 1310nm: 0.3 to 1.0 dB/KM
@ 1550nm: 0.3 to 1.0 dB/KM

D. Suitable for use with the following systems and protocols:

1. IEEE 802.5 TOKEN RING 4Mbps and 16Mbps.

2. IEEE 802.3 ETHERNET - 10Mbps 10Base-T and 100Mbps 100Base-Tx.

3. FDDI on fiber 100Mbps

E. Each fiber shall be individually identified with factory color coding or factory imprinted label. The outer cable jacket shall be imprinted with date, manufacturer's model and catalog number, along with agency listing identification. All fiber optic cable shall be produced by the same manufacturer.

F. Optical fiber cables used outside or below grade shall be housed in an OSP loose tube, gel-filled, construction jacket configuration. Inside fiber shall be riser or plenum (as conditions require) tight buffered. OSP loose tube, gel-filled fiber cable that will have at least 50 feet inside a building (from point of entry to point of the connector or point of exit) shall be inside/outside rated.

G. Each optical fiber component shall be surrounded by an individual aramid yarn strength member.

H. Optical fiber cable shall withstand a minimum short-term tensile load of 105 pounds without damage to the optical fiber.

I. Optical fiber cable shall be able to withstand a minimum bend radius of 45 millimeters (mm) during installation without damage to the optical fiber elements.

J. Optical fiber cable shall have a minimum crush resistance of 200 N/cm.

K. Loose tube fiber cables shall have breakout and furcation kits installed, for every tube and fiber, at both ends of termination of every link.

2.02 FIBER OPTIC DISTRIBUTION ENCLOSURES (ATDU)

A. The ATDU enclosure shall mount in a EIA standard 19 inch wide enclosed or open frame equipment rack assembly. The ATDU enclosure shall be metal, painted finish, manufacturers standard color. The ATDU shall provide the following self-contained functions internal to the ATDU assembly.

1. Fiber cable termination.

2. Fiber cable patch panel.

3. Fiber cable management, training and strain relief.

4. Individual fiber and patching port identification numbers, color coding of incoming trunk and out-going distribution fiber ports.

B. Fiber cable patch panels shall be metal with patch ports for each fiber to be terminated at the ATDU.

2.03 EQUIPMENT RACK

A. The MDF racks and IDF racks to be swing gate open equipment rack style as follows:

1. Combination of wall and floor mounted rack from nominal 78 inches of usable mounting frame height. The equipment mounting portion of the rack shall be hinged gate frame assembly. The rack shall provide access to the rear of the installed equipment, the wall behind the rack assembly and wall mounted terminal blocks, when hinged open. As manufactured by B-Line, Sauders, or Henry.

2. The gate assembly shall hinge open not less than 120 degrees from the closed (normal position) on a fixed frame combination floor/wall mounted support structure. A positive latching mechanism shall lock the gate in the fully open and fully closed positions. The rack construction shall allow opening the swing gate, with the installed equipment depth, without obstruction. The fixed stationery portion of the swing gate rack assembly shall be supported from the wall located behind the rack with adjustable length "dual rail arm" wall brackets and with floor mounted support anchors. The arms shall provide field adjustment (approximately 24 inches) of the equipment rack spacing from the wall behind the rack. Provide a minimum of our support arms for each swing gate equipment rack.

3. The rack assembly shall be constructed of extruded metal, aluminum gold iridite finish, or hot dip hardware shall be stainless steel.

4. Provide steel caster rolling wheel support on the bottom rail of the moveable swing gate frame. The wheel shall provide additional support, but not the main support, of the moving gate assembly and rack mounted equipment along the floor travel "outside arc" of the gate in the open or closed position. The vertical height of the wheel assembly shall be adjustable □3 inches.

B. Horizontal cable management shall be providing in each rack. A minimum of two front/rear wire management panels shall be provided in each rack. One combination front and rear horizontal wire management shall be provided for each fiber termination box, for each 24 ports of RJ45 panels, and each 24 ports of hubs or switches. All racks shall be furnished with a minimum of 25 velcro cable ties to ensure a neat and manageable system. All cables and their termination on each end shall be labeled per EIA/TIA administration standards. All labeling schemes and label designations shall be reflected on the CAD drawings at the end of the project and in the submittals.

C. Rack Mounting and Hardware

1. Vertical wire management shall be supplied for all open racks (two required per rack).

2. Rack mount screws (#12-24) not used for installing fiber panels and other hardware shall be bagged and left with the rack upon completion of the installation.

3. All racks shall have an APC PRO-7 surge suppression power strip installed with a cord long enough to reach the rack power supply.

PART 3 - EXECUTION

3.01 CABLE INSTALLATION

A. Cables connecting to equipment racks shall be installed with not less than six feet of slack cable between the equipment rack/terminal block and terminal backboard. The slack cable shall be coiled and supported on the backboard and/or cable tray.

B. Cables shall be trained, dressed and racked on the plywood backboards. Provide cable, metal support arms and re-enterable type cable support rings not less than 12 inches on center mounted onto the plywood along the entire length of all cables.

C. Minimum bending radius of fiber optic cables shall not be less than 9-inches. Maximum pulling tension shall not exceed 600 pounds. In no case shall the manufacturer's recommendations be violated.

D. Cable lengths over 50 feet shall be machine pulled not hand pulled. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum cable pulling speed shall be greater than 15 feet per minute.

E. A dynamometer to measure pulling tension shall be used on all cable runs in excess 200 feet or with more than 180 degrees in bends. The actual pulling tension value shall be calculated and recorded for each pull.

F. The portions of cables installed without raceways or cable tray supports shall be installed with "j-hook" cable supports.

1. The "j-hooks" shall provide multitiered "treed" "j" shared hooks, with wide flat cable support base (0.5"W minimum) and smooth rounded corners, specifically designed for Category-5 and fiber optic cable support. As manufactured by Erico Inc.

2. The individual "j-hook" attachment to the building structure shall be "beam clamp", "hanger rod", clevis hanger styles.

3. Install "j-hooks" not more than 36 inches on center along the entire cable length, at each cable change in direction, to insure less than 6 inches of cable sag between adjacent hooks. Secure cables to "j-hooks" with cable tie wraps. "J-hooks" supported cables, bundle cables together with tie wraps.

4. "Bridle rings" shall not be used to support cables.

5. Cables shall not lay directly on ceilings, ceiling hangers, lighting fixtures, air ducts, piping, or equipment.

G. In each conduit to be used for fiber cable provide four (4) 1-inch innerduct with "Jack-moon" plugs.

3.02 HANDLING OF CABLE REELS:

A. Cable ends shall be sealed prior to shipment to prevent moisture entry into cable. Cable ends shall remain sealed at all times including during installation. Where ends seals are removed, reseal cable ends by stripping cable finishes back 2" down to insulation. Then apply four layers of an insulating tape criss-cross over the cable end and carry back at least 4" onto cable outer finish. Add a containing cover of two layers of vinyl electrical tape completely over the end seal.

B. Cable reels shall be shipped with factory applied lagging (protective cover) left in place until removal is absolutely necessary. Store reels of cable on a firm surface, paved, or on planking to prevent settling into soft ground.

3.03 CABLE TERMINATIONS

A. General

1. Polarity and color coding of cable connections at splices, terminations and outlets shall be consistently maintained throughout the entire electronic network system.

2. Terminate all cables onto respective outlets and terminals. Terminations shall comply with manufacturer's recommendations.

B. Fiber Optic Terminations

1. Individual fiber optic fibers shall each be terminated with a fiber optic fiber connector. The connector for each fiber shall be "plugged" into separate fiber optic fiber interconnection couplers on the rear of each respective outlet.

2. Each fiber optic termination ferrule shall be inspected, after completion of the termination, visually with a fiber optic inspection microscope and an interferometer, to insure fiber “undercut”, “protruding” fiber, over polish and underpolish of fiber termination ends does not exist in the finished termination ferrule.

3. Fiber optic cables terminated between two fiber optic patch panels located in separate equipment racks. The fibers shall be paired together for purposes of identification. Each pair of fibers shall be "plugged" into separate, physically adjacent fiber optic fiber interconnection couplers at each patch panel. The horizontal/vertical arrangement of paired patch panel fiber couplers shall match at both ends of the fiber cable.

3.04 EQUIPMENT RACKS

A. General

1. Install, assemble, mount and connect devices and equipment in the respective equipment racks, bolted securely to the rack frame with stainless steel hardware. "Star" style lock washers shall be provided to insure an electrically continuous ground path between the equipment/devices and rack frames.

2. Provide blank metal filler panels to close unused equipment "front" mounting space in equipment racks, manufacturer's standard finish color.

3. Provide a copper wire outlet connector in the respective equipment rack for each remote copper wire computer workstation outlet and copper wire cable shown connected to the respective equipment rack. The copper wire outlet connectors in the equipment racks shall be provided in equipment rack mounted copper wire patch panels.

4. Terminal racks, equipment locations, patch panels, and cross connects shall be arranged to allow for natural cabling progression, minimize crossing of cables and allow easy access to each system component.

5. Equipment Rack Anchorage:

   a. Securely anchor floor standing racks to the floor at each corner.

   b. Securely anchor wall-mounted racks to the wall at four corners.

   c. Mounting method shall support the total rack weight including installed equipment, but in no case less than 500 pounds with a 2.0 times safety factor.

3.05 CIRCUIT TERMINAL ROOMS AND CLOSETS

A. Provide conductor/cable training and racking support distribution rings installed on backboards. Support rings shall be spaced a minimum of 10 inches on center along all cable/conductor routing paths on backboards and within 4 inches of each change in cable/conductor direction. As manufactured by Newton 3042 series, Saunders or equal.

3.06 GROUND (ADDITIONAL REQUIREMENTS)

A. Provide a ground bus at each rack bonded to the ground conductor shown on plans.

B. Provide a separate 12AWG copper stranded green insulated ground conductor from each individual equipment element in the rack to the respective rack ground bus.

3.07 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. Fiber optic cables shall be identified in each pull box and equipment rack. Identification tags shall include the following information:

   1. Installation month and date (i.e. 3/92, 4/78 etc.).

   2. Conductor size conductor type (i.e. loose tube fiber; (#24 AWG UTP Category 5, 200 pair, telephone/voice etc.).

   3. Provide polypropylene tag holders with interchangeable, yellow polypropylene tag with black alpha/numeric characters sets. Characters shall be approximately .25" high. As manufactured by Almetek industries "EZTAG" - Ledgewood, New Jersey.

B. Equipment and outlet naming identification and color coding shall comply with ANSI/EIA/TIA latest revision.

C. The labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

D. All label printing will be machine generated using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, approximately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet labels will be the manufacturer's label provided with the outlet assembly.

E. Record Drawings

1. The installation contractor will be provided with two sets of drawings at the start of the project. One set will be designated for the central location to document all as-built information as it occurs throughout the project. The central set will be maintained by the Contractor's Foreman on a daily basis, and will be available to the Technical representative upon request during the course of the project. Anticipated variations from the building drawings may be for such things as cable routing and actual outlet placement. No variations will be allowed to the planned termination positions of horizontal and backbone cables, and grounding conductors unless approved in writing by the Owner. Contractor shall also redraw, with AutoCAD version 13 or newer, the site and floor plans showing all fiber, copper, racks, and information outlets as well as the labeling scheme for all items. These CAD drawings shall be on 81/2" x 11" sheets of paper and disk, and be turned over to the owner with the OEM manuals.

2. The Contractor shall provide the central drawing set to the owner at the conclusion of the project. The marked up drawing set will accurately depict the as-built status of the system including termination locations, cable routing, and all administration labeling for the cable system. In addition, a narrative will be provided that describes any areas of difficulty encountered during the installation that could potentially cause problems to the telecommunications system.

3.08 CABLE SYSTEM TESTING

A. All cables and termination hardware shall be 100% tested for defects in installation to verify cable performance under installed conditions. All conductors of each installed cable shall be verified useable by the contractor prior to system acceptance. Any defect in the cable system installation including but not limited to cable, connectors, feed-through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

B. Continuity

1. Each pair of each installed cable shall be tested using a "green light" test set that shows opens, shorts, polarity and pair-reversals. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicted by the test set in accordance with the manufacturers recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

C. Length

1. Each installed cable shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in identification number and circuit or pair number. For multi-pair cables, the longest pair length shall be recorded as the length for the cable.

2. Near End Cross-Talk (NEXT)

3. Attenuation

4. Ambient Noise

5. Attenuation to Cross-Talk Ratio (ACR)

6. Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard, and the result shown as pass/fail. Test results shall be printed directly from the test unit or from a download file using an application from the test equipment manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test result achieved.

D. Fiber

1. All fiber terminations shall be visually inspected with a minimum 200 X microscope to ensure that no surface imperfections exist after final polishing. In addition, each fiber strand shall be tested for attenuation with an optical power meter and light source as well as an OTDR. Cable length and splice attenuation shall be verified using and OTDR.

E. Attenuation

1. Horizontal distribution multimode optical fiber attenuation shall be measured at either 850 manometers (nm) or 1300 nm using and LED light source and power meter. Backbone multimode fiber shall be tested at both 850 nm and 1300 nm in one direction. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B. One 2-meter patch cord shall be used for the test reference and two 2-meter patch cords shall be used for the actual test. This test method uses a one jumper reference, two jumper test to estimate the actual link loss of the installed cables plus the loss of two connectors. This measurement is consistent with the loss which network equipment will see under normal installation and use. Test evaluation for the panel to panel (backbone) or panel to outlet (horizontal) shall be based on the values set forth in the EIA/TIA-568-A Annex H, Optical Fiber Link Performance Testing.

2. Where concatenated links are installed to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. After the link performance test has been successfully completed, each link shall be concatenated and tested. The test method shall be the same used for the test described above. The evaluation criteria shall be established between the Owner and the Contractor prior to the start of the test.

3. Singlemode optical fiber attenuation shall be measured at 1310 nm and 1500 nm using a laser light source and power meter. Tests shall be performed at both wavelengths in one direction on each strand of fiber. The set-up and test shall be performed in accordance with EIA/TIA-526-7 Standard, Method 1A. Two meter patch cords shall be used as test references and for the actual test. This test method utilizes a one jumper reference, two jumper test to estimate the actual link loss of the install cable plus two patch cords.

4. Test evaluation for the panel to panel (backbone) shall be based on the values set forth in the EIA/TIA-568-A Annex H, Optical Fiber Link Performance Testing.

H. Length and Splice Loss

1. Each cable shall be tested with an Optical Time Domain Refrectometer (OTDR) to verify installed cable length and splice losses. The OTDR measurements for length shall be performed in accordance with EIA/TIA-455-60. The measurements to determine splice loss shall be performed in accordance with manufactures recommendations and best industry practices. These tests shall be employed on all cables after installation and in addition where one or more of the following conditions exist.

2. OTDR and power meter testing is specifically requested by the Owner.

3. Each strand shall be tested on all outsite plant and tight-buffered cables and/or where splices exist.

4. A representative strand of each fiber cable shall be tested to verify length if the estimated cable length is within 10% of the maximum length specified, respective to cable function, in the TIA/EIA-568-A Standard.

I. Test Documentation

1. Test documentation shall be provided in a three-ring binder(s) within three weeks after the completion of the project. The binder(s) shall be clearly marked on the outside front cover and spine with the words "Test Results", the project name, and the date of completion (month and year). The binder shall be divided by major heading tabs, Horizontal and Backbone. Each major heading shall be further sectioned by test type. Within the horizontal and backbone sections, scanner test results (Category 3, 4, or 5), fiber optic attenuation test results, OTDR traces, and green light test results shall be segregated by tab. Test data within each section shall be presented in the sequence listed in the administration records. The test equipment by name, manufacturer, model number and last calibration date will also be provided at the end of the document. Unless a more frequent calibration cycle is specified by the manufacturer, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test.

2. Scanner tests shall be printed on 8-1/2" x 11" \. Hand written test results (attenuation results and green light results) shall be documented on and Excel spreadsheet. OTDR test results shall be printed or attached and copied on 8-1/2" x 11" paper for inclusion in the test documentation binder.

3. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall collocated in the binder.

3.09 FIRESTOP SYSTEMS

A. A firestop system is comprised of the item or items penetrating the fire rated structure; the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, heat, vapor and pressurized water stream.

B. All penetrations through fire rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating items i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.

C. Firestop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE, licensed (actual or reciprocal) in the state where the work is to be performed. A drawing showing the proposed firestopped system, stamped/embossed by the cognizant PE shall be provided to the Owner's Technical Representative prior to installing the firestop system.

D. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

END OF SECTION

SECTION 16780

TELEVISION DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances tools, equipment, facilities transportation and services necessary for an incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other sections for work related to those other sections and required to be included as work under this section.

2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit copy of document certifying that the installer of the system is authorized by the manufacturer of the cable and equipment to design and install the system.

B. Submit a document stating that the installer of the system maintains a fully-equipped and staffed service facility complete with all spare parts necessary to maintain and/or repair the system and to properly use all test equipment.

C. Submit copy of installer's valid C-7 Contractor's license.

D. Submit a list of at least ten (10) projects of similar scope completed by the installer.

E. Submit product data sheets and descriptive literature for all component parts and cabling.

F. Submit a block diagram of the entire system showing the calculated signal levels at the output of every active component and at every outlet in the system. The levels shall be noted in DMBV @ 54 MHz and at 470 MHz. The levels shall be noted for the return path on subchannels 13 MHz and 43 MHz to the headend from the worst case outlet in the system. Submit loss calculation for the worst case outlet in the system.

G. At the completion of the project, the Contractor shall provide complete as-built drawings and service manuals. The drawings and manuals shall include the following:

1. Identification of all components and cable runs in the system. The identification numbers must match those used in construction.

2. Signal level measurements as hereinbefore specified.

3. Signal-to-noise and feeder-line resistance as specified.

4. Service manuals and schematic diagrams of all active components used in the system.

5. A complete block diagram with all specified measurements and outlet I.D. numbers. Diagram shall be on 8 1/2" x 11". Also furnish one (1) diskette copy in AutoCad, Designer, Corel, or Excel format.

6. The complete manuals must be assembled and organized to permit easy reference and cross-checking and to facilitate future servicing.

7. All information shall be printed or typewritten.

1.03 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. Label each end of each new building entrance cable to indicate the building number as identified on the site electrical drawings, i.e., "P19".

1.04 EQUIPMENT QUALIFICATIONS

A. Each item referred to on the drawings and in these specifications represent the standard of quality required by the District. Where the manufacturer's name and model number are used, it is understood that the manufacturer's published specification sheets are wholly embodied herein. The Contractor shall submit a bid covering each item and method as specifically described herein.

B. System shall comply with TIA 568/569. Grounding shall be per NEC Article 820 Part C and BICSI TDM Section 18.

C. System shall meet or exceed the technical standards set forth in FCC rules Part 76.

PART 2 - PRODUCTS

2.01 The system shall include all materials and equipment and labor required to distribute all channels from the Cable TV Utility Co. service and local Campus feed areas.

2.02 The system shall meet the following performance specifications on each operational channel with all channels carrying signals within the specified operating levels.

A. Minimum amplifier gain: 45.5db.

B. Maximum outlet level: plus 12DBMV at outlet tapoffs.

C. Minimum outlet level: plus 6DBMV at outlet tapoffs.

D. Signal-to-noise ratio: 42db or greater.

E. Cross modulation level at the output of the distribution amplifier: greater than 46db.

F. Minimum isolation between any two outlets: 28db for frequencies between 10 MHz and 300 MHz; 20db over a total range of 5 MHz to 750 Mhz.

G. Channel balance: maximum 3dB difference between adjacent channels.

H. The picture quality at each outlet as viewed on one of the schools existing receivers shall show no visible degradation of picture quality over that observed with the same receiver connected directly to the incoming cable TV feed.

I. The Contractor shall provide pads, equalizers, and/or tilt compensators as required to balance the input and output of the distribution amplifier to provide a balanced output on every operative channel.

J. All passive distribution equipment installed after the first distribution amplifier shall be designed to operate at all frequencies from 5 MHz to 890 MHz.

K. System shall allow insertion of two separate simultaneous transmissions from any of the system outlets on subchannels T8 and T9 to the headend. Subchannel shall operate simultaneously with all forward channels.

L. Headend equipment shall convert the incoming subchannels to Channels 33 and 42, respectively, for forward redistribution into the system.

M. Provide traps to filter out incoming cable TV channels 33 and 42.

N. Amplifier bandwidths shall be from 50 MHz to 550 MHz in the forward direction and from 5 MHz to 30 MHz in the reverse path.

2.03 The following list of major equipment items are listed to establish quality and shall not be construed as a complete list of items required for the system:

A. Distribution amplifiers: Blonder-Tongue, "BIDA 5400-55" series with "RA" return amplifier or equal and the appropriate filters.

B. Wall Taps: Radiation-proof with coupling value and connection configuration as required for system performance at each location as indicated.

C. Splitters: Blonder-Tongue "XRS" series or equal.

D. Directional Couplers: Blonder-Tongue #CRS series.

E. Modulator: Blonder-Tongue, Stock No. 5992 series or equal.

F. Channel Elimination filters: Microwave Filter Company, Part #3367-216, #6211LP-568/589.25, #3322-568/600(50), #3271SUBPT8.

G. Channel Converter: Blonder-Tongue, Stock No. 1459 series or equal.

H. High-Output Saw Filtered Audio/Video Processor: Blonder-Tongue "ESHP" series or equal.

I. Headend Combiner: Blonder-Tongue, Stock No. 5956 or equal.

J. Equipment Rack: Soundolier #UWA200-61 with plug strip inside for 120 volt connections.

2.04 CABLE

A. Main trunk cable running between the headend equipment and each terminal cabinet shall be Commscope P3-75-500JCASS series nominal .500"O.D. with aluminum sheath.

B. Cables from terminal cabinets to directional couplers shall be PVC-jacketed, coaxial copper-clad center conductor, foam dielectric, tape, and aluminum braid shield. Size and attenuation rating of cable shall be as required to achieve overall system performance as indicated.

C. All coaxial cable terminations and connectors shall be designed for the cables provided and installed per manufacturer's specifications. No soldered or handmade connections will be permitted.

2.05 All equipment shall be designed and rated for 117 volts 60 Hz AC operation and shall be UL rated for 24 hours a day continuous operation.

2.06 BROADCAST CART

A. Include within this Contract a portable video broadcasting system including the following items:

1. A video camcorder complete with connecting cables, 120 volt power adapter, and tripod.

2. An agile audio/video modulator with options and accessories to place audio and video signals from the camcorder onto subchannel T8.

3. Output jack to plug into any TV outlet on Campus and broadcast in the reverse direction to the headend equipment.

4. A metal finished cart with wheels or castors and space for all equipment and accessories.

5. Preamplifier/6-channel automatic mixer to receive audio input from microphones and output to A/V modulator.

6. Six (6) microphones and desk stands equal to Electrovoice #635N/D-B series with 15-foot cords and plugs.

PART 3 - EXECUTION

3.01 No coaxial cables which show bruises, kinks, or shipping damage shall be installed in this system.

3.02 No coaxial connectors, fitting, terminations, or junctions shall be installed in any inaccessible location. Said connections shall only be made at outlets or terminal cabinets.

3.03 Extreme caution shall be exercised in the installation of all cables to avoid abrasions, accidental grounds or cable distortions.

3.04 TESTING

A. Before the contract shall be considered complete, the Contractor shall demonstrate the performance of the system in the presence of the District. The Contractor shall provide all test and reception gear required to prove the performance as outlined.

B. The District may order any changes, adjustments or further tests deemed necessary to assure that the system is complete and operating in accordance with these specifications. All costs of tests and documentation will be borne by the Contractor.

C. Measure and record signal levels in DBMV on channel and channel at every new outlet in the system and at the headend.

D. Measure and record signal-to-noise ratio at every outlet of the system.

E. All signal measurements shall be observed and recorded using recently calibrated test equipment equal to Wavetek SAM II or Sencore SL750.

END OF SECTION

SECTION 16930

LOW VOLTAGE REMOTE CONTROL RELAY SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances tools, equipment, facilities transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other sections for work related to those other sections and required to be included as work under this section.

2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

1. Submit product data sheets for all switches, relays, wiring devices, device plates, controllers, power supplies, cabinets, etc.

2. Submit detailed shop drawings including dimensioned plans, elevations, details, schematic and "point-to-point" wiring diagrams and descriptive literature for all component parts and cabinets.

3. Submit worst case voltage drop calculations on control circuits.

4. Submit material list for outlet boxes and cover plates. Cover plate proposed engraving identification schedule and description of proposed software program control operations, for each control circuit.

PART 2 - PRODUCTS

2.01 GENERAL

A. Function

1. The low voltage relay control system shall provide a complete and operable system to control lighting and related equipment indicated on the drawings. As manufactured by, Watt Stopper or approved equal and shall match the existing system on campus. Connect the new relay panel to the existing main lighting control panel located in Building C.

2. Control wiring shall be in accordance with the NEC requirements for Class 2 remote control systems, Article 725, energy limited systems.

B. Emergency Operation

1. Relays controlling circuits connected to emergency power supply systems (i.e. lighting battery inverters, engine generators, etc.) shall provide an automatic "turn-

on" of the controlled circuits upon failure "loss-of-voltage" in the non-emergency incoming supply source.

2. Provide automatic override of "off" controls and connection for "loss-of" incoming normal power "sensing" circuit in each respective control panel.

3. Provide automatic override to turn all lighting circuits on when activated by the fire alarm system emergency "on" control, automatic transfer switches and emergency lighting battery inverter units emergency on controls.

2.02 MANUALLY OPERATED CONTROL SWITCHES

A. Switch Function

1. Switches shall provide manual on-off control of respective low voltage coil relay(s) indicated on the drawings.

2. Switches shall control up to three parallel low voltage coil relays directly. Where more than three parallel relays are controlled by a single switch, a multi-relay sequential controller shall be provided between the switch and respective group of relays.

B. Switch Configuration

1. Switches shall be momentary on/off contact operation heavy duty **toggle** type, single pole, double throw with center position rest. (Watt Stopper LVS-1 series or equal.) Switch color to be selected by Architect. Provide key operated switches where indicated on drawings.

2. Where more than one switch is shown installed at the same general location on the drawings, all switches at that same location shall be mounted in a common multi-gang outlet box and under a common cover plate. Cover plates shall be one piece stainless steel prepunched for switches. Switches shall be a maximum of 2-rows high.

3. Switches controlling lighting or other equipment located in the same area/room shall be arranged in function groups adjacent to each other in the switch coverplate.

2.03 LOW VOLTAGE COIL LOAD CONTROL RELAY

A. General

1. Relays shall be single pole single throw maintained contact, load rated 20 ampere at 277 volt-single phase, 60Hz A.C. in 60 degrees centigrade ambient temperature.

2. Relays shall be rated full load capacity with Tungsten filament, electronic/induction lamp, ballast or resistive loads. 14,000 ampere symmetrical short circuit withstand rating in series with the upstream branch circuit protection devices. 0.5 HP motor load at 120 volt and 1.5 HP motor load at 220 through 277 volt.

3. Relay coil shall operate at 24 volt 60Hz AC or DC three wire, mechanical latching type, to open or close on receipt of a pulsed voltage to the coil.

4. Relay operation shall be gravity independent of relay physical position/orientation.

5. Relay auxiliary pilot contacts where remote pilot lights and/or remote relay on-off status monitoring is required on device(s) controlling the relay.

B. Relay Electrical Connections

1. Each relay with prewired insulated copper conductor pigtails for control circuit connection.

2. Each relays with two screw type terminals for connection of load wires #14 AWG thru #10 AWG, solid or stranded copper load circuit conductors.

C. Relay Quantity

1. Provide multiple relays for each branch circuit.

2. Total quantity of relays as required to perform the switching control zones for each building area and multi-level lighting intensities control.

3. Control sequences as shown on the floor plans and as described herein.

D. Multi-Relay Sequential Controller

1. Where multiple low voltage coil relays require control by a single control device action or mastering control device, a multi-relay sequential controller shall be provided.

2. The controller shall sequentially turn the individual relays "on" or "off" when an on or off signal is input into the controller.

3. The controller shall accept maintained normally open or momentary pulsed inputs from controlling devices to initiate the control sequence.

4. Where one controller does not have adequate capacity to handle the indicated quantity of relays, multiple controllers shall be provided in "cascaded" sequence of operation.

2.04 POWER SUPPLY

A. General

1. Control power transformers shall be rated 60 Hz, AC line voltage input, 75VA momentary and 40VA continuous control power load, 24 volt nominal secondary control source. Primary line voltage shall be as indicated on the drawings.

2. A solid state rectifier shall rectify the 24 volt, 60 Hz transformer output to D.C. halfwave or fullwave.

3. The relay control system shall operate at 24 volt D.C. nominal.

4. Power supplies shall be fused on the line side.

5. Provide multiple power supplies as required to allow multiple simultaneous operation of relay control zones.

2.05 CONTROL CABINETS

A. General

1. The control cabinets shall contain, but not be limited to, the following components. Control cabinets shall be factory prewired, assembled, and tested:

   a. Low voltage coil relays.

   b. Power supplies.

   c. Multi-relay sequence controllers.

   d. Terminal strips, for each incoming control/load conductor connection.

   e. Control and load circuit wiring connections.

   f. Lighting and control automation.

B. Equipment Housing

1. The cabinet housing shall be metal similar to branch circuit panelboard construction, with not less than two internally barriered and isolated sections. One Section shall contain the line voltage components and connections, the second section shall contain the low voltage control devices and components.

2. Low voltage coil relays shall be supported in the cabinet barrier divider, in an arrangement to allow ease of installation and replacement.

3. The cabinet shall be sized to accommodate a minimum of not less than 30 relays and 48 relays maximum, along with associated control components and power supplies. Maximum 22-inches wide x 5.75-inches deep x height as required. Provide hinged locking cover door. All components including operator controls shall be located behind the cover door. Provide additional cabinets for relay quantities exceeding 48 relays.

2.06 LIGHTING AND CONTROL AUTOMATION

A. General

1. Provide separate independent control input ports for each remote manual control switch; each remote occupancy motion sensor; emergency controller input; fire alarm control input; and each remote automatic and/or manual control function device shown on the drawings or described in the contract documents.

2. Each control input port shall be an independent communication channel assignable for control by the internal system software programming functions. Each individual relay and/or multiple groups of relays shall be controlled by software programming to respond to the "on-off" control functions.

3. Additionally, provide four (4) spare unused control input ports for future connections, in each cabinet.

B. Lighting and Equipment Automatic On-Off Control

1. The control system shall provide field programmable individual and/or group "automatic-off" and "automatic-on" lighting and equipment control of each individual relay contained in each lighting control panel.

2. The automatic control system shall operate in conjunction with the manual-switch controls and related external control points such as occupancy sensors, fire alarm systems, emergency electrical systems, photo electric switches, EMCS/BAS equipment, etc.

3. The on-off setpoints shall be field programmable in each control panel to provide distributed local control independent operation of each control panel. The automatic settings shall be stored in "non-volatile" memory in each control panel and shall be maintained in memory for a minimum of 180 days after the continuous loss of all normal input power to the control panel.

4. The automatic "on-off" controls shall provide the following programmable control of each individual low voltage coil relay in each control panel. The automatic controls shall function individually or in any combination with each other:

   a. Time-of-day "on" and "off" with not less than (8)-independent "on" or "off" operations each day for each separate relay each day.

   b. Separate independent special event, weekday, weekend, holiday, daylight savings and leap year program settings.

   c. Perpetual internal calendar not less than 30-year range, for day and date automatic control functions.

   d. Astronomical – Time clock function, to provide automatic calculation of sunrise and sunset based on date and geographical location for automatic on-off scheduling. The time-clock function shall also provide normal time clock lighting control functions, without the astronomical time clock adjustment function for selected relay circuits.

   e. Emergency egress exit lighting, dry relay contact input to provide automatic "turn-on" during a failure in normal utility power of each lighting control relay designated and/or connected to "emergency egress exit lighting" circuits. Momentary or maintained relay contact operation.

   f. Photo electric switch, dry relay contact inputs to provide automatic "turn-on" and "turn-off" of each lighting control relay designated for "day-lighting", "night light" and/or "security light" photocell control lighting zone controls. The photoelectric switch control sequence shall function in conjunction with the normal time-clock control sequence. Momentary or maintained photo electrical cell relay control.

   g. Fire alarm system dry relay contact input to provide automatic "turn-on" during a fire alarm condition, of each lighting control relay designated and/or connected to the lighting control panel.

5. Window area "daylighting" control (where indicated on drawings).

a. Separate "daylight" photosensor analog input 1 through 10 volt AC or DC variable input range, for each lighting control zone (room) where daylight photo sensor is shown on the drawings.

b. The "daylight" control shall automatically turn on/off and/or dim lighting fixtures located in the daylighting area of each lighting zone, independently of the remaining light fixtures located in the same lighting zone. Each "daylight zone on/off and/or dimming function shall be controlled by the light intensity as measured by the respective photo sensor.

C. Telephone Control Interface

1. Telephone override shall provide any pre-authorized touch tone telephone to override any individual control relay and/or group of control relays from a local telephone system handset. The override operation shall be the same as that of a direct manual lighting control override operation.

2. Each lighting control relay shall respond to not less than (8)–eight different telephone command/control keypad dial tone override codes.

3. Provide telephone override for each lighting control zone in each lighting control panel.

4. The telephone override, security access monitoring shall accept authorized telephone command inputs only from verified access encoded authorization system contained within the building lighting control system.

D. Remote Communications Ports

1. Each lighting control panel shall be provided with communications ports. The communications ports shall provide for connections of external control and monitoring systems to each control panel as follows:

2. RS232 – To provide programming and control of the lighting control panel from a "plug-in" personal computer (PC) port. Provide Microsoft-Windows® compatible programming/control software for the lighting control panel.

3. RS485 – To provide connection of one or more (up to 256) lighting control panels together as a lighting control communications network with a host control system.

4. Gateway Ethernet – EIA/TIA-568B Category 5E; 100-BaseT network connection of each with a control panel to the building/facility control with a gateway communications, for Ethernet network, and/or energy management and host control system Energy Management Control System(EMCS)or Building Automation System (BAS).

2.07 HOST CONTROL OPERATOR INTERFACE

A. General

1. The methods for displaying alarms, data, trouble, status and the methods for software programming control setups and operator control override etc. shall comply with the following.

2. The interfaces shall be integrated into the respective equipment cabinets. Mounting heights for the display and control components shall not exceed 72-inches or be less than 30-inches above finished floor.

3. Provide not less than one (1) complete lighting host control operator interface located in the 'master" relay control cabinets. If all or only some of the relay control panels are not interconnected together through the respective Remote Communications Ports, then provide one (1) complete lighting host control operator interface in each relay control panel.

B. Information Display

1. Graphics display unit using liquid crystal screen (LCD) combining visual icons, graphics and text information display with "touch-screen" or "keypad" operator control functions. Self-illuminating, nominal 10-inch diagonal minimum active screen size.

2. The screen pointer shall follow the finger touch on the screen. Alternately, separate function membrane switches and LED's shall provide an alternate back-up display and control.

3. The graphics display annunciator shall display in a combination of graphics, text and numerical format individual information for each control zone; each trouble zone; each status/information indication; each communications zone; each operator control function.

4. The graphics display shall provide simultaneous display and touch screen or keypad control of not less than (8) eight independent status events and control events occurring at the same time. The information shall scroll on the graphics annunciator to display all system events.

C. System Operator Control Interface

1. The controls shall provide software generated "touch buttons" and "key-pads" on the display or dedicated "keypad" to perform the system operator control functions.

2. A descriptive indication of the respective function action shall be displayed for each control interface.

C. Building Floor Plans

1. Provide facility graphics based floor plans scaled and proportional to the physical building floor plans and site plans. The facility plans shall be stored on the PC hard disk and displayed on the screen.

2. A single line representation of the building floor plan. The floor plan shall show walls, doors, windows, elevators, stairs, room names, room numbers and each lighting control system component symbol location. A separate floor plan including basements and roofs shall be provided for each floor in each building, grouped by building location.

3. A plan shall be provided showing a single line representations of the entire site with identification names. The site plan shall shown each building outline, side walks, streets, parking lots, control panel and annunciator locations, covered walkways, tunnels, etc.

4. The facility plans shall display automatically on the display screen upon activation of the system from any device location. The display shall show each activation point, type and elapsed time.

5. The facility plans shall display by operator command input from the keyboard, information including system device type, location, trouble status time of operation initiation, etc.

D. Connectors

1. Provide a minimum of 35 ft. of terminated plug-in control cable to connect the CKC to the lighting system communications port outlet.

2. Provide wall outlet plug jacks, coverplates and outlet boxes for plug connection of CKC to the lighting control system.

PART 3 – EXECUTION

3.01 GENERAL

A. Factory Setup and Programming

1. Provide system programming and setup of all control sequences for the lighting control system.

2. Test all control system functions after the installation and connections are complete and the system has been energized.

3. Setup and testing shall be performed by manufacturer trained and authorized technician at the project site, after installation and connections are complete.

3.02 CONTROL CABINETS

A. General

1. Control relay cabinets shall be installed directly adjacent to respective branch circuit lighting panelboard. Cabinet shall be flush or surface mounted to match the respective panel. Provide a dedicated control relay cabinet for each branch circuit panelboard with low voltage remote control relays. Do not "share" a control relay cabinets among multiple branch circuit panelboards.

2. Provide a minimum of three (3) 3-inch conduits between the cabinet and respective panel(s) for branch circuit conductors.

3. The cabinet section directly adjacent to the panelboard providing the line side branch circuit connections shall contain the line voltage compartment.

4. Each cabinet shall have two spare relays installed and space for two future relays. Each cabinet shall have four (4) spare unused control input ports for future external control inputs.

5. Provide 2#14 (AWG) copper THHN/THWN 600 volt insulated conductors from each control panel to the control power branch circuit breaker in the panelboard for the control panel control power source.

3.03 OUTLET BOXES (ADDITIONAL REQUIREMENTS)

1. Provide multi-gang outlet boxes with coverplates for installation of manually operated control switches.

2. Install all control devices located remote from the control panels in outlet boxes.

3.04 WIRING (ADDITIONAL)

A. General

1. Neatly lace and rack wiring in cabinet.

2. All control wire conductors shall be terminated on isolated, terminal strips.

3. The low voltage control and communications circuits shall not route through the line voltage branch circuit panelboard.

4. All control wiring for runs exterior to the cabinets shall be provided with spare conductors sufficient to include the operation of two (2) additional future control devices.

B. Control Circuits

1. The drawings do not indicate the quantity of control wires required between various control points. The CONTRACTOR shall provide the quantity and type of control wire required for proper system operation, as recommended by the system manufacturer. Install all control circuits in conduit.

2. Control wire shall be copper #18 AWG minimum, twisted pairs, PVC insulated for control voltage, color coded to match relay and switch wiring "pigtail" color codes. [Control wiring shall be rated for installation in a environmental “air-plenum”.]

3. Network communications wires shall be ANSI/EIA/TIA-568B, 100-OHM, 4-pair shielded twisted pairs STP, Category-5E.

4. Where multiple control wires are installed in a single conduit or route to a single location provide multiconductor control cables with outer jacket; except control wires for control of multi-relay sequential controllers which shall be separate twisted shielded three wire PVC insulated conductors, with a ground wire and outer jacket for each controller to prevent "RF" interference.

5. Control wire shall be increased in wire gauge size as required to insure proper system operation and voltage drop over the installation distance shown on the drawings between equipment and control device locations.

3.05 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. General

1. Each relay shall have an identification tag indicating the originating branch circuit number and panelboard name along with the relay name as indicated on the drawings.

2. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit number and source panel name.

3. Each low voltage control wire and terminal shall have an identification tag indicating switch or control device name and relay controlled as indicated on the drawings.

4. Provide a point to point wiring diagram on the inside over of the control cabinet.

5. Each manually operated control switch shall be provided with engraved identification describing devices and areas controlled by the respective switch.

END OF SECTION

SECTION 16931

OCCUPANCY MOTION SENSORS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other specification sections and drawings for related work required to be included as work under Division Sixteen.

2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit data sheets on sensors, wiring diagrams, relays, transformers, junction boxes, and mounting accessories.

B. Submit six (6) copies redrawn building floor plans showing all components of the occupancy motion sensor system including interconnecting cabling and conduits. Sensors shall be located on the drawings in the location conforming with the requirements stated herein. Drawings shall be prepared to scale and show all doors, all interior and exterior building walls, architectural and structural elements relevant to the installation of the system.

1.03 EQUIPMENT QUALIFICATIONS

A. The manufacturer shall have a minimum of five years of experience in the sensor and lighting control industry.

B. System shall be Watt Stopper, Novitas or equal.

C. Occupancy motion sensor systems shall be compatible with the specific lighting fixture ballast(s) and lamps controlled. (Several types of ballasts may occur in a given area). Premature failure or life expectancy reductions of the lamps, ballasts, relays or motion sensors is not acceptable.

1.04 PERFORMANCE REQUIREMENTS

A. Occupancy motion sensor systems shall be provided in every location throughout the facility where fluorescent lighting is utilized.

B. Coordinate the locations with the Architectural Reflected Ceiling Plans.

PART 2 - PRODUCTS

2.01 MOTION SENSORS

A. Motion sensors shall be self-contained, infrared or crystal controlled to witin +/- 0.01% ultrasonic, solid state low voltage devices designed specifically for energy conservation lighting control. Housing shall be white and impact-resistant.

B. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction in coverage shall occur when air conditioning or heating fans are in operation or when sensor has turned off lighting due to not sensing motion.

C. Sensitivity and time-on after activation shall be such that there will be no nuisance on/off switching of the lights by the motion sensor while the room is occupied.

D. The failure of a sensor shall cause the load contacts to close so that the motion sensor function is automatically bypassed.

E. All sensors shall be provided with an indicator light to verify that motion is being detected and that the unit is operation.

2.02 CONTROL UNITS

A. Control unit shall shall be an integrated self-contained unit consisting internally of load switching mechanical control relay and a transformer of sufficient capacity to provide low-voltage power to a minimum of two (2) sensors. Solid-state electronic-type relay contacts shall not be used.

B. Relay contacts shall be dry types with ratings of:

10A - 120 VAC Tungsten
20A - 120 VAC Ballast
20A - 277 VAC Ballast

Relay contacts shall be isolated.

C. Control units shall be U.L. listed.

2.03 Wiring between sensors and control units shall be 18 AWG, stranded U.L. Classified, PVC jacketed and insulated.

2.04 Enclosures for control units shall be pressed steel, NEMA I construction with mounting plates and barriers to provide separation between line and low voltage wiring or standard 4" deep junction box with control unit mounting to cover plate with 1/2" knockout.

PART 3 - EXECUTION

3.01 Provide ultrasonic type sensors in areas in which partitions, casework or other features limit the coverage of the infrared type sensors, (i.e. restrooms, laboratories, storage, files, locker rooms, etc).

3.02 It shall be the contractor's responsibility to provide the quantity of motion sensors required for complete and proper volumetric coverage without gaps within the range of coverage(s) of controlled areas. Rooms shall have ninety (90) to one hundred (100) percent volumetric coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s).

3.03 All ultrasonic sensors shall comply with the State of California Safety and Health Requirements. Decibel levels for ultrasonic sensors shall comply with the following California Energy Commission criteria for ultrasonic emissions:

MAXIMUM DECIBEL LEVELS
FOR ULTRASONIC EMISSIONS

Midfrequency of Sound Pressure Third-Octave Bank (kHz)	Minimum dB Level Within Third Octave Band in dB reference 20 micropascals)
Less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

The Contractor shall certify in wiring that all installed ultrasonic sensors comply with the specified California Energy Commission criteria for ultrasonic sound.

3.04 All sensors shall be California Energy Commission Title 24 approved and certified.

3.05 Control units shall be located in accessible ceiling spaces and be powered from the lighting circuit which they control.

3.06 Adjust and test each sensor/control unit in accordance with the manufacturers recommendations. Be certain that no obstructions block proper sensor coverage of areas desired, and minimize sensor pickup zone.

NOTE: Occupancy sensors may be affected by various conditions in the room. It may be necessary for the Contractor to make adjustments, change the location or type of sensor to obtain proper operation in a specific room. The Contractor shall have final responsibility for proper operation of the system in each room and should therefore make labor allowances for changes and adjustments.

3.07 Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The suppliers obligation shall include repair or replacement, and testing without charge to the District, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. Warranty on sensors and control units will be for a period of at least two (2) years. The warranty shall commence upon Owner's acceptance of the project. Warranty on labor shall be for a period of minimum one (1) year.

3.08 The Contractor shall provide the training necessary to familiarize the District's personnel with the operation, use and adjustment of the devices.

3.09 All wiring shall be installed in conduit.

3.10 Sensors shall be wall mounted in areas where fixtures are pendant mounted or other obstructions inhibit the effectiveness of a ceiling mounted device.

3.11 Sensors shall be ceiling-mounted or wall-mounted at a height to avoid obstructions which may inhibit the effectiveness of the device.

END OF SECTION

Irvine, CA 92612
949-833-5588
Fax 949-833-5511
Project No. 20318

DSA APPLICATION NO.
A - 112620

San Gabriel Unified School District

APPENDIX - A

Geotechnical Report

Geotechnical Investigation Report dated February 23, 2009
Project Number: 602488-00

GEOTECHNICAL INVESTIGATION, PROPOSED WAREHOUSE CONVERSION TO CLASSROOMS, FITNESS CENTER AND RESTROOMS AT DEL MAR HIGH SCHOOL, 312 SOUTH DEL MAR AVENUE, CITY OF SAN GABRIEL, CALIFORNIA

Prepared for:

SAN GABRIEL UNIFIED SCHOOL DISTRICT
JMS Site Office
1372 East Las Tunas Drive
San Gabriel, California 91776

Project No. 602488-001

February 23, 2009

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

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A LEIGHTON GROUP COMPANY

February 23, 2009

Project No. 602488-001

To: San Gabriel Unified School District
JMS Site Office
1372 East Las Tunas Drive
San Gabriel, California 91776

Attention: Ms. Marla Nadolney

Subject: Geotechnical Investigation, Proposed Warehouse Conversion to Classrooms, Fitness Center and Restrooms at Del Mar High School, 312 South Del Mar Avenue, City of San Gabriel, California

In accordance with your authorization, Leighton Consulting, Inc. (Leighton) has conducted a geotechnical investigation for the proposed conversion of an existing warehouse building for use as classrooms, a fitness center and restrooms at Del Mar High School, located at 312 South Del Mar Avenue in the City of San Gabriel, California. The purpose of our investigation has been to evaluate geology/geotechnical conditions of the site with respect to the planned improvements, and to provide preliminary geotechnical recommendations for design and construction of the improvements.

Based upon our investigation, construction of the proposed improvements is feasible from a geotechnical viewpoint, provided our recommendations are incorporated into the design and construction of the project. The most significant geotechnical issues at the site are those related to seismic hazards and compressible soil. The site is not located in an area currently designated as an Alquist-Priolo Earthquake Fault Zone; however, it is located within an area of historically high seismic activity. Thus, significant ground shaking should be anticipated at the site during the anticipated life of the proposed improvements. The site is not located within an area designated as potentially liquefiable in the State of California Seismic Hazard Map for the El Monte Quadrangle (CDMG, 1998).

We appreciate the opportunity to be of service to the San Gabriel Unified School District. If you have any questions, or if we can be of further service, please call us at your convenience at (909) 484-2205.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

Philip A. Buchiarelli, CEG 1715
Principal Geologist



Jason D. Hertzberg, GE 2711
Associate Engineer

SFR/PB/JDH/rsh

Distribution: (6) Addressee

Leighton

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1.0 INTRODUCTION

1.1 Site Location and Description

Del Mar High School is located at 312 South Del Mar Avenue in the City of San Gabriel, Los Angeles County, California. The campus is situated at the southeast corner of Broadway and Del Mar Avenue. The campus is rectangular in shape with classrooms and offices occupying the northern and eastern part of the campus and a parking lot in the central and western portion of the campus fronting Del Mar Avenue. South of the main campus building are two portable classroom buildings, and south of these is an existing warehouse building used for storage by the District. This warehouse building at the south end of the campus is planned for conversion. A convalescent home and industrial buildings are present east of the school and additional industrial buildings are to the south.

Aerial photographs show the site was vacant in 1938. The existing buildings were present by 1953.

1.2 Proposed Improvements

The existing warehouse planned for conversion appears to be approximately 6,500 square feet in area. Based on the plan for conversion prepared by IBI Group and dated January 31, 2009, we understand that the planned improvements will consist of redesigning the eastern portion of this building to accommodate classrooms and restrooms and the western portion to accommodate a fitness center. The central portion of the warehouse will be removed and replaced with a concrete pathway and landscaping. In addition, the existing portable classrooms will be removed and replaced with a basketball court. Redesign of the school entrance and parking area is also planned. Relatively minor grading with cuts and fills less 2 or 3 feet are expected to attain desired grades.

This is a public school project under the jurisdiction of the Division of the State Architect (DSA), to be constructed in accordance with the 2007 California Building Code (CBC).

1.3 Previous Investigation

Our affiliate company Leighton and Associates conducted a geotechnical investigation in 2002 for conversion of the building that currently serves as the main classroom building for Del Mar High School (Leighton and Associates, 2002). As part of that study, several borings were excavated on the campus, and laboratory testing and analysis was conducted. Where appropriate, we have utilized that data in our current study.

1.4 Purpose of Investigation

The purpose of our study has been to evaluate the geologic/geotechnical conditions of the site with respect to the planned improvements and provide preliminary recommendations for design and construction. We have used the plans for the school improvements prepared by IBI Group and dated January 31, 2009 in preparation of our study.

1.5 Scope of Investigation

The scope of this investigation has included the following tasks:

- Background Review - A background review of readily available, relevant, geotechnical reports, literature, and historic aerial photographs pertinent to the site was performed (Appendix A).

- Site Clearance - The proposed boring locations were located and marked for coordination with Underground Service Alert (USA). We also met with representatives from the district to clear the boring locations.

- Hollow-Stem Auger Borings - Two (2) hollow-stem auger borings (L-1 and L-2) were excavated, logged and sampled to depths of 51.5 and 21.5 feet below the ground surface. Each boring was logged by a member of our technical staff. Relatively undisturbed soil samples were obtained at selected intervals within the borings using a California Ring Sampler. Standard Penetration Tests (SPT) were conducted at selected intervals within the borings and soil samples were obtained. Bulk samples of representative soil types were also obtained from the borings. The boring logs are provided in Appendix B. The boring locations for this and the previous investigation (Leighton and Associates, 2002) are shown on the Geotechnical Map, Figure 3.

- Laboratory Tests - Laboratory tests were performed on selected representative soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate physical and engineering characteristics of the onsite soil. Tests performed include:

  - In situ moisture content and dry density.
  - Sieve analysis
  - Collapse potential
  - Maximum dry density and optimum moisture content.
  - Expansion Index.

- Water-soluble sulfate concentration.
- Resistivity, pH, and chloride.

The results of our in situ moisture and density tests are shown on the boring logs (Appendix B). Other laboratory test results are presented in Appendix C.

- Engineering Analysis - The data obtained from our background review, field exploration, and laboratory testing program was evaluated and analyzed in order to develop conclusions and preliminary geotechnical recommendations for the project.

- Report Preparation - The results of this investigation have been summarized in this report, presenting our findings, conclusions and recommendations for the proposed project.

2.0 FINDINGS

2.1 Regional Geology

The site is located in the Los Angeles Basin in the northern portion of the Peninsular Range geomorphic province of California. This is an area of complex geology as the relatively northwestward moving Peninsular Range Province collides with the Transverse Range Province (San Gabriel Mountains) to the north. Several active or potentially active faults have been mapped in the region and are believed to accommodate compression associated with this collision. The known regional active and potentially active faults include the Raymond, Verdugo, Sierra Madre, and Hollywood faults. The Raymond fault is the closest active mapped fault, located about 3 kilometers north of the site. The largest and most active fault in southern California is the San Andreas Fault Zone, located approximately 45 kilometers from the site.

The site is underlain by older alluvial fan soil deposits, principally consisting of a thick accumulation of sand and silty sand eroded from the mountains and deposited in the site vicinity (see Figure 5 Regional Geology).

2.2 Subsurface Soil Conditions

Based upon our review of pertinent geotechnical literature and our subsurface exploration, the site is underlain by alluvial soil deposits. In general, the onsite soil encountered within our exploratory borings consisted of loose to medium dense silty sand and stiff clayey sand in the upper 5 feet. This soil was typically underlain by medium dense to very dense silty sand and sandy clay and sand to the bottom of our borings (maximum of 51.5 feet). Results of laboratory tests indicate that the in situ moisture content within the upper 5 feet ranged from approximately 3 to 17 percent.

2.2.1 Compressible and Collapsible Soil

Soil compressibility refers to a soil's potential for settlement when subjected to increased loads, such as from a fill surcharge or foundation loading. Based on our investigation, the upper 5 to 8 feet of alluvial soil is considered slightly to moderately compressible.

Collapse potential refers to the potential settlement of a soil under existing stresses upon being wetted. A representative sample of the subsurface soil was tested for collapse potential. Test results indicate that the near-surface soil onsite has a negligible collapse potential.

2.2.2 Expansive Soil

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and shrink when dried. Foundations constructed on these soils are subjected to large uplifting forces caused by the swelling. Without proper measures taken, heaving and cracking of both building foundations and slabs-on-grade could result.

Laboratory testing of a near-surface sample of the onsite soil yielded an Expansion Index of 7. Testing during the previous investigation (Leighton and Associates, 2002) yielded an Expansion Index of 8. Based on these test results, the alluvial soils onsite are expected to have a very low expansion potential.

2.2.3 Sulfate Content

Water-soluble sulfates in soil can react adversely with concrete. However, concrete in contact with soil containing sulfate concentrations of less than 0.1 percent by weight is considered to have negligible sulfate exposure based on the American Concrete Institute (ACI) provisions, adopted by the 2007 CBC (CBC, 2007, Chapter 19A, and ACI, 2005, Chapter 4).

A near-surface soil sample was tested during this investigation for soluble sulfate content. The result of this test and a test conducted previously (Leighton and Associates, 2002) indicate a sulfate content of less than 0.01 percent by weight, indicating negligible sulfate exposure. As such, the soils exposed at pad grade are not expected to pose a significant potential for sulfate reaction with concrete.

2.2.4 Resistivity, Chloride and pH

Soil corrosivity to ferrous metals can be estimated by the soil's electrical resistivity, chloride content and pH. In general, soil having a minimum resistivity less than 2,000 ohm-cm is considered corrosive. Soil with a chloride content of 500 parts-per-million (ppm) or more is considered corrosive to ferrous metals.

As a screening for potentially corrosive soil, a representative soil sample was tested during this investigation to determine its minimum resistivity, chloride content, and pH. These tests indicated a minimum resistivity of 6,300 ohm-cm, a chloride content of 88 ppm, and pH of 7.1. Based on these test results, the onsite soil is considered moderately corrosive to ferrous metals.

2.3 Groundwater

Groundwater was not encountered in any of our excavations performed during this investigation, or the previous investigation to a maximum depth of 51.5 feet. Shallow groundwater levels are not expected to be present beneath the site. California Geologic Survey (CGS) Groundwater data indicates the historically highest level of groundwater recorded in the site vicinity was on the order of 125 feet below the ground surface (CGS, 1998).

2.4 Faulting and Seismicity

In general, the primary seismic hazards for sites in the region could include strong ground shaking and fault rupture. The potential for fault rupture and seismic shaking are discussed below.

2.4.1 Surface Faulting

Our review of available in-house literature indicates that there are no known active or potentially active faults that traverse the site, and that the site is not located within a State of California established Alquist-Priolo Earthquake Fault Zone (CGS, 2000). However, the site is located approximately 3 kilometers from the Raymond fault.

Historical records of seismic activity in the region indicate that a peak horizontal ground acceleration (PHGA) of 0.69g has not been exceeded at this site since recording began in 1800. A summary of seismic activity estimates at the site is included in Appendix D. A map of recent regional seismic events is included in the *Regional Seismicity Map*, Figure 7.

The known regional active and potentially active faults that could produce the most significant ground shaking at the site include the Raymond, Verdugo, Sierra Madre, Puente Hills Blind Thrust and Hollywood faults. The Raymond fault is the closest mapped active fault, located about 5 kilometers from the site.

PHGA and hazard deaggregation were performed using the United States Geological Survey's 2002 Interactive Deaggregations utility. The results of this analysis indicates that the predominant earthquake has a PHGA of 1.05g with magnitude of approximately 6.5 (M_W) at a distance on the order of 5 kilometers for the Maximum Considered Earthquake (2% probability of exceedance in 50 years).

2.4.2 Site Specific Ground Motion Hazard Analysis

We have developed a site-specific response spectrum for the design earthquake ground motion in accordance with the 2007 California Building Code ASCE Standard 7-05, Section 21 and the recently released Division of the State Architect (DSA) Bulletin 09-01 issued January 26, 2009.

Software developed by Risk Engineering (EZ-FRISK 7.31) was utilized for the probabilistic and deterministic seismic hazard analyses for the maximum considered earthquake (MCE). Three NGA attenuation relationships were used in the analyses, namely: Boore-Atkinson (2007), Campbell-Bozorgnia (2008), and Chiou-Youngs (2008). A summary of the analysis is included in Appendix D. The site-specific ground motion hazard analysis generally resulted in lower design spectral response accelerations than the general procedure in accordance with Section 1613A of the 2007 CBC (also Section 11.4.5 of ASCE T-05). Seismic design recommendations are presented in Section 3.2 of this report.

2.5 Secondary Seismic Hazards

In general, secondary seismic hazards for sites in the region could include soil liquefaction, earthquake-induced settlement, lateral displacement, landsliding, seiches, and tsunamis. The potential for secondary seismic hazards at the site is discussed below.

2.5.1 Liquefaction Potential

Liquefaction is the loss of soil strength or stiffness due to a buildup of excess pore-water pressure during strong ground shaking. Liquefaction is associated primarily with loose (low density), granular, saturated soil. Effects of severe liquefaction can include sand boils, excessive settlement, bearing capacity failures, and lateral spreading.

The site is not located in an area mapped as potentially liquefiable on the State of California Seismic Hazard Zones Map for the El Monte Quadrangle (CGS, 1999). Liquefaction occurs when three general conditions exist: 1) shallow ground water, 2) low-density silty or sandy soil, and 3) high intensity ground motion. Due to the historic and current lack of shallow ground water at the site, the potential for liquefaction is considered very low for the site (see Figure 8).

2.5.2 Seismically Induced Settlement

Seismically induced settlement consists of dry dynamic settlement (above groundwater) and liquefaction-induced settlement (below groundwater). During a strong seismic event, seismically induced settlement can occur within loose to moderately dense sandy soil due to reduction in volume during and shortly after an earthquake event. Settlement caused by ground shaking is often nonuniformly distributed, which can result in differential settlement.

We have performed analyses to estimate the seismically induced settlement using the methods set forth by Tokimatsu and Seed (1987). The results of our analyses indicate the onsite soils are expected to develop no more than about 2 inches of seismic settlement based on the analysis. Differential settlement due to seismic loading is expected to be 1 inch (half of the total settlement) over a horizontal distance of 40 feet. A summary of seismic settlement analysis is included in Appendix D.

2.5.3 Seismically Induced Landslides

Significant slopes are not located on or near the site. Therefore, the site is not considered susceptible to seismically induced landslides.

2.5.4 Earthquake Induced Flooding

Earthquake-induced flooding can result from the failure of dams or other water-retaining structures resulting from earthquakes. Due to the lack of up gradient bodies of water, the potential for earthquake induced flooding are not a hazard to this site (Los Angeles County, 1991).

2.5.5 Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the inland location of the site and its distance from lakes or ponds, seiches and tsunamis are not a hazard to this site.

2.6 Subsidence

The site is not located in area of documented or potentially significant subsidence to groundwater/oil withdrawal.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon this study, we conclude that the proposed improvements are geotechnically feasible. We have found no significant geologic or soil-related constraints during the course of this investigation that cannot be mitigated by proper design and construction practices. Geotechnical recommendations for construction and design of the proposed improvements are presented in the following sections. Site grading plans and building foundation plans were not available for review during preparation of this report. Leighton should review these plans when available to confirm the recommendations are appropriate.

3.1 General Earthwork and Grading

All earthwork should be performed in accordance with the General Earthwork and Grading Specifications presented in Appendix E, unless specifically revised or amended below or by future recommendations based on final development plans.

Site Preparation

Prior to construction, the site should be cleared of vegetation, asphalt pavement, concrete, trash, and debris. Any underground obstructions should be removed. The resulting cavities should be properly backfilled and compacted. Efforts should be made to locate existing utility lines. Those lines should be removed or rerouted if they interfere with the proposed construction, and the resulting cavities should be properly backfilled and compacted. In addition, any loose, highly compressible, or otherwise unsuitable soil encountered should be removed.

Overexcavation and Recompaction

To provide a more uniform footing subgrade and to reduce the potential for adverse differential settlement, we recommend that the soil underneath the proposed interior footings be overexcavated and recompacted to a minimum depth of 12 inches below the bottom of the proposed footing or 3 feet below the lowest adjacent existing grade, whichever is deeper. Local conditions may require that deeper overexcavation be performed; such areas should be evaluated by Leighton during construction.

Where possible, the overexcavation and recompaction should extend a horizontal distance beyond the footing equal to the depth of the overexcavation below the footings. However, to protect existing footings, the overexcavation be made with ABC slot cuts, no more than 5 feet wide (i.e., all the "A" slot cuts are excavated and backfilled prior to excavating the

"B" cuts, etc.) Leighton should review the contractor's slot cutting approach prior to slot cut being made.

The soil below proposed slabs-on-grade should be overexcavated and recompacted to a minimum of 12 inches below the proposed finish grade or 2 feet below the existing ground surface, whichever is deeper.

Prior to replacing the overexcavated material, the bottoms of the removal should be scarified, moisture conditioned, as needed, to reach near optimum moisture content, and recompacted to a minimum of 90 percent relative compaction

Areas planned for site walls, retaining walls, asphalt, concrete pavement, flatwork and areas to receive fill should be overexcavated to a minimum depth of 12 inches below the existing ground surface or 12 inches below the proposed subgrade, whichever is deeper. In addition, uncontrolled fill, if encountered, should be removed from structural areas prior to fill placement.

Fill Placement and Compaction

The onsite soil is generally suitable for use as compacted structural fill, provided it is free of debris, organic material, oversize material (greater than 8 inches in largest dimension) and debris. Any soil to be placed as fill, whether onsite or imported material, should be accepted by Leighton. All fill soil should be placed in thin, loose lifts, moisture conditioned, as necessary, to near-optimum moisture content, and compacted to a minimum 90 percent relative compaction as determined by ASTM Test Method D1557. Aggregate base used in pavement sections should be compacted to a minimum of 95 percent relative compaction.

Import Fill Soil

If import soil is proposed to be placed as fill at the site, the material should be geotechnically accepted by Leighton. Preferably at least 3 working days prior to proposed import to the site, the contractor should provide Leighton pertinent information of the proposed import soil, such as location of the soil, whether stockpiled or native in place, and pertinent geotechnical reports if available. We recommend that a Leighton representative visit the proposed import site to observe the soil conditions and obtain representative soil samples. Potential issues may include soil that is more expansive than onsite soil, soil that is too wet, soil that is too rocky or too dissimilar to onsite soils, oversize material, organics, debris, etc.

The owner should ensure proper documentation that soils imported to the project site are suitable for use at the school site from an environmental standpoint. The import soils should be evaluated and/or tested, as appropriate, for environmental suitability based on the *Information Advisory - Clean Imported Fill* (Department of Toxic Substances Control, October 2001 or more current edition). The documentation certifying the soils are suitable for use should be provided to the project construction manager prior to intended import to the site. Leighton can provide these services to the District, but the contractor must give Leighton adequate time to properly evaluate the material prior to import--a minimum of 3 working days (laboratory rush charges would apply), but preferably 5 working days or more. The contractor should provide Leighton pertinent information, such as the amount and location of the soil, whether stockpiled or native in place, soil owner contact information, and pertinent environmental reports, if available.

Shrinkage and Subsidence

The change in volume of excavated and recompacted soil varies according to soil type and location. This volume change is represented as a percentage increase (bulking) or decrease (shrinkage) in volume of fill after removal and recompaction. Subsidence occurs as in-place soil is moisture-conditioned and densified to receive fill, such as in processing an overexcavation bottom. Subsidence is in addition to shrinkage due to recompaction of fill soil. Field and laboratory data used in our calculations included laboratory-measured maximum dry densities for soil types encountered at the subject site and the measured in-place densities of soils encountered. We preliminarily estimate the following earth volume changes will occur during grading:

Shrinkage	Approximately 15 percent
Subsidence	Approximately 0.15 foot

The level of fill compaction, variations in the dry density of the existing soils and other factors influence the amount of volume change. Some adjustments to earthwork volume should be anticipated during grading of the site.

3.2 Seismic Design Parameters

Seismic parameters presented in this report should be considered during project design. In order to reduce the effects of ground shaking produced by regional seismic events, seismic design should be performed in accordance with the 2007 edition of the California Building Code (CBC). Because our site-specific ground motion hazard analysis generally resulted in lower design spectral response accelerations than the general procedure in Section 1613A

of the 2007 CBC, we recommend that the values from the general procedure be used for project design, as follows. The following data should be considered for the seismic analysis of the subject site:

Table 1. 2007 CBC Seismic Design Parameters

Categorization/Coefficient	Design Value
Site Longitude (decimal degrees)	-117.4177
Site Latitude (decimal degrees)	33.9600
Site Class Definition (Table 1613A.5.2)	D
Mapped Spectral Response Acceleration at 0.2s Period, S_s (Figure 1613A.5(3))	1.5
Mapped Spectral Response Acceleration at 1s Period, S_1 (Figure 1613A.5(4))	0.6
Short Period Site Coefficient at 0.2s Period, F_a (Table 1613A.5.3(1))	1.0
Long Period Site Coefficient at1s Period, F_v (Table 1613A.5.3(2))	1.5
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS} (Eq. 16A-37)	1.5
Adjusted Spectral Response Acceleration at 1s Period, S_{M1} (Eq. 16A-38)	0.9
Design Spectral Response Acceleration at 0.2s Period, S_{DS} (Eq. 16A-39)	1.0
Design Spectral Response Acceleration at 1s Period, S_{D1} (Eq. 16A-40)	0.6

3.3 Foundation Recommendations

The proposed building conversion improvements may be supported on shallow foundations. However, Leighton should review the foundation plans and the anticipated foundation loads, when available, to verify that our recommendations have been implemented and to evaluate potential differential settlement of the proposed improvements based on the proposed loads. The foundations should be designed in accordance with the current California Building Code (CBC).

The footing subgrade should be prepared as recommended in Section 3.1. Leighton should observe the footing excavations prior to the placement of steel or concrete to evaluate the soil conditions. The proposed footings should have a minimum embedment depth of 18 inches below the lowest adjacent grade. However, if new footings are planned near existing footings, the new footings should be at least as deep as the existing footings. The proposed footings should have a minimum width of 18 inches for continuous footings and 24 inches for isolated footings. An allowable bearing capacity of 2,000 psf may be used for design. This value may be increased by 250 psf for each additional foot of embedment or depth to maximum value of 4,000 psf. The allowable bearing pressures are for the total

dead load and frequently applied live loads. These values may be increased by one third when considering loads of short duration, such as those imposed by wind and seismic forces.

The soil resistance available to withstand lateral loads on shallow foundations is a function of the frictional resistance along the base of the foundation and the passive resistance that may develop as the face of the structure tends to move into the soil. The frictional resistance between the base of the foundation and the subgrade soil may be computed using a coefficient of friction of 0.35. The passive resistance may be computed using an allowable equivalent fluid pressure of 270 pcf, assuming there is constant contact between the footing and undisturbed soil.

Since settlement is a function of footing size and contact bearing pressure, differential settlement can be expected between adjacent columns or walls where a large differential loading condition exists.

The recommended allowable bearing capacity is generally based on a total allowable, post construction settlement of 1 inch. Differential settlement due to static loading is estimated at ½ inch over a horizontal distance of 30 feet. Since settlement is a function of footing size and contact bearing pressure, differential settlement can be expected between adjacent columns or walls where a large differential loading condition exists. Potential seismically induced differential settlement is estimated to be on the order of 1 inch over a horizontal distance of 40 feet.

3.4 Slabs-On-Grade

Concrete slabs-on-grade should be designed by the structural engineer in accordance with the current CBC for a soil with a very low expansion potential.

Where conventional light floor loading conditions exist, the following minimum recommendations should be used. More stringent requirements may be required by local agencies, the structural engineer, the architect, or the CBC. Slabs-on-grade should have the following minimum recommended components:

Subgrade Over Optimum: The subgrade soil should be moisture conditioned to at least 2 percent above optimum moisture content to a minimum depth of 12 inches prior to placing the moisture barrier, steel or concrete.

Moisture Retarder: A moisture retarder consisting of 10-mil Visqueen (or equivalent) should be placed below slabs where moisture-sensitive floor coverings or equipment is planned. The moisture retarder should be underlain by a minimum of 2 inches of sand. The structural engineer should specify pertinent concrete design parameters, such as whether or not a sand blotter layer should be placed over the vapor barrier. Gravel or other protruding objects that could puncture the moisture retarder should be removed from the subgrade prior to placing the barrier.

Concrete Thickness: Slabs-on-grade should be at least 4 inches thick. Reinforcing steel should be designed by the structural engineer, but as a minimum should be No. 3 rebar placed at 24 inches on center, each direction, mid-depth in the slab.

Minor cracking of the concrete as it cures, due to drying and shrinkage is normal and should be expected. However, cracking is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. Low slump concrete can reduce the potential for shrinkage cracking. Additionally, our experience indicates that reinforcement in slabs and foundations can generally reduce the potential for concrete cracking.

Moisture retarders can reduce, but not eliminate moisture vapor rise from the underlying soils up through the slab. Floor covering manufacturers should be consulted for specific recommendations.

Leighton does not practice in the field of moisture vapor transmission evaluation, since this is not specifically a geotechnical issues. Therefore, we recommend that a qualified person, such as the flooring subcontractor and/or structural engineer, be consulted with to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. That person should provide recommendations for mitigation of potential adverse impact of moisture vapor transmission on various components of the structures as deemed appropriate.

3.5 Retaining Walls

If planned, we recommend that retaining walls be backfilled with onsite very low expansive soil, and constructed with a backdrain in accordance with the recommendations

provided on Figure 9, *Retaining Wall Backfill and Subdrain Detail.* Using expansive soil as retaining wall backfill will result in higher lateral earth pressures exerted on the wall. Based on these recommendations, the following parameters may be used for the design of conventional retaining walls up to 6 feet tall, with a level backfill:

Table 2. Retaining Walls with Level Backfill

Conditions	Equivalent Fluid Pressure (pounds-per-cubic-foot)
Active (cantilever)	35
At-Rest (braced)	55
Passive	270 (allowable) (Maximum of 3,500 psf)

Cantilever walls that are designed to yield at least 0.001H, where H is equal to the wall height, may be designed using the active condition. Rigid walls and walls braced at the top should be designed using the at-rest condition. Passive pressure is used to compute soil resistance to lateral structural movement. In addition, for sliding resistance, a frictional resistance coefficient of 0.35 may be used at the concrete and soil interface. The lateral passive resistance should be taken into account only if it is ensured that soil providing passive resistance, embedded against the foundation elements, will remain intact with time. The above values do not contain an appreciable factor of safety expect for the passive pressure, which already includes a factor of safety of 1.5. The structural engineer should apply the applicable factors of safety and/or load factors during design.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure or traffic loading, should be considered in the design of the retaining wall. Loads applied within a 1:1 projection from the surcharging structure on the stem of the wall should be considered in the design. A third of uniform vertical surcharge-loads should be applied as a horizontal pressure on cantilever (active) retaining walls, while half of uniform vertical surcharge-loads should be applied as a horizontal pressure on braced (at-rest) retaining walls. For sliding and overturning analyses, soil unit weight of 120 pcf may be assumed for calculating the actual weight of soil over wall footings.

For conventional retaining walls up to 6 feet tall, footings should have a minimum width of 24 inches and a minimum embedment of 12 inches below the lowest adjacent grade. An allowable bearing capacity of 2,000 psf may be used for retaining wall footing design, based on the minimum footing width and depth. This bearing value may be increased by 250 psf per foot increase in width or depth to a maximum allowable bearing pressure of 4,000 psf.

3.6 Sulfate Attack and Ferrous Corrosion Protection

Based on the results of laboratory testing, concrete structures in contact with the onsite soil will have negligible exposure to water-soluble sulfates in the soil. Therefore, common Type II Portland cement may be used for concrete construction onsite. Concrete should be designed in accordance with Table 4.3.1 of the American Concrete Institute ACI 318-05 provisions (ACI, 2005).

Based on our laboratory testing, the onsite soil is considered moderately corrosive to ferrous metals. Corrosion information presented in this report should be provided to your underground utility contractors.

3.7 Pavement Design

Based on the design procedures outlined in the current Caltrans Highway Design Manual, our geotechnical experience in the site vicinity, and assuming an R-value of 50, flexible pavement sections may consist of the following for the Traffic Indices (TI) indicated.

Table 3. Preliminary Asphalt Pavement Sections

Traffic Index	Asphalt Concrete (AC) Thickness (foot)	Class 2 Aggregate Base (AB) Thickness (foot)
5 or less (Auto Parking)	0.25	0.35
7 (Bus Lane)	0.30	0.45

All pavement construction should be performed in accordance with the Standard Specifications for Public Works Construction. Field inspection and periodic testing, as needed during placement of the base course materials, should be undertaken to evaluate whether the requirements of the standard specifications are fulfilled. Prior to placement of aggregate base, the subgrade soil should be processed to a minimum depth of 6 inches, moisture-conditioned, as necessary, and recompacted to a minimum of 90 percent relative compaction as determined by ASTM Test Method D1557 (95 percent for full depth asphalt, such as for playground areas). Aggregate base should be moisture conditioned, as necessary, and compacted to a minimum of 95 percent relative compaction.

3.8 Temporary Excavations

All temporary excavations, including utility trenches, retaining wall excavations and other excavations should be performed in accordance with project plans, specifications and all OSHA requirements.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the slope, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structures.

Cantilever shoring should be designed based on an active fluid pressure of 40 pcf. If excavations are braced at the top and at specific design intervals, the active pressure may then be approximated by a rectangular soil pressure distribution with the pressure per foot of width equal to 23H, where H is equal to the depth of the excavation being shored.

During construction, the soil conditions should be regularly evaluated to verify that conditions are as anticipated. The contractor should be responsible for providing the "competent person" required by OSHA, standards to evaluate soil conditions. Type C soils should preliminarily be assumed. Close coordination between the competent person and the geotechnical engineer should be maintained to facilitate construction while providing safe excavations.

3.9 Trench Backfill

Utility-type trenches onsite can be backfilled with the onsite material, provided it is free of debris, significant organic material and oversized material. Prior to backfilling the trench, pipes should be bedded and shaded in a granular material that has a sand equivalent of 30 or greater. The sand should extend 12 inches above the top of the pipe. The bedding/shading sand should be densified in-place by jetting. The native backfill should be placed in loose layers, moisture conditioned, as necessary, and mechanically compacted using a minimum standard of 90 percent relative compaction. The thickness of layers should be based on the compaction equipment used in accordance with the Standard Specifications for Public Works Construction (Greenbook).

3.10 Surface Drainage

Positive surface drainage should be provided to direct surface water away from structures and towards suitable collective drainage facilities. Surface drainage should be provided to prevent ponding of water adjacent to the structures. In general, the area around the buildings should slope away from the building.

3.11 Additional Geotechnical Investigation and Services

The geotechnical recommendations presented in this report are based on subsurface conditions as interpreted from limited subsurface explorations and limited laboratory testing. Our geotechnical recommendations provided in this report are based on information available at the time the report was prepared and may change as plans are developed. Additional geotechnical investigation and analysis may be required based on final development plans. Leighton should review the site, grading, foundation and shoring plans when available and comment further on the geotechnical aspects of the project and check to see general conformance of the project plans to the recommendations presented in this report. Geotechnical observation and testing should be conducted during excavation and all phases of grading operations. Our conclusions and recommendations should be reviewed and verified by Leighton during construction and revised accordingly if geotechnical conditions encountered vary from our findings and interpretations. Geotechnical observation and testing should be provided:

- During overexcavation of compressible soil.
- During compaction of all fill materials.
- After excavation of all footings and prior to placement of concrete.
- During utility trench backfilling and compaction.
- During pavement subgrade and base preparation.
- When any unusual geotechnical conditions are encountered.

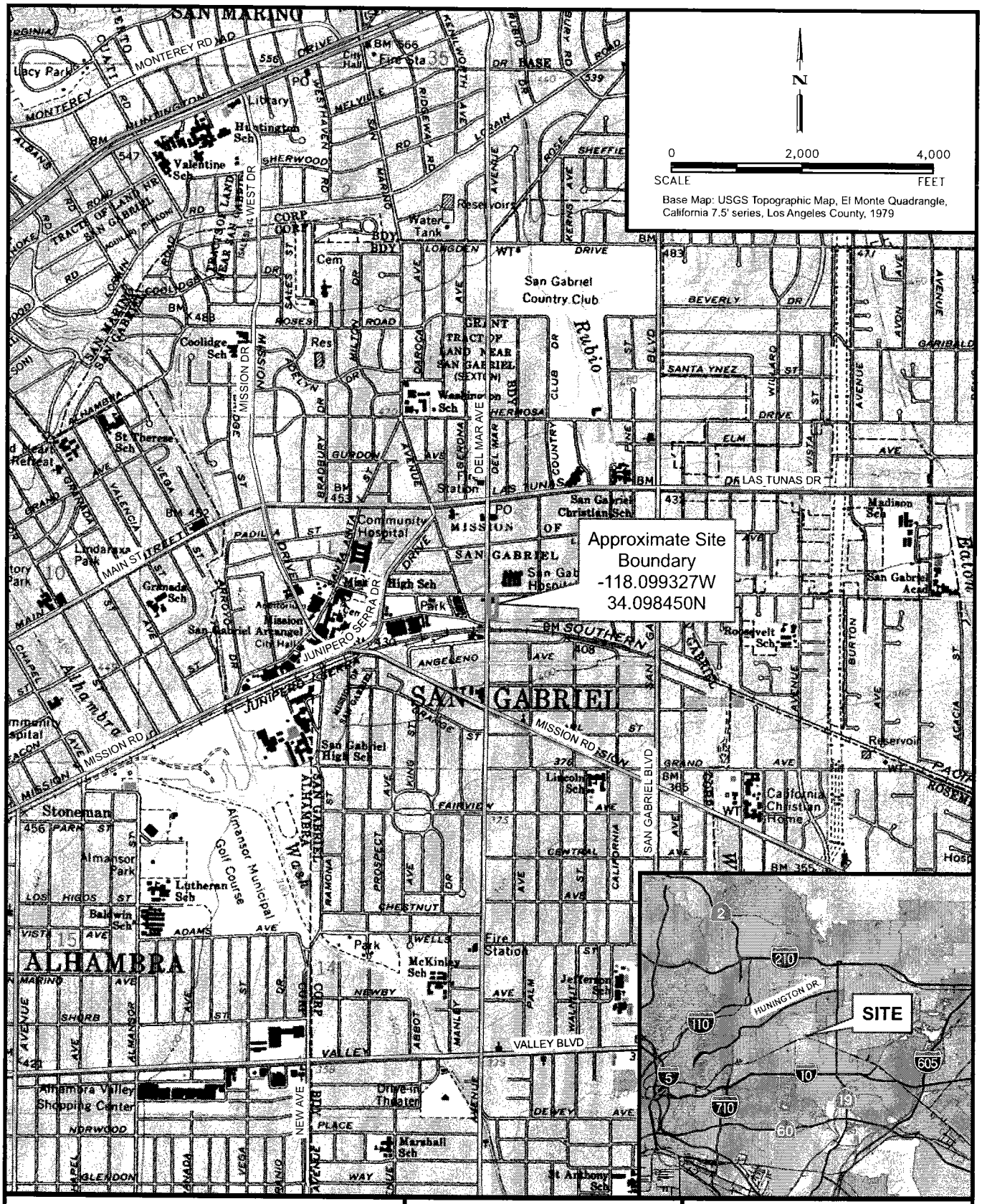
3.12 Limitations

This report was based in part on data obtained from a limited number of observations, site visits, soil excavations, samples, and tests. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, our findings, conclusions, and recommendations presented in this report are based on the assumption that Leighton Consulting, Inc. will provide geotechnical observation and testing during construction.

Environmental services were not included as part of this study. This report was prepared for the sole use of San Gabriel Unified School District for application to the design of the proposed warehouse conversion at Del Mar High School project in accordance with generally accepted geotechnical engineering practices at this time in California.

3.13 ASFE Important Information about this Geotechnical Engineering Report

See Association of Soil and Foundation Engineers (ASFE) insert on the following page.



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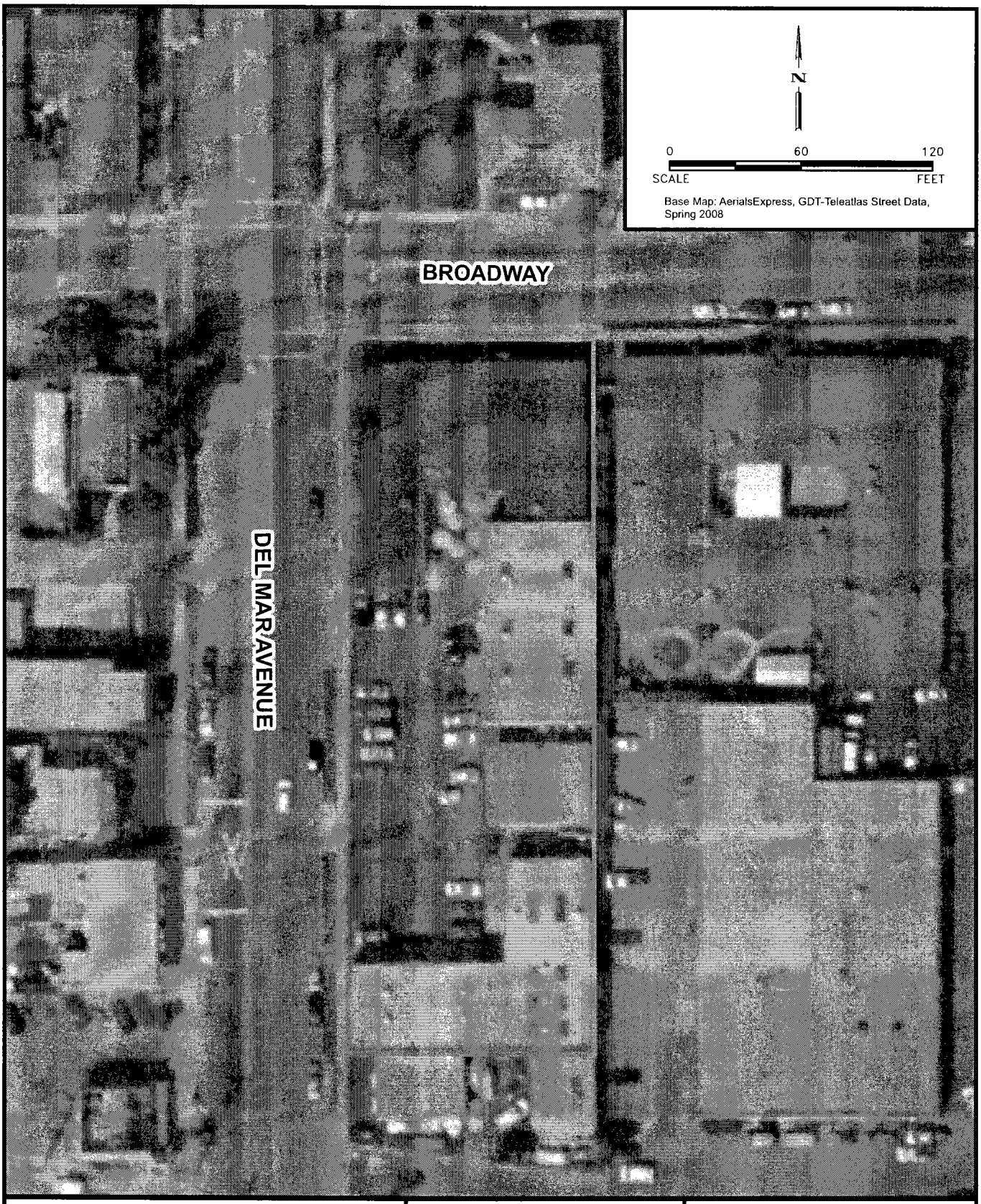
SITE LOCATION MAP

Project No.
602488-001

Date
February 2009

Figure 1

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San Gabriel Unified School District
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SITE VICINITY MAP

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602488-001

Date
February 2009

Figure 2

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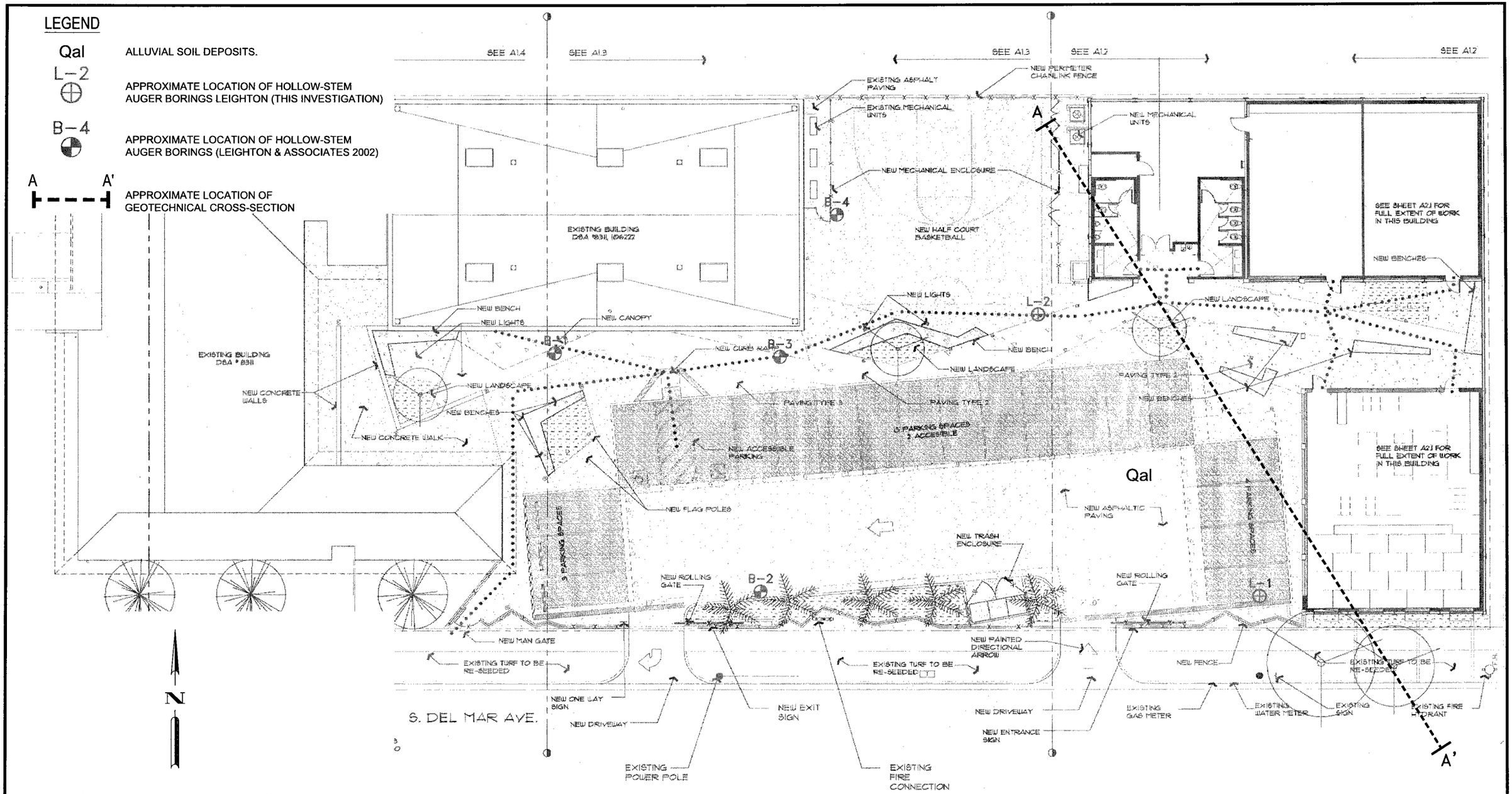
LEGEND

Qal — ALLUVIAL SOIL DEPOSITS.

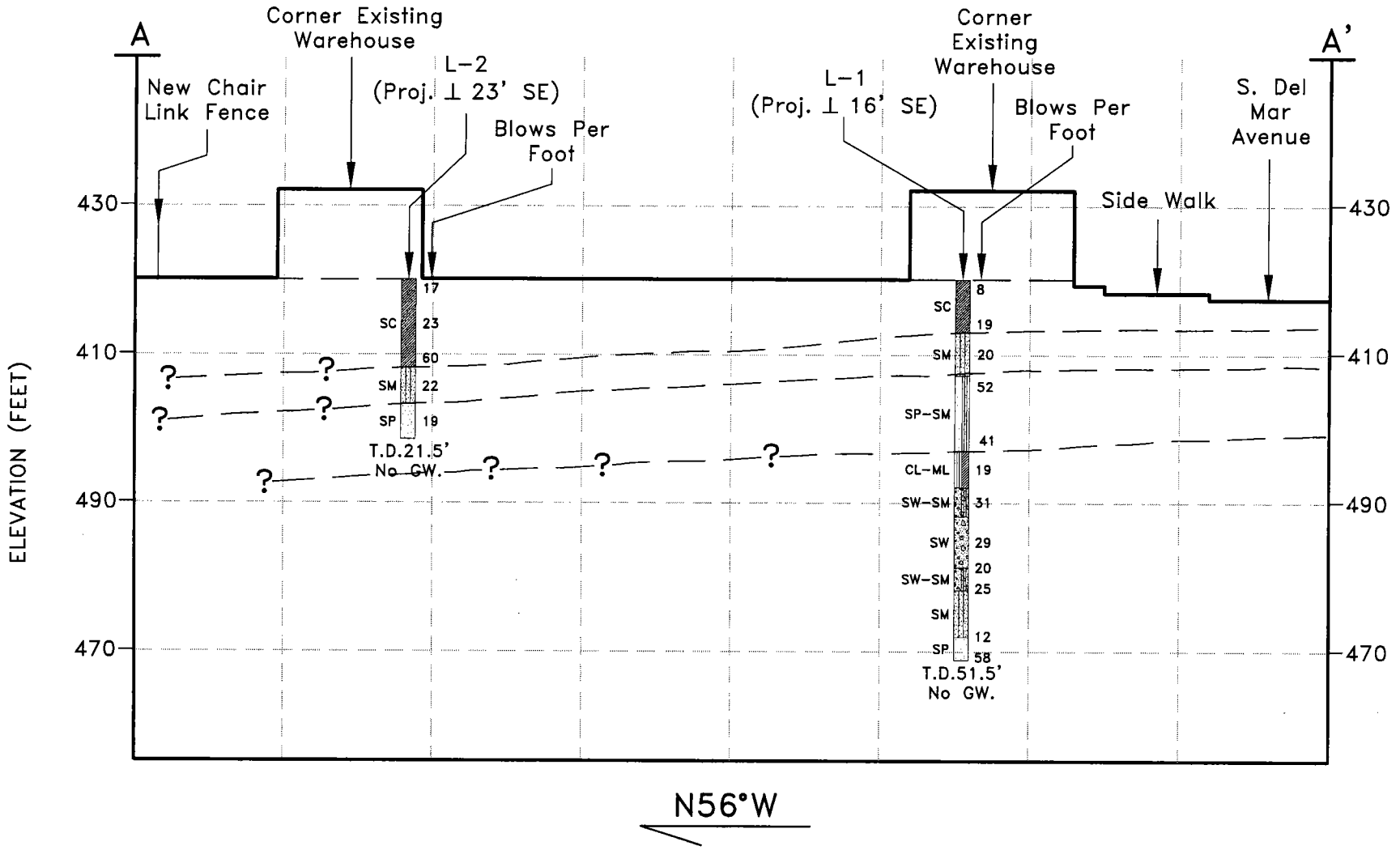
L–2 — APPROXIMATE LOCATION OF HOLLOW-STEM AUGER BORINGS LEIGHTON (THIS INVESTIGATION)

B–4 — APPROXIMATE LOCATION OF HOLLOW-STEM AUGER BORINGS (LEIGHTON & ASSOCIATES 2002)

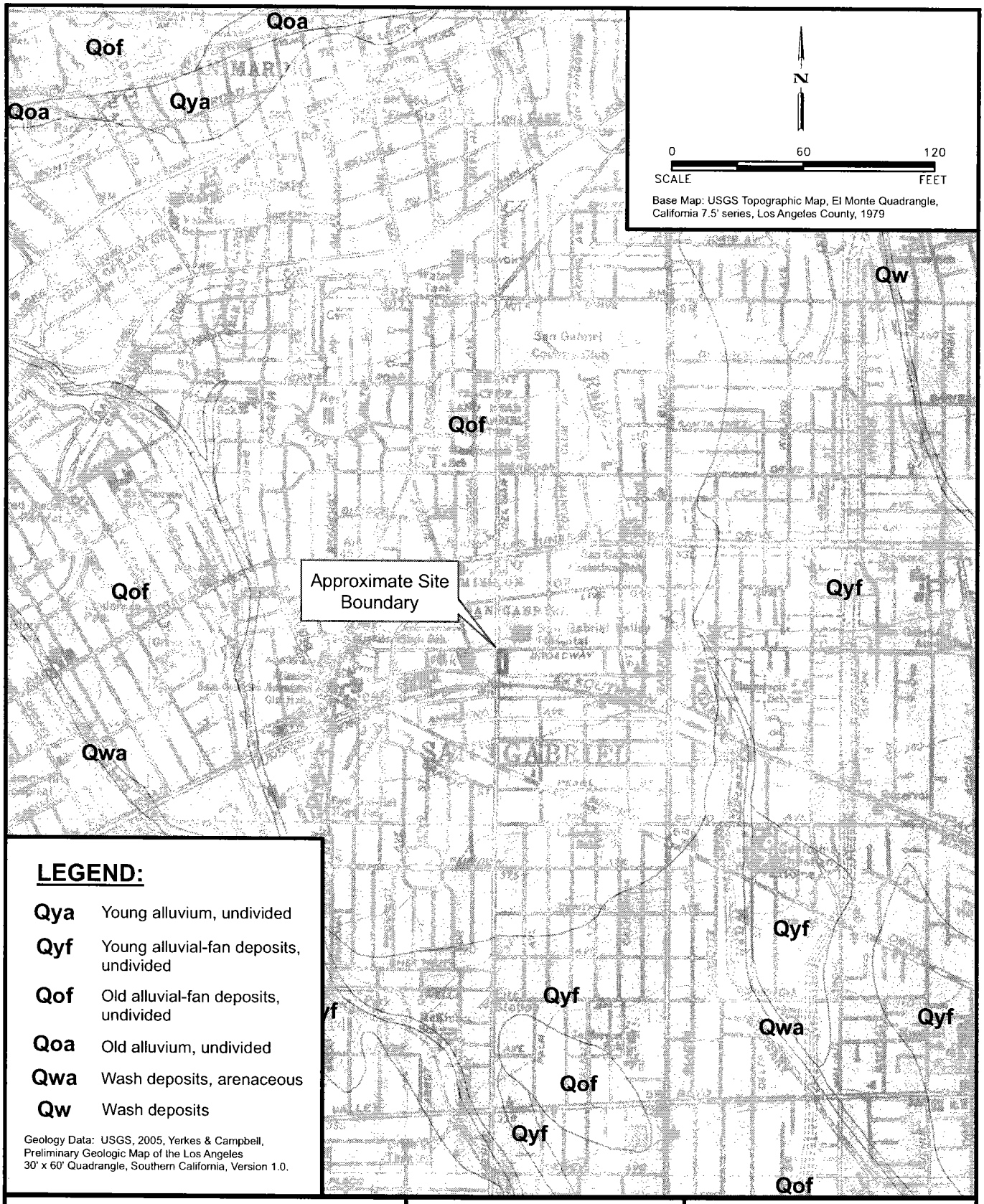
A — A' — APPROXIMATE LOCATION OF GEOTECHNICAL CROSS-SECTION



Proj: 602488-001	Eng/Geol: JDH/PA	**GEOTECHNICAL MAP** SAN GABRIEL UNIFIED SCHOOL DISTRICT DEL MAR HIGH SCHOOL 312 SOUTH DEL MAR AVENUE SAN GABRIEL, CALIFORNIA	FIGURE 3
Scale: 1"=20'	Date: 2/09		Leighton
Drafted By: VMN	Checked By: BQT	P:\DRAFTING\602488\001\OF_2009-02-12\FIGURE3-GEO.DWG (02-23-09 8:49:10AM) Plotted by: btran	



Proj: 602488-001	Eng/Geol: JDH/PB	**GEOTECHNICAL CROSS-SECTION A-A'**	FIGURE 4
Scale: 1"=20'	Date: 2/09	SAN GABRIEL UNIFIED SCHOOL DISTRICT DEL MAR HIGH SCHOOL 312 S. DEL MAR AVENUE SAN GABRIEL, CALIFORNIA	Leighton
Drafted By: VMN	Checked By: BQT	P:\DRAFTING\602488001\OF_2008-02-12\FIGURE4-SECT.DWG (02-23-09 8:42:33AM) Plotted by: btran	



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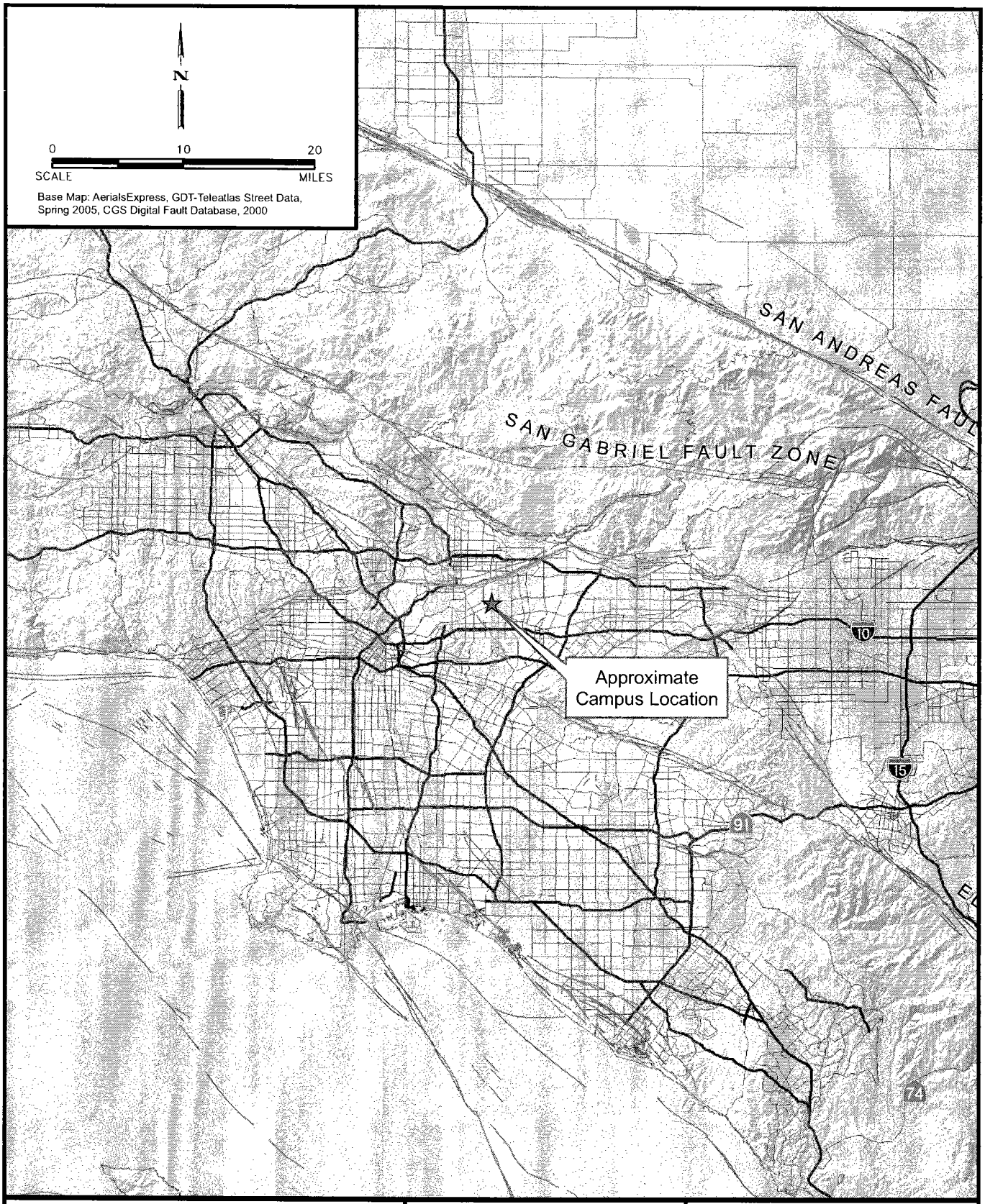
REGIONAL GEOLOGY MAP

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Figure 5

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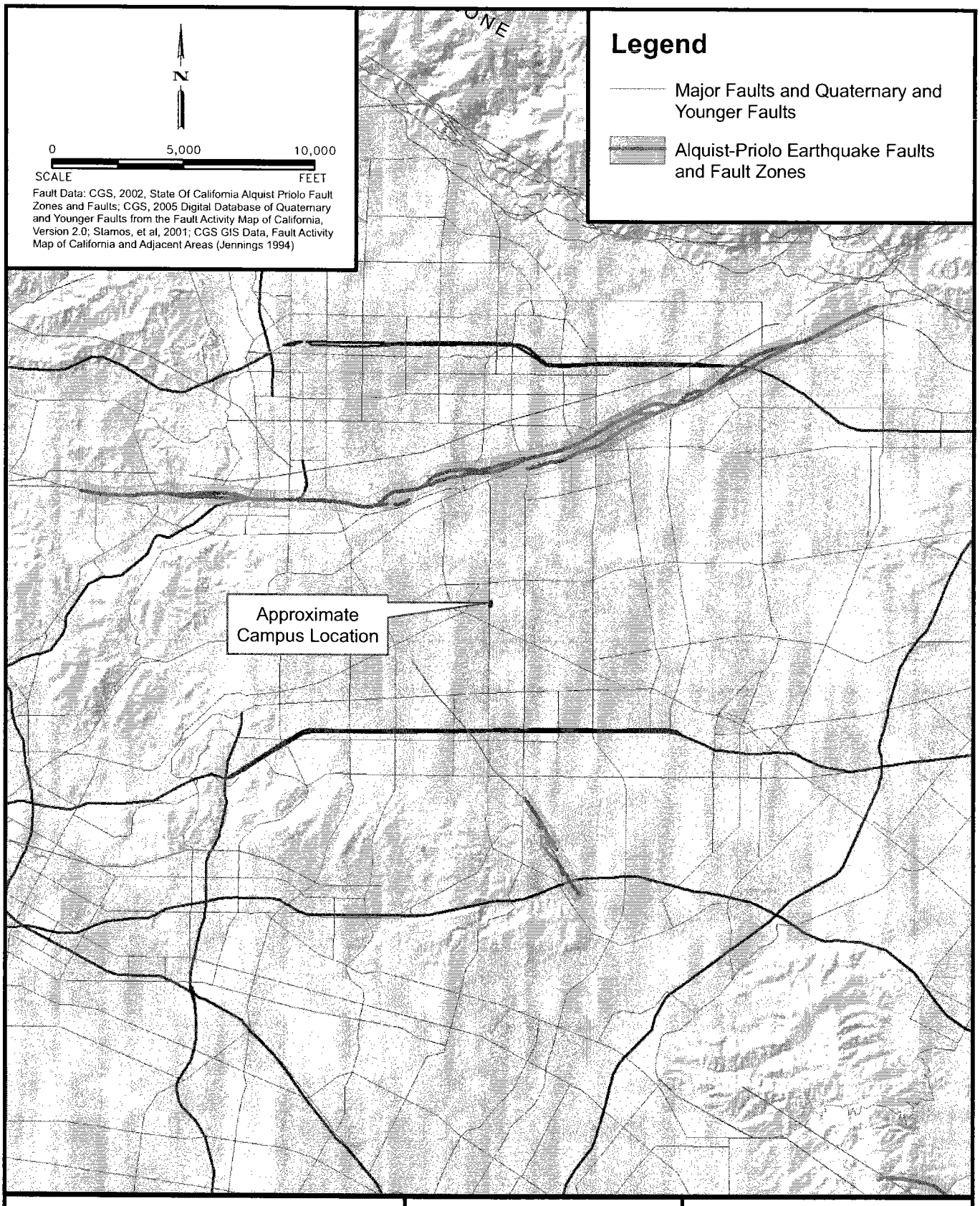
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REGIONAL FAULT MAP

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Figure 6A

Map Metadata:
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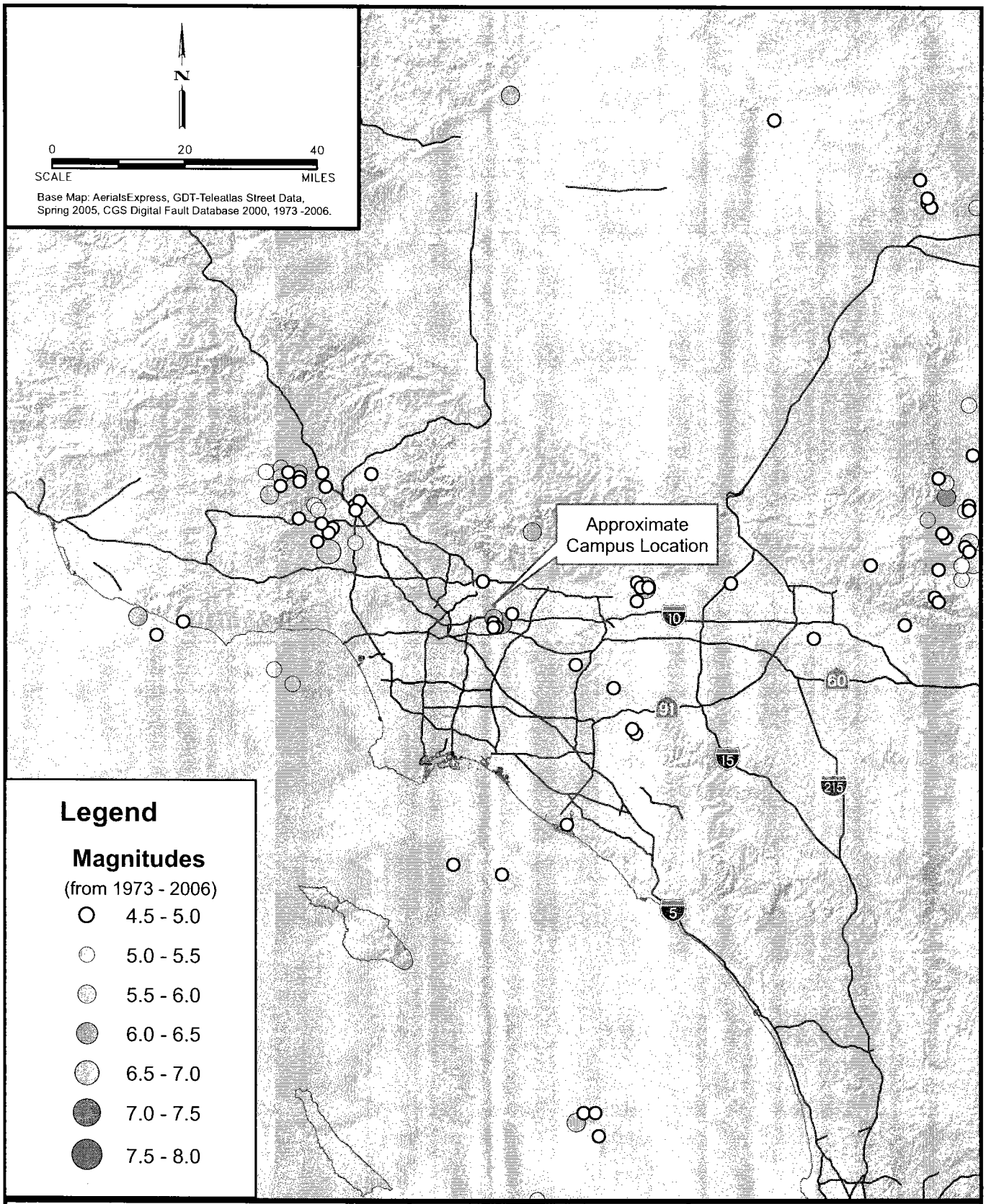
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VICINITY FAULT MAP

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Figure 6B

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REGIONAL SEISMICITY MAP

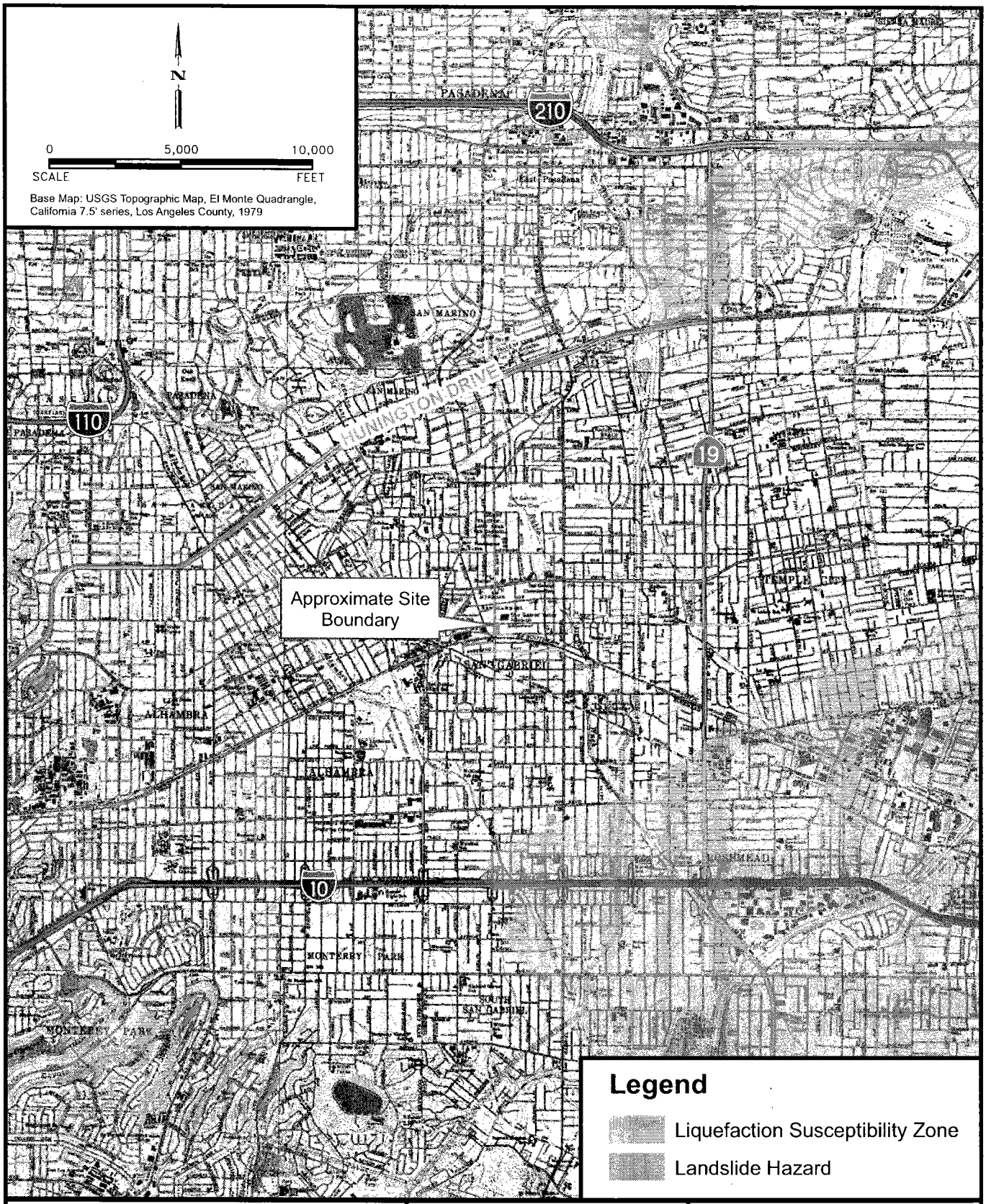
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Figure 7

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SEISMIC HAZARD MAP

Project No.
602488-001

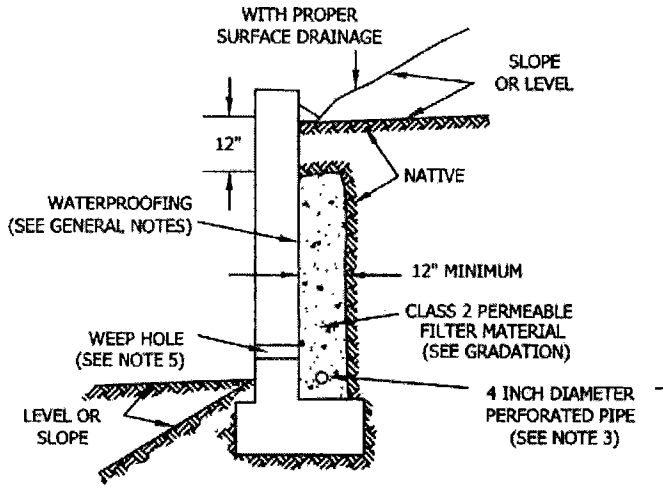
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Figure 8

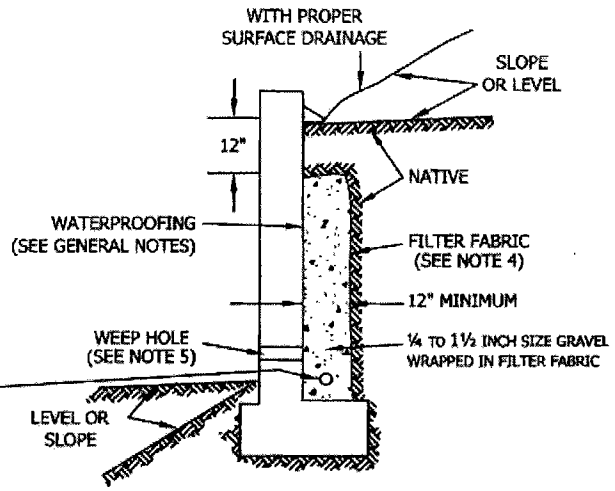
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SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

OPTION 1: PIPE SURROUNDED WITH CLASS 2 PERMEABLE MATERIAL



OPTION 2: GRAVEL WRAPPED IN FILTER FABRIC



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

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

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

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Figure 9

APPENDIX A

APPENDIX A

References

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Aerial Photographs Reviewed:

Date	Flight	Photo Frame	Scale	Agency
6/5/1938	AXJ	44-85, 44-85	1:20,000	National Archives
10/19/1953	AXJ	13K175-177	1:20,000	USDA

APPENDIX B

APPENDIX B

FIELD EXPLORATION

The field investigation consisted of a surface reconnaissance and a subsurface exploration program. Encountered soils were logged in the field by our representative and described in general accordance with the Unified Soil Classification System (ASTM D 2488). Logs of these subsurface explorations, as well as a key to the classification of the soil, are included as part of this appendix.

Three borings were drilled with a truck-mounted hollow-stem drill rig. Standard Penetration Tests (SPT) were conducted and soil samples obtained. Relatively undisturbed soil samples were obtained at selected intervals within the borings using a Modified California Ring Sampler. Bulk samples of representative soil types were also obtained from the borings. These samples were transported to our geotechnical laboratory for evaluation and appropriate testing. Borings were backfilled with the excavated earth materials after logging and sampling was completed, and were patched with cold-mix asphalt where pavement was penetrated.

The attached subsurface exploration logs and related information depict subsurface conditions only at the locations indicated and at the particular date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on the logs represent the approximate boundary between soil types and the transition may be gradual.

GEOTECHNICAL BORING LOG L-1

Project No.	602488-001	**Date Drilled**	1-24-09
Project	SGUSD Del Mar	**Logged By**	Sean Richards
Drilling Co.	WDI	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger, Automatic Drop Hammer 140 lb, 30" Drop	**Ground Elevation**	415'
Location	Del Mar High School, See Geotechnical Map	**Sampled By**	Sean Richards

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									The Soil Description applies only to a location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
415	0								3" AC over 3" Base.	
				B-1					**Quaternary Alluvium (Qal).**	MD
				R-1	3 3 5	118.0	14.0	SM	SANDY CLAY: loose, dark brown, moist, fine to medium grained sand, trace 1/8 inch gravel.	
				R-2	6 8 11			SC	SANDY CLAY: medium dense, dark brown, moist, fine to medium grained sand.	
410	5			R-3	5 9 11	116.0	14.0	SC	SANDY CLAY: medium dense, dark brown, moist, fine to medium grained sand.	CN
405	10			B-2 R-4	14 20 32	123.0	7.0	SM	SILTY SAND: medium dense, light brown, dry to moist, fine to medium grained sand.	
400	15			R-5	11 18 23	105.0	3.0	SP-SM	SAND with Silt: medium dense, light brown to brown, dry to moist, fine to coarse grained sand with fine gravel, trace silt, 6% fines.	-200
395	20			S-1	7 7 12			SP-SM	SAND with Silt: medium dense, brown to dark brown, dry to moist, fine to medium grained sand.	
390	25			R-6	9 13 18	117.0	17.0	CL-ML	SILTY CLAY: very stiff, brown to reddish brown, dry to moist, fine to medium grained sand, subrounded, some fine gravel, 55% fines.	-200
385	30									

SAMPLE TYPES:

S SPLIT SPOON	G GRAB SAMPLE		
R RING SAMPLE	C CORE SAMPLE		
B BULK SAMPLE			
T TUBE SAMPLE			

TYPE OF TESTS:

DS DIRECT SHEAR	SA SIEVE ANALYSIS	-200 % FINES PASSING		
MD MAXIMUM DENSITY	SE SAND EQUIVALENT	AL ATTERBERG LIMITS		
CN CONSOLIDATION	EI EXPANSION INDEX			
CR CORROSION	RV R VALUE			



*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG L-1

Project No.	602488-001	**Date Drilled**	1-24-09
Project	SGUSD Del Mar	**Logged By**	Sean Richards
Drilling Co.	WDI	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger, Automatic Drop Hammer 140 lb, 30" Drop	**Ground Elevation**	415'
Location	Del Mar High School, See Geotechnical Map	**Sampled By**	Sean Richards

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
385	30			S-2	8 13 16			SW-SM	SAND with Silt: medium dense, brown, dry to moist, fine to medium grained sand.	
380	35			S-3	14 12 8			SW	SAND with Silt and Gravel: medium dense, brown, dry to moist, fine to medium grained sand.	
375	40			S-4	9 12 13			SW-SM	SAND with Silt: medium dense, brown, dry to moist, fine to medium grained sand, aproximately 2 inch Silty Clay bed within sample.	
370	45			S-5	5 6 6			SM	SILTY SAND: medium dense, brown to dark brown, dry to moist, fine to medium grained sand, trace fine gravel, 36% fines.	-200
365	50			S-6	14 27 31			SP	SAND with Gravel: medium dense, light brown, dry to moist, fine to medium grained sand, poorly graded, trace fiine gravel.	
360	55								**Total depth of boring 51.5 feet.** **No Groundwater encountered.** **Backfilled with Native 01/24/2009 .**	
355	60									

SAMPLE TYPES:

S SPLIT SPOON	G GRAB SAMPLE		
R RING SAMPLE	C CORE SAMPLE		
B BULK SAMPLE			
T TUBE SAMPLE			

TYPE OF TESTS:

DS DIRECT SHEAR	SA SIEVE ANALYSIS	-200 % FINES PASSING
MD MAXIMUM DENSITY	SE SAND EQUIVALENT	AL ATTERBERG LIMITS
CN CONSOLIDATION	EI EXPANSION INDEX	
CR CORROSION	RV R VALUE	



*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG L-2

Project No.	602488-001	**Date Drilled**	1-24-09
Project	SGUSD Del Mar	**Logged By**	Sean Richards
Drilling Co.	WDI	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger, Automatic Drop Hammer 140 lb, 30" Drop	**Ground Elevation**	415'
Location	Del Mar High School, See Geotechnical Map	**Sampled By**	Sean Richards

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*The Soil Description applies only to a location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
415	0								3" AC over 3.5" Base.	
				B-1					Quaternary Alluvium (Qal).	EI, CR
				R-1	3 7 10	107.0	8.0	SC	CLAYEY SAND: loose, dark brown, moist, fine to medium grained sand, trace fine gravel.	
410	5			R-2	5 7 16	113.0	8.0	SC	CLAYEY SAND: medium dense, reddish brown, dry to moist, fine to medium grained sand.	
405	10			R-3	10 19 41	113.0	12.0	SC	CLAYEY SAND: medium dense, reddish brown to brown, dry to moist, fine to medium grained sand.	
400	15			R-4	6 9 13	105.0	7.0	SM	SILTY SAND: medium dense, yellowish brown to light brown, dry to moist, fine to medium grained sand, 20% fines.	-200
395	20			S-1	6 6 13			SP	SAND: medium dense, light brown, dry to moist, fine to medium grained sand.	
390	25								**Total depth of boring 21.5 feet.** **No Groundwater encountered.** **Backfilled with Native 01/24/2009 .**	
385	30									

SAMPLE TYPES:

S SPLIT SPOON	G GRAB SAMPLE		
R RING SAMPLE	C CORE SAMPLE		
B BULK SAMPLE			
T TUBE SAMPLE			

TYPE OF TESTS:

DS DIRECT SHEAR	SA SIEVE ANALYSIS	-200 % FINES PASSING
MD MAXIMUM DENSITY	SE SAND EQUIVALENT	AL ATTERBERG LIMITS
CN CONSOLIDATION	EI EXPANSION INDEX	
CR CORROSION	RV R VALUE	



*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

LEIGHTON AND ASSOCIATES, 2002

GEOTECHNICAL BORING LOG B-1

Date 4-19-02 | Sheet 1 of 2

Project Blurock, SGUSD Warehouse | Project No. 020685-001

Drilling Co. 2R Drilling, Inc. | Type of Rig Hollow-Stem Auger

Hole Diameter 8 in. | Drive Weight 140 lb. (automatic hammer) | Drop 30 in.

Elevation Top of Hole (ft) | Location See Boring Location Map

Logged By SJF

Sampled By SJF

Elevation (Feet)	Depth (Feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION
	0			Bag 1					5 in. asphalt over 7 in. base
				R-1	8	115.0	10.7	SM	@ 2': Silty Sand with gravel, brown, very moist, loose, fine to coarse sand, slightly porous
	5			R-2	12	117.8	13.2	SM	@ 5': Silty Sand with few gravel, brown, very moist, loose, fine to coarse sand, slightly porous
	10			R-3	34	120.3	12.2	SM	@ 10': Silty Sand, orange brown, very moist, medium dense, fine to coarse sand
	15			R-4	59			SP	@ 15': Sand (poorly graded) with few gravel, brown, moist, dense, fine to medium sand, friable
	20			S-1	20			SP	@ 20': Sand (poorly graded) with few gravel, brown, moist, medium dense, fine to medium sand, friable, some silt laminations
	25			R-5	36			SM	@ 25': Silty Sand with few gravel, brown, moist, medium dense, fine to coarse sand
	30								

SAMPLE TYPES: Bag=Bulk, R=2.5-in. Ring (Ca Mod), S=SPT, T=Shelby Tube

GEOTECHNICAL BORING LOG B-1

Date 4-19-02 Sheet 2 of 2

Project Blurock, SGUSD Warehouse Project No. 020685-001

Drilling Co. 2R Drilling, Inc. Type of Rig Hollow-Stem Auger

Hole Diameter 8 in. Drive Weight 140 lb. (automatic hammer) Drop 30 in.

Elevation Top of Hole (ft) Location See Boring Location Map

Logged By SJF

Sampled By SJF

Elevation (Feet)	Depth (Feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION
	30			S-2	70			SW	@ 30': Sand (well graded), brown, moist. very dense, fine to coarse sand, friable
	35			R-6	55			SM	@ 35': Silty Sand with gravel, brown, moist. dense, fine to coarse sand
	40			S-3	45			SW	@ 40': Sand (well graded) with gravel, tan. moist. dense, fine to coarse sand
									Total Depth = 41.5 feet No groundwater encountered Backfilled with soil cuttings and capped with asphalt
	45								
	50								
	55								
	60								

SAMPLE TYPES: Bag=Bulk, R=2.5-in. Ring (Ca Mod), S=SPT, T=Shelby Tube

GEOTECHNICAL BORING LOG B-2

Date 4-19-02 | Sheet 1 of 1

Project Blurock, SGUSD Warehouse | Project No. 020685-001

Drilling Co. 2R Drilling, Inc. | Type of Rig Hollow-Stem Auger

Hole Diameter 8 in. | Drive Weight 140 lb. (automatic hammer) | Drop 30 in.

Elevation Top of Hole (ft) | Location See Boring Location Map

Logged By SJF

Sampled By SJF

Elevation (Feet)	Depth (Feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION
	0			Bag 1					7 in. asphalt over 6 in. base
				R-1	18	120.3	12.6	CL	@ 2': Sandy Clay, orange brown, moist, stiff, slightly porous, fine to coarse sand
	5			R-2	24	119.7	14.6	SC	@ 5': Claycy Sand, brown, moist, very stiff, slightly porous, fine to coarse sand
									Total Depth = 6.5 feet No groundwater encountered Backfilled with soil cuttings and capped with asphalt
	10								
	15								
	20								
	25								
	30								

SAMPLE TYPES: Bag=Bulk, R=2.5-in. Ring (Ca Mod), S=SPT, T=Shelby Tube

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GEOTECHNICAL BORING LOG B-3

Date 4-19-02 Sheet 1 of 1

Project Blurock, SGUSD Warehouse Project No. 020685-001

Drilling Co. 2R Drilling, Inc. Type of Rig Hollow-Stem Auger

Hole Diameter 8 in. Drive Weight 140 lb. (automatic hammer) Drop 30 in.

Elevation Top of Hole (ft) Location See Boring Location Map

Logged By SJF

Sampled By SJF

Elevation (Feet)	Depth (Feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION
	0			Bag 1					5 in. asphalt over 7 in. base
				R-1	24	121.7	11.5	SC	@ 2': Clayey Sand, brown, moist, stiff, fine to coarse sand, slightly porous
	5			R-2	26	113.0	12.3	SC	@ 5': Clayey Sand, brown, moist, very stiff, fine to coarse sand
									Total Depth = 6.5 feet No groundwater encountered Backfilled with cuttings and capped with asphalt
	10								
	15								
	20								
	25								
	30								

SAMPLE TYPES: Bag=Bulk, R=2.5-in. Ring (Ca Mod), S=SPT, T=Shelby Tube

GEOTECHNICAL BORING LOG B-4

Date 4-19-02 Sheet 1 of 1

Project Blurock, SGUSD Warehouse Project No. 020685-001

Drilling Co. 2R Drilling, Inc. Type of Rig Hollow-Stem Auger

Hole Diameter 8 in. Drive Weight 140 lb. (automatic hammer) Drop 30 in.

Elevation Top of Hole (ft) Location See Boring Location Map

Logged By SJF

Sampled By SJF

Elevation (Feet)	Depth (Feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION
	0			Bag 1					6 inches asphalt over 6 inches base
				R-1	5	105.9	9.6	SM	@ 2': Silty Sand, brown, moist, very loose, fine to coarse sand, slightly friable
	5			R-2	17	114.8	9.7	SM	@ 5': Silty Sand, brown, moist, medium dense, fine to coarse sand, slightly friable
	10			R-3	42			SM	@ 10': Silty Sand with minor gravel, brown, moist, medium dense, fine to coarse sand, slightly friable
	15			R-4	66			SP	@ 15': Sand (poorly graded), moist, dense, fine to coarse sand, friable
	20			S-1	35			SP	@ 20': Sand (poorly graded), brown, moist, dense, fine sand, friable, some clay laminations
									Total Depth = 21.5 No groundwater encountered Backfilled with soil cuttings and capped with asphalt
	25								
	30								

SAMPLE TYPES: Bag=Bulk, R=2.5-in. Ring (Ca Mod), S=SPT, T=Shelby Tube

Leighton and Associates

APPENDIX C

APPENDIX C

GEOTECHNICAL LABORATORY TESTING

The geotechnical laboratory testing program was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the soils underlying the site and to aid in verifying soil classification.

In-Situ Moisture and Density: The natural water content (ASTM D 2216) and in-situ dry density (ASTM D 2937) was determined for recovered relatively undisturbed ring-lined barrel drive samples, from our subsurface explorations. Results of these tests are shown on the logs at the appropriate sample depths, in Appendix B.

Compaction: A laboratory compaction test (ASTM D 1557) was performed on a representative bulk soil-sample of the surface soil to determine the maximum dry density and optimum moisture content. Results of this test are presented on the following "*Modified Proctor Compaction Test*" figure.

Sieve Analysis: Sieve analyses (ASTM D 422) were performed on a selected bulk sample of the subsurface soils. This test was performed to assist in the classification of the soil. Results of this test are presented on the "*Particle Size Distribution*" figure.

Collapse Potential: A collapse potential test was performed on a selected soil sample in general accordance with ASTM Standard Test Method D 4546. Test results are presented on the "*One Dimensional Swell or Settlement*" figure.

Consolidation: A consolidation test was performed on a selected soil sample in accordance with ASTM D 2435. Test results are presented on the "*One Dimensional Consolidation Properties of Soils*" figure.

Atterberg Limits: An Atterberg limits test was performed on a near-surface bulk sample to aid in the identification of near surface soils at the site. This test was performed in accordance with ASTM D 4318. The results are presented the "*Atterberg Limits*" figure.

Expansion Index: An expansion index test was performed to determine the expansion properties of the near-surface soil on site. This test was performed in general accordance with ASTM D 4829. The results are presented on the "*Expansion Index of Soils*" figure.

Corrosivity Tests: To evaluate the corrosion potential of the subsurface soils at the site, we tested a representative bulk sample collected during our subsurface investigation for pH, resistivity and soluble sulfate and chloride content testing. Results of these tests are presented at the end of this appendix.

Boring No.	L-1	L-1	L-1	L-2				
Sample No.	R-5	R-6	S-5	R-4				
Depth (ft.)	15	25	45	15				
Sample Type	Drive	Drive	SPT	Drive				
Soil Identification								
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00	0.00	0.00				
Dry Weight of Soil + Container (g)	0.00	0.00	0.00	0.00				
Weight of Container (g)	1.00	1.00	1.00	1.00				
Moisture Content (%)	0.00	0.00	0.00	0.00				
Sample Dry Weight Determination								
Weight of Sample + Container (g)	770.99	820.23	672.90	752.78				
Weight of Container (g)	220.05	251.78	235.11	237.73				
Weight of Dry Sample (g)	550.94	568.45	437.79	515.05				
Container No.:								
After Wash								
Method (A or B)	B	B	B	B				
Dry Weight of Sample + Cont. (g)	739.35	505.28	516.22	652.43				
Weight of Container (g)	220.05	251.78	235.11	237.73				
Dry Weight of Sample (g)	519.30	253.50	281.11	414.70				
% Passing No. 200 Sieve	**5.7**	**55.4**	**35.8**	**19.5**				
% Retained No. 200 Sieve	94.3	44.6	64.2	80.5				

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PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: SGUSD Del Mar
Project No.: 602488-001
Client Name: LCI / Rancho Cucamonga
Tested By: S. Felter Date: 01/28/09

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MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	SGUSD Del Mar	Tested By :	G. Berdy	Date:	02/02/09
Project No.:	602488-001	Input By :	J. Ward	Date:	02/06/09
Boring No.:	L-1	Depth (ft.)	0-5		
Sample No. :	B-1				
Soil Identification:					

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft^3) 0.03310 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3741.0	3846.0	3950.0	3898.0		
Weight of Mold (g)	1841.0	1841.0	1841.0	1841.0		
Net Weight of Soil (g)	1900.0	2005.0	2109.0	2057.0		
Wet Weight of Soil + Cont. (g)	465.70	494.50	472.30	457.60		
Dry Weight of Soil + Cont. (g)	450.10	468.00	437.30	416.30		
Weight of Container (g)	50.70	50.50	51.00	50.30		
Moisture Content (%)	3.91	6.35	9.06	11.28		
Wet Density (pcf)	126.5	133.5	140.5	137.0		
Dry Density (pcf)	121.8	125.6	128.8	123.1		

Maximum Dry Density (pcf) 129.0 **Optimum Moisture Content (%)** 9.0

PROCEDURE USED

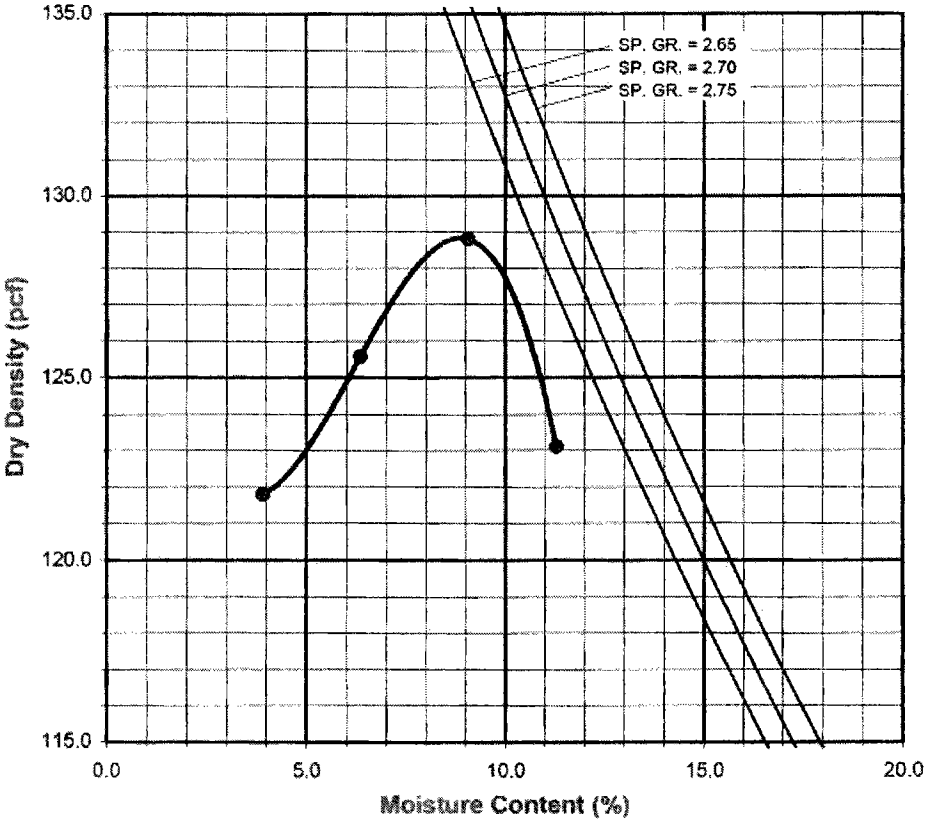
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



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EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	SGUSD Del Mar	Tested By:	G. Berdy	Date:	02/03/09
Project No. :	602488-001	Checked By:	J. Ward	Date:	02/06/09
Boring No.:	L-2	Depth (ft.)	2-5		
Sample No. :	B-1				
Soil Identification:	Olive brown silty, clayey sand (SC-SM)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0065
Wt. Comp. Soil + Mold	(g)	603.90	448.20
Wt. of Mold	(g)	181.20	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	841.60	629.40
Dry Wt. of Soil + Cont.	(g)	779.30	572.60
Wt. of Container	(g)	0.00	181.20
Moisture Content	(%)	7.99	14.51
Wet Density	(pcf)	127.5	134.3
Dry Density	(pcf)	118.1	117.3
Void Ratio		0.428	0.437
Total Porosity		0.300	0.304
Pore Volume	(cc)	62.0	63.4
Degree of Saturation (%) [S_{meas}]		**50.4**	89.6

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
02/03/09	10:41	1.0	0	0.1345
02/03/09	10:51	1.0	10	0.1335
Add Distilled Water to the Specimen				
02/03/09	11:07	1.0	16	0.1390
02/04/09	7:25	1.0	1234	0.1410
02/04/09	8:28	1.0	1297	0.1410

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	7

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SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

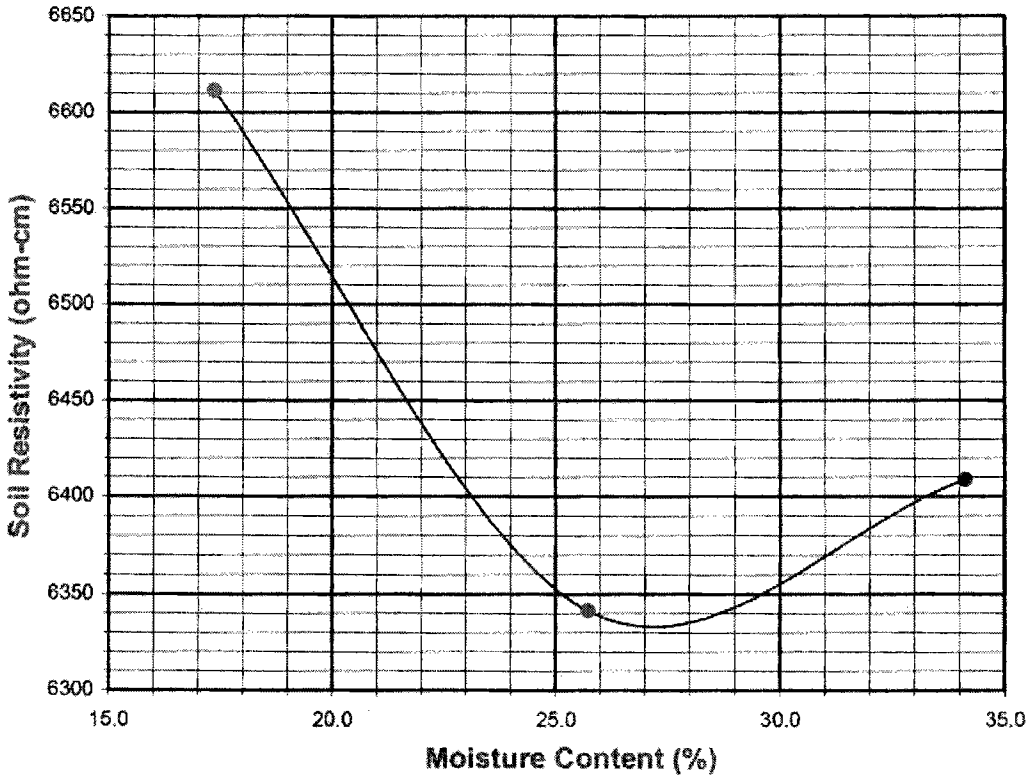
Project Name: SGUSD Del Mar
Project No. : 602488-001
Boring No.: L-2
Sample No. : B-1
Soil Identification:

Tested By : O. Figueroa Date: 01/26/09
Data Input By: J. Ward Date: 02/02/09
Depth (ft.) : 2-5

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	17.34	980	6611
2	200	25.73	940	6341
3	300	34.11	950	6409
4				
5				

Moisture Content (%) (MCi)	8.96
Wet Wt. of Soil + Cont. (g)	204.17
Dry Wt. of Soil + Cont. (g)	192.40
Wt. of Container (g)	61.08
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
6333	**27.2**	**59**	**88**	**7.12**	**19.2**



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One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

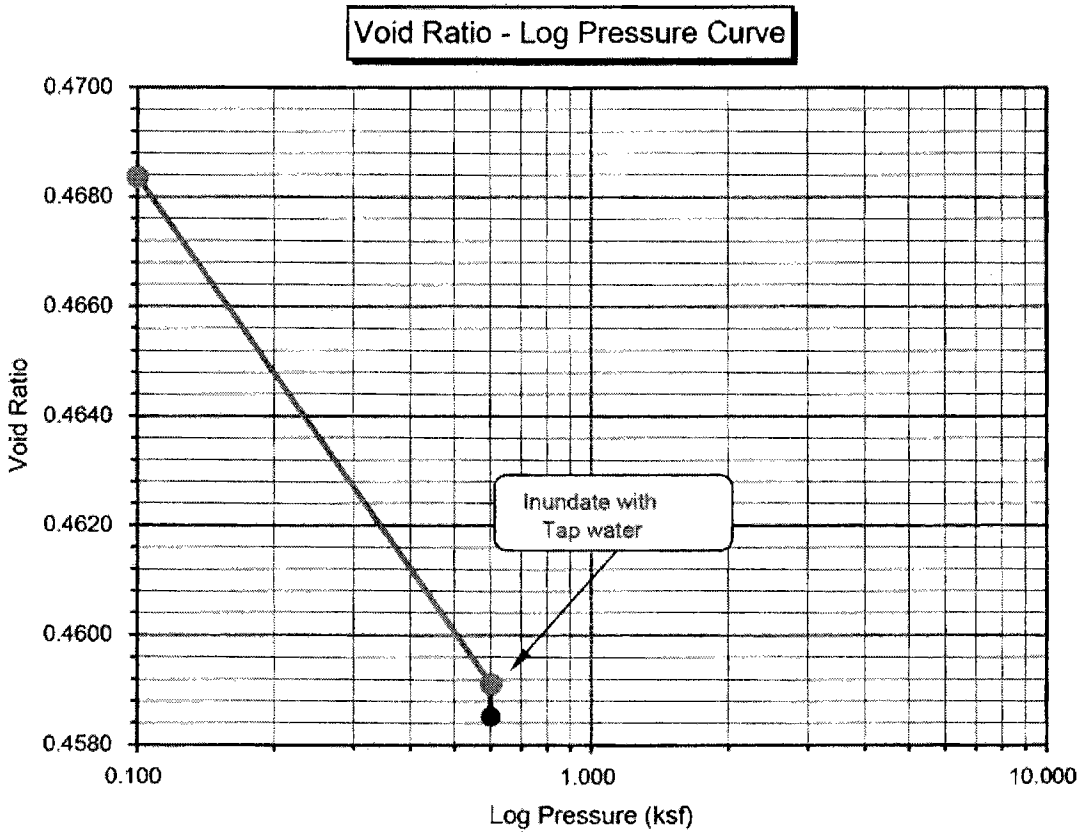
Project Name:	SGUSD Del Mar	Tested By:	A. Santos	Date:	01/26/09
Project No.:	602488-001	Checked By:	J. Ward	Date:	02/06/09
Boring No.:	L-1	Sample Type:	Drive		
Sample No.:	R-3	Depth (ft.)	5.0		
Sample Description:					

Initial Dry Density (pcf):	114.8
Initial Moisture (%):	14.39
Initial Length (in.):	1.0000
Initial Dial Reading:	0.2065
Diameter(in):	2.416

Final Dry Density (pcf):	115.3
Final Moisture (%) :	16.1
Initial Void Ratio:	0.4684
Specific Gravity(assumed):	2.70
Initial Saturation (%)	83.0

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.2065	1.0000	0.00	0.00	0.4684	0.00
0.600	0.1995	0.9930	0.07	-0.70	0.4591	-0.63
H2O	0.1991	0.9926	0.07	-0.74	0.4585	-0.67

Percent Swell (+) / Settlement (-) After Inundation = -0.04



LEIGHTON AND ASSOCIATES, 2002

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Blurock / SGUSD Warehouse	Tested By:	ACS	Date:	5/5/02
Project No. :	010685-001	Checked By	JHW	Date:	5/8/02
Boring No.:	B-2	Depth (ft.)	0-5		
Sample No. :	Bag-1				

Visual Sample Description: Brown Silty Sand (SM)

Dry Wt. of Soil + Cont.	(gm.)	1000.00
Wt. of Container No.	(gm.)	0.00
Dry Wt. of Soil	(gm.)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0082
Wt. Comp. Soil + Mold (gm.)	619.30	439.10
Wt. of Mold (gm.)	204.00	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	0	0
Wet Wt. of Soil + Cont. (gm.)	831.10	643.10
Dry Wt. of Soil + Cont. (gm.)	765.90	586.80
Wt. of Container (gm.)	0.00	204.00
Moisture Content (%)	8.51	14.71
Wet Density (pcf)	125.3	131.4
Dry Density (pcf)	115.4	114.5
Void Ratio	0.460	0.472
Total Porosity	0.315	0.321
Pore Volume (cc)	65.2	66.9
Degree of Saturation (%) [S_{meas}]	49.9	84.1

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
05/05/02	17:10	1.0	0	0.6038
05/05/02	17:20	1.0	10	0.6035
Add Distilled Water to the Specimen				
05/06/02	8:00	1.0	880	0.6120
05/06/02	11:02	1.0	1062	0.6120

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	8.5
Expansion Index ($EI)_{50}$ = EI_{meas} - (50 -S_{meas})x((65+EI_{meas}) / (220-S_{meas}))	8

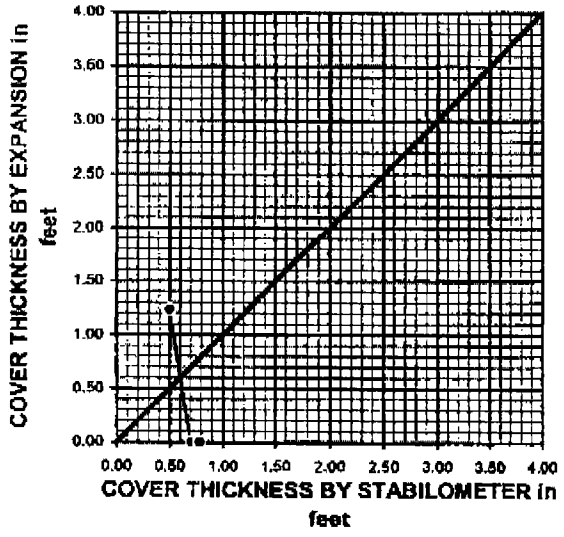
TERATEST LABS	R-VALUE TEST RESULTS

PROJECT NAME:	Blurock SGUSD Warehouse	PROJECT NUMBER:	020685-001
SAMPLE NUMBER:	Bag-1	SAMPLE LOCATION:	B-3
SAMPLE DESCRIPTION:	SM	TECHNICIAN:	ACS
		DATE SAMPLED	4/19/02

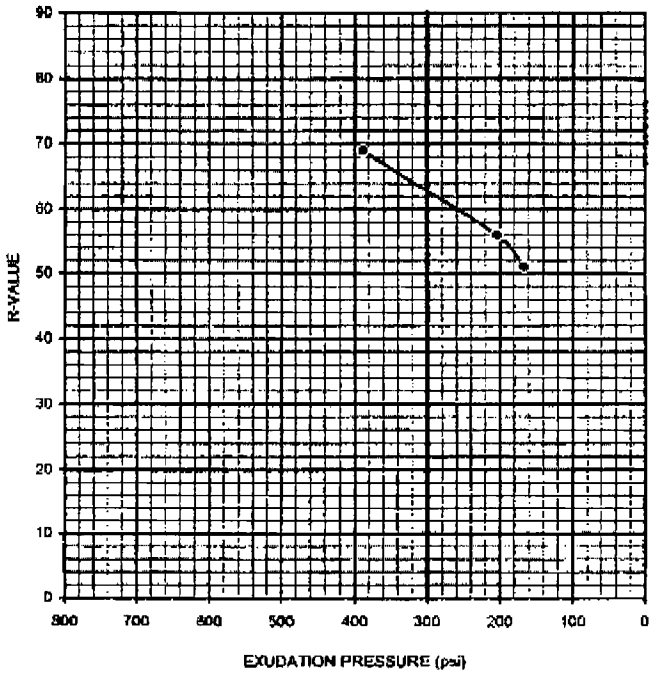
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	9.1	9.7	10.1
HEIGHT OF SAMPLE, Inches	2.35	2.43	2.46
DRY DENSITY, pcf	126.6	126.3	125.7
COMPACTOR AIR PRESSURE, psf	400	350	300
EXUDATION PRESSURE, psf	389	204	166
EXPANSION, Inches x 10exp-4	37	0	0
STABILITY Ph 2,000 lbs (160 psi)	29	46	55
TURNS DISPLACEMENT	4.18	4.40	4.51
R-VALUE UNCORRECTED	73	58	51
R-VALUE CORRECTED	69	56	51

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.50	0.70	0.78
EXPANSION PRESSURE THICKNESS, ft.	1.23	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	61
R-VALUE BY EXUDATION:	63
EQUILIBRIUM R-VALUE:	61

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

Project Name: Blurock / SGUSD Warehouse
Tested By : VJ Date: 04/30/02
Project No. : 020685-001
Data Input By: JHW Date: 05/08/02
Boring No.: B-2
Checked By: JHW Date: 05/08/02
Sample No. : Bag-1
Depth (ft.) : 0-5
Visual Soil Identification: Brown (SM)

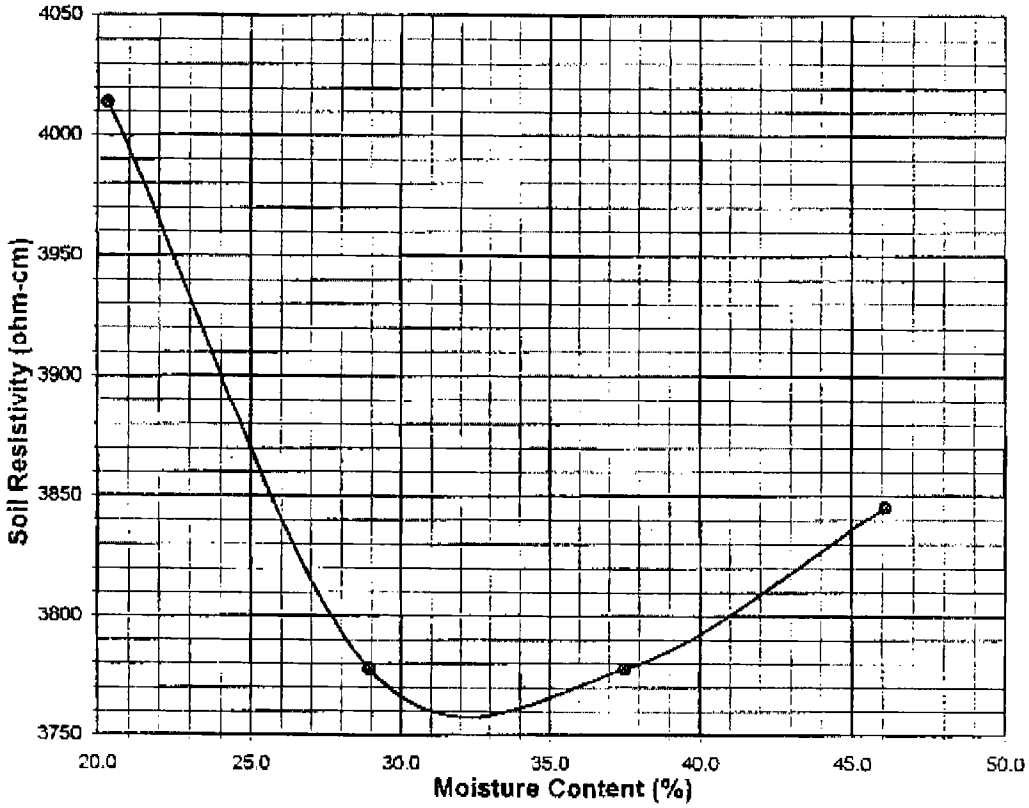
Initial Moisture Content (%)

Wet Wt. of Soil + Cont. (gm.)	173.29
Dry Wt. of Soil + Cont. (gm.)	161.33
Wt. of Container (gm.)	59.44
Moisture Content (%) (MCi)	11.74

Initial Soil Weight (gm)(Wt)	1300.00
Box Constant:	6.7460

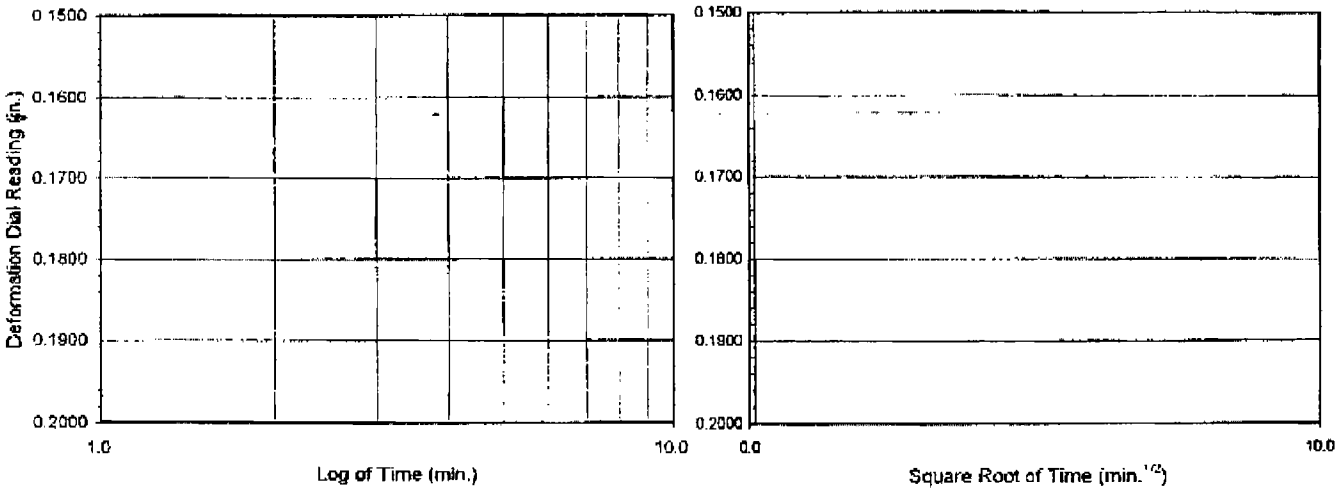
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100

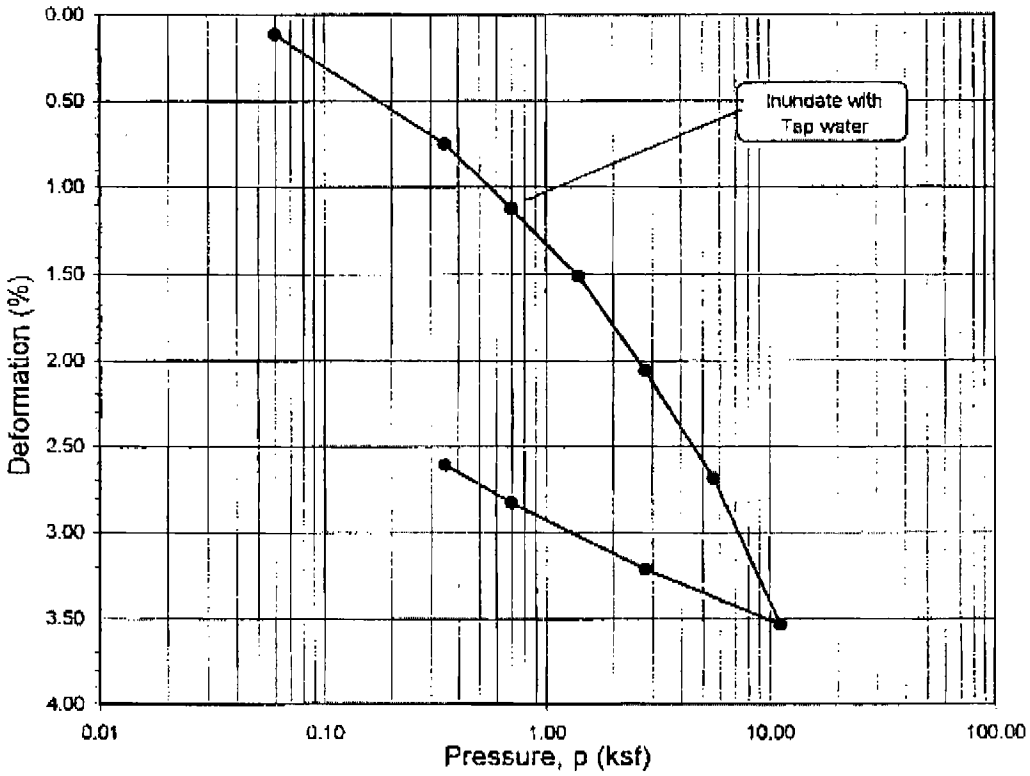
Remolded Specimen	Moisture Adjustments				
Water Added (ml) (Wa)	100	200	300	400	
Adj. Moisture Content (MC)	20.33	28.93	37.52	46.12	
Resistance Rdg. (ohm)	595	560	560	570	
Soil Resistivity (ohm-cm)	4014	3778	3778	3845	



Minimum Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532/643
3757	32.5	42	136	9.21 @ 20.8 °C

No Time Readings





Boring No.	Sample No.:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-4	R-2	5	10.6	12.9	125.1	127.8	0.348	0.312	82	108

Sample Description:

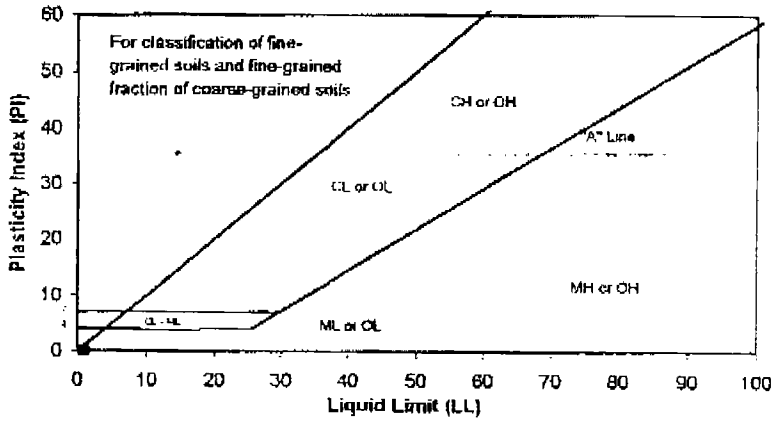
Brown Clayey Sand (SC)

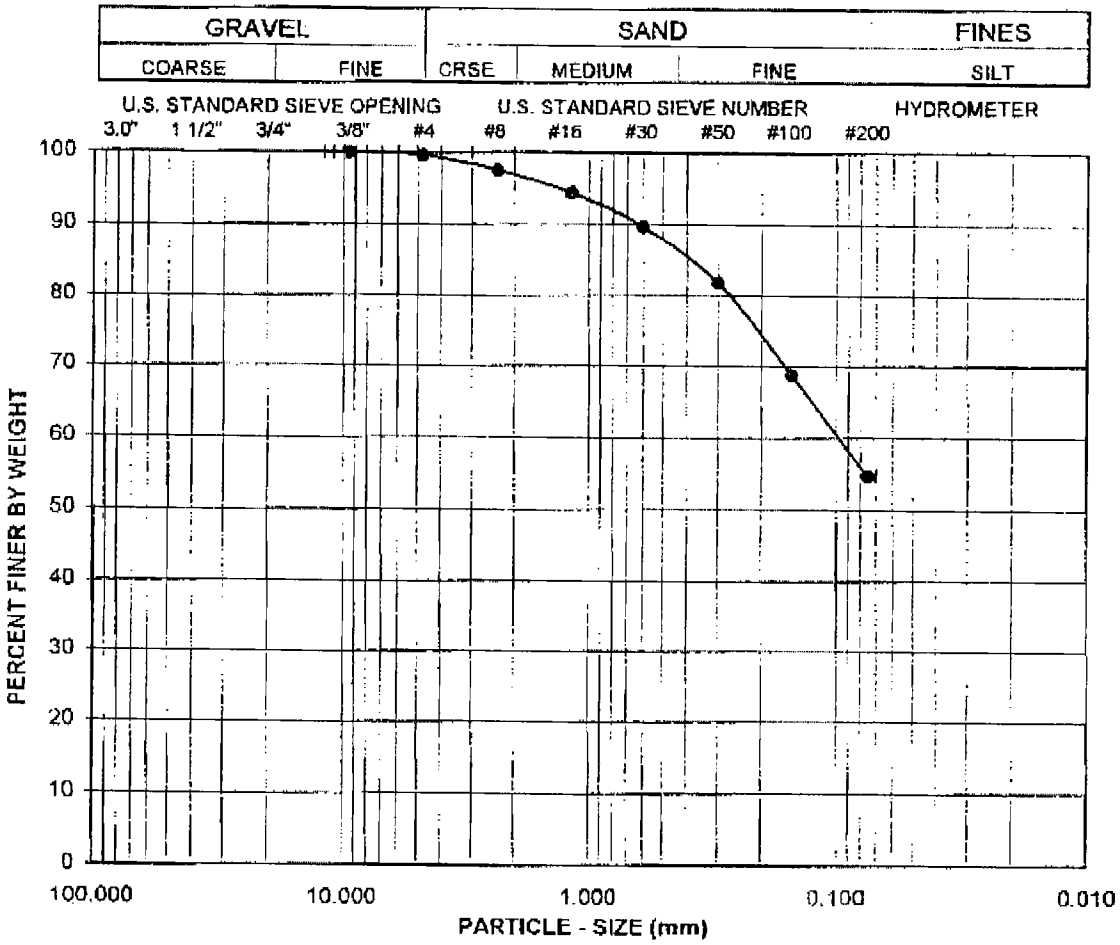
Project No.: 020685-001

Blurock / SGUSD Warehouse

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
(ASTM D 2435)

05-02





Boring No.:	Sample No.:	Depth (ft.):	Soil Type	GR:SA:FI	LL,PL,PI
B-2	R-1	2	s(ML)/s(CL)	0 : 45 : 55	N/A, N/A, N/A

Visual Sample Description:

Brown Sandy Silt / Sandy Clay s(ML) / s(CL)

Project No.: 020685-001

Blurock / SGUSD Warehouse

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

05-02

SA B-2 R-1 @2

COMPACTION TEST

ASTM D 1557

Project Name: Blurock, SGUSD Wharehouse | Tested By : MTR | Date: May-6-02

Project No.: 020685-001 | Calculated By: | Date:

Boring No.: B-4 | Depth (ft.) 0-5'

Sample No. : Bag-1

Visual Sample Description: Brown si sand

Preparation Method: [ ] Moist [X] Dry | [X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft ³) 0.03322 *Ram Weight 10 LBS Drop 18 inches*

	2.5	5	7.5	10		
TEST NO.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	3798.0	3925.0	3917.0	3826.0		
Wt. of Mold (gm.)	1803.0	1803.0	1803.0	1803.0		
Net Wt. of Soil (gm.)	1993.0	2122.0	2114.0	2023.0		
Wet Wt. of Soil + Cont. (gm.)	599.70	555.80	526.10	566.20		
Dry Wt. of Soil + Cont. (gm.)	574.70	521.70	484.60	509.60		
Wt. of Container (gm.)	51.70	49.40	51.60	50.50		
Moisture Content (%)	4.78	7.22	9.58	12.33		
Wet Density (pcf)	132.3	140.8	140.3	134.3		
Dry Density (pcf)	126.2	131.3	128.0	119.5		

Maximum Dry Density (pcf) 131.5 **Optimum Moisture Content (%)** 9.6

PROCEDURE USED

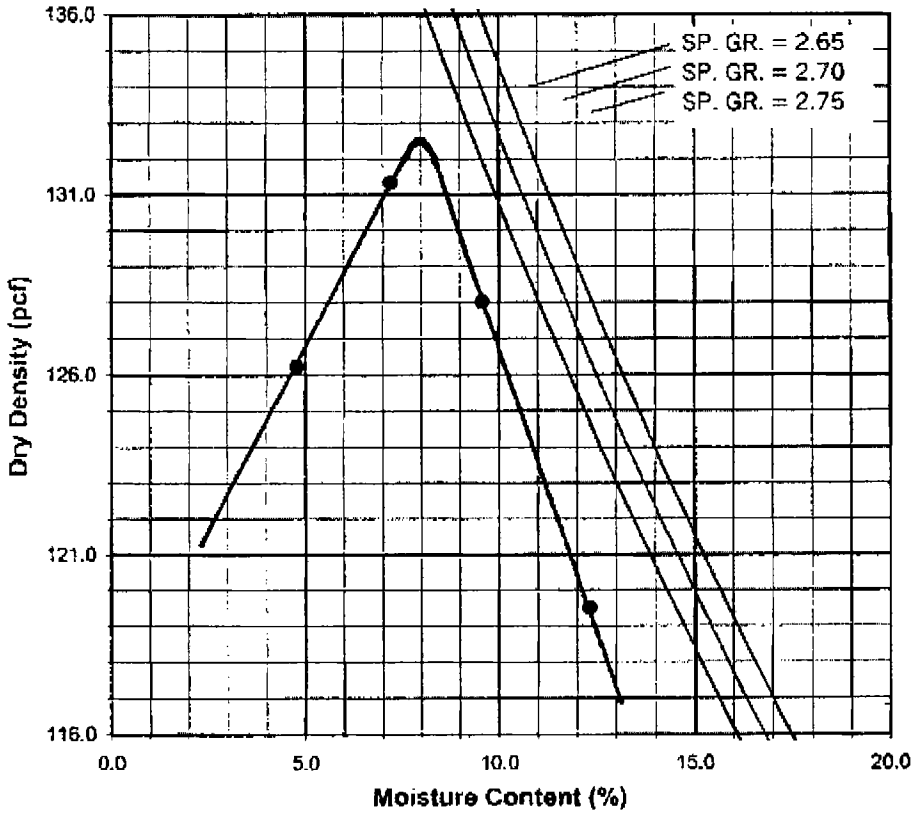
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + #4 > 20% and + 3/8 " < 20%

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + ¾ in <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



MX B-4 bag-1

APPENDIX D

```
**********
*        *
*  EQFAULT  *
*        *
*  Version 3.00  *
*        *
**********
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DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 602488-001

DATE: 02-16-2009

JOB NAME: SGUSD Del Mar H.S.

CALCULATION NAME: Proximity Analysis

FAULT-DATA-FILE NAME: CDMGFLTE.DAT

SITE COORDINATES:
SITE LATITUDE: 34.0981
SITE LONGITUDE: 118.0594

SEARCH RADIUS: 100 mi

ATTENUATION RELATION: 14) Campbell & Bozorgnia (1997 Rev.) - Alluvium
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
DISTANCE MEASURE: cdist
SCOND: 0
Basement Depth: 5.00 km Campbell SSR: 0 Campbell SHR: 0
COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: CDMGFLTE.DAT

MINIMUM DEPTH VALUE (km): 3.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)		ESTIMATED MAX. EARTHQUAKE EVENT MAXIMUM EARTHQUAKE MAG. (Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
RAYMOND	3.5	5.6	6.5	0.569	X
VERDUGO	4.7	7.6	6.7	0.511	X
SIERRA MADRE	7.8	12.6	7.0	0.406	X
HOLLYWOOD	8.1	13.0	6.4	0.306	IX
CLAMSHELL-SAWPIT	8.6	13.9	6.5	0.301	IX
ELYSIAN PARK THRUST	8.8	14.2	6.7	0.326	IX
WHITTIER	9.3	14.9	6.8	0.275	IX
SAN JOSE	13.0	20.9	6.5	0.193	VIII
COMPTON THRUST	14.7	23.7	6.8	0.201	VIII
NEWPORT-INGLEWOOD (L.A.Basin)	15.5	25.0	6.9	0.181	VIII
SANTA MONICA	18.0	29.0	6.6	0.137	VIII
SIERRA MADRE (San Fernando)	18.3	29.4	6.7	0.145	VIII
SAN GABRIEL	18.5	29.7	7.0	0.152	VIII
CHINO-CENTRAL AVE. (Elsinore)	19.9	32.0	6.7	0.130	VIII
CUCAMONGA	20.7	33.3	7.0	0.152	VIII
NORTHRIDGE (E. Oak Ridge)	21.8	35.1	6.9	0.133	VIII
PALOS VERDES	24.2	39.0	7.1	0.129	VIII
MALIBU COAST	25.2	40.5	6.7	0.095	VII
SAN ANDREAS - 1857 Rupture	27.9	44.9	7.8	0.188	VIII
SAN ANDREAS - Mojave	27.9	44.9	7.1	0.109	VII
SANTA SUSANA	28.3	45.6	6.6	0.075	VII
ELSINORE-GLEN IVY	31.4	50.6	6.8	0.073	VII
HOLSER	33.6	54.0	6.5	0.055	VI
ANACAPA-DUME	35.3	56.8	7.3	0.095	VII
SAN JACINTO-SAN BERNARDINO	35.4	56.9	6.7	0.058	VI
SAN ANDREAS - San Bernardino	35.9	57.7	7.3	0.095	VII
SAN ANDREAS - Southern	35.9	57.7	7.4	0.103	VII
NEWPORT-INGLEWOOD (Offshore)	36.7	59.0	6.9	0.066	VI
CLEGHORN	39.3	63.2	6.5	0.042	VI
OAK RIDGE (Onshore)	40.6	65.4	6.9	0.058	VI
SIMI-SANTA ROSA	42.6	68.5	6.7	0.046	VI
SAN CAYETANO	45.5	73.2	6.8	0.045	VI
SAN ANDREAS - Carrizo	47.8	76.9	7.2	0.061	VI
SAN JACINTO-SAN JACINTO VALLEY	49.7	80.0	6.9	0.045	VI
NORTH FRONTAL FAULT ZONE (West)	50.1	80.7	7.0	0.046	VI
ELSINORE-TEMECULA	53.3	85.9	6.8	0.037	V
SANTA YNEZ (East)	56.6	91.1	7.0	0.041	V
CORONADO BANK	58.2	93.6	7.4	0.056	VI
VENTURA - PITAS POINT	62.3	100.2	6.8	0.029	V
RED MOUNTAIN - S. LOCKHARDT	64.9	104.4	7.1	0.038	V

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
OAK RIDGE(Blind Thrust Offshore)	65.1(104.8)	6.9	0.030	V
GARLOCK (West)	65.6(105.5)	7.1	0.037	V
CHANNEL IS. THRUST (Eastern)	66.9(107.7)	7.4	0.042	VI
M.RIDGE-ARROYO PARIDA-SANTA ANA	67.0(107.8)	6.7	0.024	V
PLEITO THRUST	67.9(109.3)	7.2	0.035	V
MONTALVO-OAK RIDGE TREND	68.2(109.8)	6.6	0.022	IV
RED MOUNTAIN	71.8(115.5)	6.8	0.024	IV
BIG PINE	72.1(116.0)	6.7	0.023	IV
SAN JACINTO-ANZA	72.1(116.0)	7.2	0.036	V
NORTH FRONTAL FAULT ZONE (East)	74.7(120.2)	6.7	0.021	IV
LENWOOD-LOCKHART-OLD WOMAN SPRGS	75.6(121.6)	7.3	0.037	V
ROSE CANYON	77.2(124.3)	6.9	0.025	V
PINTO MOUNTAIN	78.9(126.9)	7.0	0.027	V
WHITE WOLF	79.0(127.1)	7.2	0.035	V
ELSINORE-JULIAN	79.7(128.2)	7.1	0.029	V
SANTA CRUZ ISLAND	81.4(131.0)	6.8	0.020	IV
GARLOCK (East)	82.2(132.2)	7.3	0.033	V
GRAVEL HILLS - HARPER LAKE	84.9(136.7)	6.9	0.022	IV
LANDERS	86.2(138.7)	7.3	0.031	V
JOHNSON VALLEY (Northern)	86.3(138.9)	6.7	0.016	IV
BLACKWATER	89.0(143.3)	6.9	0.021	IV
CALICO - HIDALGO	91.5(147.3)	7.1	0.024	V
SANTA YNEZ (West)	91.8(147.7)	6.9	0.020	IV
NORTH CHANNEL SLOPE	92.0(148.1)	7.1	0.021	IV
SAN ANDREAS - Coachella	94.1(151.4)	7.1	0.023	IV
EMERSON So. - COPPER MTN.	94.3(151.7)	6.9	0.019	IV
BURNT MTN.	97.0(156.1)	6.4	0.012	III
EUREKA PEAK	97.6(157.1)	6.4	0.012	III
So. SIERRA NEVADA	98.3(158.2)	7.1	0.019	IV

-END OF SEARCH- 59 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE RAYMOND FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 3.5 MILES (5.6 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.5689 g

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*                       *
*      E Q S E A R C H  *
*                       *
*      Version 3.00     *
*                       *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 632488-001

DATE: 02-16-2009

JOB NAME: SGUSD Del Mar H.S.

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
  MINIMUM MAGNITUDE: 5.00
  MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
  SITE LATITUDE: 34.0981
  SITE LONGITUDE: 118.0994

SEARCH DATES:
  START DATE: 1800
  END DATE: 1999

SEARCH RADIUS:
  100.0 mi
  160.9 km

ATTENUATION RELATION: 14) Campbell & Bozorgnia (1997 Rev.) - Alluvium
  UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
  ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
  SCOND: 2 Depth Source: A
  Basement Depth: 5.00 km Campbell SSR: 0 Campbell SHR: 0
  COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 3.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi	(km)
MGI	34.1000	118.1000	07/31/1855	415 0.0	0.0	6.30	0.686	XI	0.1	0.2
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.316	IX	1.7	2.8
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.472	X	2.8	4.5
MGI	34.0000	118.0000	12/25/1923	1745 0.0	0.0	5.00	0.093	VII	8.8	14.2
MGI	34.0830	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.089	VII	9.3	14.9
T-A	34.0000	118.2500	05/26/1860	0 0 0.0	0.0	5.00	0.073	VII	11.0	17.6
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.073	VII	11.0	17.6
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.073	VII	11.0	17.6
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.086	VII	12.6	20.3
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.074	VII	13.3	21.4
DMG	34.2020	117.9020	08/28/1969	215 0.0	0.0	5.50	0.066	VII	13.4	21.5
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.035	V	19.6	31.6
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.042	V	21.8	35.1
GSP	34.1420	117.7000	02/28/1990	234336.6	5.0	5.20	0.033	V	23.0	37.0
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.035	V	23.3	37.5
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.038	V	23.4	37.7
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.026	V	23.9	38.4
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.026	V	23.9	38.4
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.028	V	24.0	38.7
DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.028	V	24.0	38.7
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.026	V	24.0	38.7
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.033	V	24.0	38.7
DMG	33.7500	118.0830	03/12/1933	323 0.0	0.0	5.00	0.026	V	24.0	38.7
DMG	34.3080	118.4540	02/09/1971	144346.7	8.2	5.20	0.029	V	24.9	40.1
GSP	34.2130	118.5370	01/17/1994	123055.4	18.3	6.70	0.093	VII	25.2	40.2
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.024	IV	27.5	44.3
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.024	IV	27.5	44.3
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.041	V	27.6	44.4
DMG	34.4110	118.4010	02/09/1971	141328.0	8.0	5.30	0.028	V	27.6	44.4
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.041	V	27.6	44.4
DMG	34.4110	118.4010	02/09/1971	14 241.8	8.4	6.40	0.067	VI	27.6	44.4
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.031	V	28.9	46.3
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.020	IV	29.6	47.6
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.023	IV	30.0	48.4
GSP	34.3050	118.5790	01/39/1994	112036.0	1.0	5.10	0.022	IV	30.9	49.7
DMG	34.3300	117.6000	07/30/1894	512 0.0	0.0	6.00	0.040	V	31.7	51.1
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.087	VII	31.8	51.2
DMG	34.3000	118.6000	04/04/1893	1940 0.0	0.0	6.00	0.040	V	31.8	51.2
DMG	33.9500	118.6320	08/31/1930	04036.0	0.0	5.20	0.021	IV	32.1	51.7
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.017	IV	32.6	52.5
DMG	33.6170	118.0170	03/14/1933	19 153.0	0.0	5.10	0.018	IV	33.5	54.0
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.046	VI	34.1	54.8
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.022	IV	34.1	54.8
PAS	33.9440	118.6810	01/01/1979	231438.9	12.3	5.00	0.016	IV	34.9	56.2
MGI	34.3000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.076	VII	34.5	56.2
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.015	IV	35.2	56.7
GSP	34.3780	118.6180	01/19/1994	211144.9	11.0	5.10	0.017	IV	35.3	56.9
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.019	IV	36.7	59.1
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.048	VI	37.0	59.5
GSP	34.3260	118.6980	01/17/1994	233330.7	9.0	5.60	0.022	IV	37.6	60.5
GSP	34.3690	118.6720	04/26/1997	103730.7	16.0	5.10	0.015	IV	37.7	60.6

GSP	34.3940	118.6650	06/26/1995	084028.9	13.0	5.00	0.014	III	38.4	61.8
GSP	34.3770	118.6980	01/19/1994	004338.9	11.0	5.20	0.016	IV	39.2	63.1

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi	[km]
GSP	34.3750	118.7110	01/19/1994	210928.6	14.0	5.50	0.019	IV	39.9	64.3
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.019	IV	40.6	65.3
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.017	IV	43.5	70.1
NGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.014	III	45.7	73.5
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.30	0.010	III	48.6	78.2
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.30	0.010	III	48.6	78.2
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.022	IV	48.6	78.2
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.026	V	49.1	78.9
DMG	34.0000	119.0000	09/24/1827	4 0 0.0	0.0	7.00	0.044	VI	52.0	83.6
NGI	34.0000	115.0000	12/14/1912	0 0 0.0	0.0	5.70	0.016	IV	52.0	83.6
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.50	0.019	IV	53.3	85.7
DMG	34.0650	119.0350	02/21/1973	144557.3	8.0	5.90	0.018	IV	53.5	86.2
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.20	0.017	IV	57.5	92.6
T-A	34.8330	118.7500	11/27/1852	0 0 0.0	0.0	7.20	0.034	V	62.6	100.8
PAS	33.6710	119.1110	09/04/1981	155030.3	5.0	5.30	0.028	III	65.0	104.7
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.029	III	65.7	105.8
DMG	34.7000	119.0000	10/23/1916	254 0.0	0.0	5.50	0.029	III	66.0	106.2
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.019	IV	66.2	106.6
DMG	33.7500	117.0000	06/05/1918	2232 0.0	0.0	5.00	0.026	II	67.4	108.5
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.026	V	67.4	108.5
DMG	34.1800	116.9200	01/15/1930	02433.9	0.0	5.20	0.027	II	67.5	108.8
DMG	34.1800	116.9200	01/15/1930	034 3.6	0.0	5.10	0.027	II	67.6	108.8
PAS	34.9430	118.7430	06/13/1988	23 643.0	6.8	5.40	0.028	III	68.9	110.8
GSP	34.3490	116.9020	11/27/1992	160057.5	1.0	5.30	0.027	II	70.5	113.4
GSP	34.1950	116.8620	08/17/1992	204152.1	21.0	5.30	0.027	II	71.0	114.3
GSP	34.3650	116.8970	12/04/1992	020857.5	3.0	5.30	0.027	II	71.1	114.5
DMG	34.8670	118.9330	09/21/1941	1953 7.2	0.0	5.20	0.027	II	71.2	114.6
GSP	34.1630	116.8550	06/28/1992	144321.0	5.0	5.30	0.027	II	71.3	114.7
DMG	34.9000	118.9000	10/23/1916	244 0.0	0.0	6.00	0.013	III	71.7	115.4
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.026	II	72.3	116.2
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.026	II	72.4	116.6
GSP	34.2330	116.8370	07/09/1992	014357.6	3.0	5.30	0.027	II	72.8	117.1
GSN	34.2030	116.8270	06/28/1992	150530.7	5.0	6.70	0.021	IV	73.1	117.6
DMG	34.9500	118.8670	07/21/1952	121936.0	0.0	5.30	0.027	II	73.3	117.9
T-A	34.9200	118.9200	01/23/1857	0 0 0.0	0.0	5.00	0.025	II	73.5	118.3
T-A	34.9200	118.9200	05/23/1857	0 0 0.0	0.0	5.00	0.025	II	73.5	118.3
DMG	34.9000	118.9500	08/01/1952	13 430.0	0.0	5.10	0.026	II	73.5	118.3
DMG	34.1000	116.8000	10/24/1935	1448 7.6	0.0	5.10	0.026	II	74.3	119.5
DMG	34.1000	119.4000	05/19/1893	035 0.0	0.0	5.50	0.008	III	74.4	119.7
DMG	34.8000	119.1000	09/05/1883	1230 0.0	0.0	6.00	0.012	III	74.8	120.4
DMG	35.0000	118.8330	07/23/1952	75319.0	0.0	5.40	0.007	II	75.0	120.6
DMG	35.0000	118.8330	07/23/1952	181351.0	0.0	5.20	0.006	II	75.0	120.6
DMG	34.9320	118.9760	03/01/1963	02557.9	13.9	5.00	0.005	II	76.2	122.6
GSP	35.2100	118.0650	07/11/1992	181416.2	10.0	5.70	0.009	III	76.8	123.6
DMG	34.9410	118.9870	11/15/1961	53855.5	10.7	5.00	0.005	II	77.0	124.0
DMG	35.1500	118.6330	01/27/1954	141948.0	0.0	5.00	0.005	II	78.7	126.6
PAS	32.9710	117.8730	07/13/1986	1347 8.2	6.0	5.30	0.006	II	78.9	127.0
DMG	32.9860	119.4750	08/06/1973	232917.0	16.3	5.00	0.005	II	79.1	127.3
DMG	34.9830	118.9830	05/23/1954	235243.0	0.0	5.10	0.005	II	79.1	127.3

DMG	33.9760	116.7210	06/12/1944	104534.7	10.0	5.10	0.005	II	79.3	127.6
DMG	33.9940	116.7120	06/12/1944	111636.0	10.0	5.30	0.006	II	79.7	128.2
DMG	34.1000	116.7000	02/07/1889	520 0.0	0.0	5.30	0.006	II	80.0	128.8
DMG	34.0000	119.5000	02/28/1926	1818 0.0	0.0	5.00	0.005	II	80.4	129.4

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi	[km]
DMG	35.0000	119.0000	02/16/1919	1557 0.0	0.0	5.00	0.005	II	80.6	129.7
DMG	35.0000	119.0000	07/21/1952	12 531.0	0.0	6.40	0.015	IV	80.6	129.7
DMG	35.1330	118.7670	07/21/1952	194122.0	0.0	5.50	0.007	II	80.9	130.2
DMG	35.1830	118.6500	07/21/1952	151358.0	0.0	5.10	0.005	II	81.2	130.6
DMG	35.0000	119.0170	02/12/1954	233949.0	0.0	5.90	0.010	III	81.2	130.7
DMG	35.0000	119.0170	07/21/1952	115214.0	0.0	7.70	0.041	V	81.2	130.7
DMG	35.0000	119.0330	07/21/1952	12 2 0.0	0.0	5.60	0.008	II	81.8	131.7
DMG	35.2330	118.5330	07/21/1952	174244.0	0.0	5.10	0.005	II	82.1	132.2
DMG	33.2910	119.1930	10/24/1969	82912.1	10.0	5.10	0.005	II	84.0	135.1
DMG	34.5000	119.5000	06/29/1926	2321 0.0	0.0	5.50	0.007	II	84.6	136.1
DMG	34.5000	119.5000	08/05/1930	1125 0.0	0.0	5.00	0.004	I	84.6	136.1
PAS	33.9980	116.6060	07/08/1986	92044.5	11.7	5.50	0.007	II	85.7	137.9
DMG	34.3670	119.5830	07/01/1941	75054.8	0.0	5.30	0.009	III	86.7	139.5
DMG	35.3110	118.4950	07/25/1952	1313 8.2	2.8	5.00	0.004	I	86.8	139.6
DMG	35.3170	118.4940	07/25/1952	19 944.6	5.5	5.70	0.007	II	87.1	140.1
DMG	35.3150	118.5160	07/25/1952	194323.7	11.2	5.70	0.007	II	87.3	140.5
DMG	35.2170	118.8170	07/23/1952	1317 5.0	0.0	5.70	0.007	II	87.3	140.6
DMG	33.0000	117.3000	11/22/1800	2130 0.0	0.0	6.50	0.014	IV	88.7	142.7
DMG	32.8170	118.3500	12/26/1951	04654.0	0.0	5.90	0.008	III	89.6	144.2
DMG	35.3330	118.6000	07/31/1952	12 9 9.0	0.0	5.80	0.008	II	89.9	144.6
GSP	34.3410	116.5290	06/28/1992	124053.5	6.3	5.20	0.005	II	91.2	146.8
DMG	34.1180	119.7020	07/05/1968	04517.2	5.9	5.20	0.005	II	91.6	147.4
DMG	34.0170	116.5000	07/24/1947	221046.0	0.0	5.50	0.006	II	91.7	147.5
DMG	34.0170	116.5000	07/26/1947	24941.0	0.0	5.10	0.004	I	91.7	147.5
DMG	34.0170	116.5000	07/25/1947	04631.0	0.0	5.00	0.004	I	91.7	147.5
DMG	34.0170	116.5000	07/25/1947	61949.0	0.0	5.20	0.005	II	91.7	147.5
DMG	35.3670	118.5830	07/23/1952	03832.0	0.0	6.10	0.010	III	91.8	147.7
DMG	35.3670	118.5830	07/23/1952	31923.0	0.0	5.00	0.004	I	91.8	147.7
DMG	35.3000	118.8000	12/23/1905	2223 0.0	0.0	5.00	0.004	I	92.0	148.1
GSP	35.1490	119.1040	05/28/1992	044740.6	21.3	5.20	0.005	II	92.3	148.5
PAS	34.3470	119.6960	08/13/1978	225453.4	12.6	5.10	0.004	I	92.8	149.3
NGI	34.4000	119.7000	03/25/1836	8 0 0.0	0.0	5.00	0.004	I	93.7	150.8
T-A	34.5000	119.6700	06/01/1893	12 0 0.0	0.0	5.00	0.004	I	93.8	150.9
GSP	34.9700	116.8190	03/18/1997	152447.7	1.0	5.10	0.004	I	94.5	152.0
GSP	34.3520	116.4520	07/01/1992	074029.9	9.0	5.40	0.005	II	94.9	152.7
GSN	34.2010	116.4360	06/28/1992	115734.1	1.0	7.60	0.030	V	95.3	153.4
GSP	34.1390	116.4310	06/28/1992	123640.6	10.0	5.10	0.004	I	95.4	153.5
PAS	34.3270	116.4450	03/15/1979	21 716.5	2.5	5.20	0.004	I	95.8	154.1
PAS	34.5160	116.4950	06/01/1975	12849.2	4.5	5.20	0.004	I	95.9	154.4
DMG	33.2670	119.4500	11/18/1947	2159 3.0	0.0	5.00	0.004	I	96.5	155.3
GSP	34.1080	116.4040	06/29/1992	141538.8	9.0	5.40	0.005	II	96.9	156.0
DMG	35.3330	118.9170	08/22/1952	224124.0	0.0	5.80	0.007	II	97.1	156.2
DMG	34.2000	119.8000	12/21/1812	19 0 0.0	0.0	7.00	0.018	IV	97.4	156.8
GSP	34.2680	116.4020	06/16/1994	162427.5	3.0	5.00	0.004	I	97.7	157.2
NGI	34.3000	119.8000	07/03/1925	1821 0.0	0.0	5.30	0.005	I	98.1	157.9

EMG	34.3000	119.8200	06/29/1925	144216.0	0.0	6.25	0.010	III	98.1	(157.9)
MGI	34.3000	119.8200	07/02/1925	1438 0.0	0.0	5.30	0.005	I	98.1	(157.9)
EMG	35.3830	118.8500	07/29/1952	7 347.0	0.0	6.10	0.009	III	98.4	(158.4)
EMG	35.4000	118.8170	07/29/1952	8 146.0	0.0	5.10	0.004	I	98.7	(158.8)
MGI	33.0000	117.0300	09/21/1856	730 0.0	0.0	5.00	0.004	I	98.7	(158.9)
EMG	33.9330	116.3830	12/04/1948	234317.0	0.0	6.50	0.012	III	98.8	(159.1)
GSP	34.0640	116.3510	09/15/1992	094711.3	9.0	5.20	0.004	I	99.4	(160.0)
PAS	33.5010	116.5130	02/25/1980	104738.5	13.6	5.50	0.005	II	99.9	(160.8)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi (km)

****

-END OF SEARCH- 159 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 1999

LENGTH OF SEARCH TIME: 200 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 0.1 MILES (0.2 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.7

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.686 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 1.581
b-value= 0.383
beta-value= 0.882

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	159	0.79899
4.5	159	0.79899
5.0	159	0.79899
5.5	58	0.29146
6.0	29	0.14573
6.5	11	0.05533
7.0	7	0.03518
7.5	2	0.01005

ASCE 7-05, Section 11.4.5/2007 CBC Seismic Design Parameters	
Categorization/Coefficient	**Design Value**
Site Longitude (decimal degrees)	-118.09936
Site Latitude (decimal degrees)	34.09813
Site Class Definition (Table 1613.5.2)	D
Mapped Spectral Response Acceleration at 0.2s Period, S_s (Figure 1613.5(3))	1.894
Mapped Spectral Response Acceleration at 1s Period, S_1 (Figure 1613.5(4))	0.710
Short Period Site Coefficient at 0.2s Period, F_a (Table 1613.5.3(1))	1.0
Long Period Site Coefficient at1s Period, F_v (Table 1613.5.3(2))	1.5
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS} (Eq. 16-37)	1.894
Adjusted Spectral Response Acceleration at 1s Period, S_{M1} (Eq. 16-38)	1.066
Design Spectral Response Acceleration at 0.2s Period, S_{DS} (Eq. 16-39)	1.263
Design Spectral Response Acceleration at 1s Period, S_{D1} (Eq. 16-40)	0.710

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period (sec)	Sa (g)
0.2	1.894 (Ss, Site Class B)
1.0	0.710 (S1, Site Class B)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Spectral Response Accelerations SMs and SM1
SMs = Fa x Ss and SM1 = Fv x S1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	1.894 (SMs, Site Class D)
1.0	1.066 (SM1, Site Class D)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Design Spectral Response Accelerations SDs and SD1
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	1.263 (SDs, Site Class D)
1.0	0.710 (SD1, Site Class D)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Site Modified Response Spectrum for Site Class D
SMs = FaSs and SM1 = FvS1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)	Sd (inches)
0.000	0.758	0.000
0.112	1.894	0.234
0.200	1.894	0.740
0.562	1.894	5.856
0.600	1.776	6.246
0.700	1.522	7.288
0.800	1.332	8.329
0.900	1.184	9.370
1.000	1.066	10.411
1.100	0.969	11.452
1.200	0.888	12.493
1.300	0.820	13.534
1.400	0.761	14.575
1.500	0.710	15.616
1.600	0.666	16.657
1.700	0.627	17.698
1.800	0.592	18.739
1.900	0.561	19.781
2.000	0.533	20.822

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Design Response Spectrum for Site Class D
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)	Sd (inches)
0.000	0.505	0.000
0.112	1.263	0.156
0.200	1.263	0.494
0.562	1.263	3.904
0.600	1.184	4.164
0.700	1.015	4.858
0.800	0.888	5.552
0.900	0.789	6.246
1.000	0.710	6.941
1.100	0.646	7.635
1.200	0.592	8.329
1.300	0.546	9.023
1.400	0.507	9.717
1.500	0.474	10.411
1.600	0.444	11.105
1.700	0.418	11.799
1.800	0.395	12.493
1.900	0.374	13.187
2.000	0.355	13.881

ASCE 7-05, Section 11.4.5/2007 CBC Seismic Design Parameters	
Categorization/Coefficient	**Design Value**
Site Longitude (decimal degrees)	-118.09936
Site Latitude (decimal degrees)	34.09813
Site Class Definition (Table 1613.5.2)	D
Mapped Spectral Response Acceleration at 0.2s Period, S_s (Figure 1613.5(3))	1.894
Mapped Spectral Response Acceleration at 1s Period, S_1 (Figure 1613.5(4))	0.710
Short Period Site Coefficient at 0.2s Period, F_a (Table 1613.5.3(1))	1.0
Long Period Site Coefficient at 1s Period, F_v (Table 1613.5.3(2))	1.5
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS} (Eq. 16-37)	1.894
Adjusted Spectral Response Acceleration at 1s Period, S_{M1} (Eq. 16-38)	1.066
Design Spectral Response Acceleration at 0.2s Period, S_{DS} (Eq. 16-39)	1.263
Design Spectral Response Acceleration at 1s Period, S_{D1} (Eq. 16-40)	0.710

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period (sec)	Sa (g)
0.2	1.894 (Ss, Site Class B)
1.0	0.710 (S1, Site Class B)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Spectral Response Accelerations SMs and SM1
SMs = Fa x Ss and SM1 = Fv x S1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	1.894 (SMs, Site Class D)
1.0	1.066 (SM1, Site Class D)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Design Spectral Response Accelerations SDs and SD1
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.0 ,Fv = 1.5

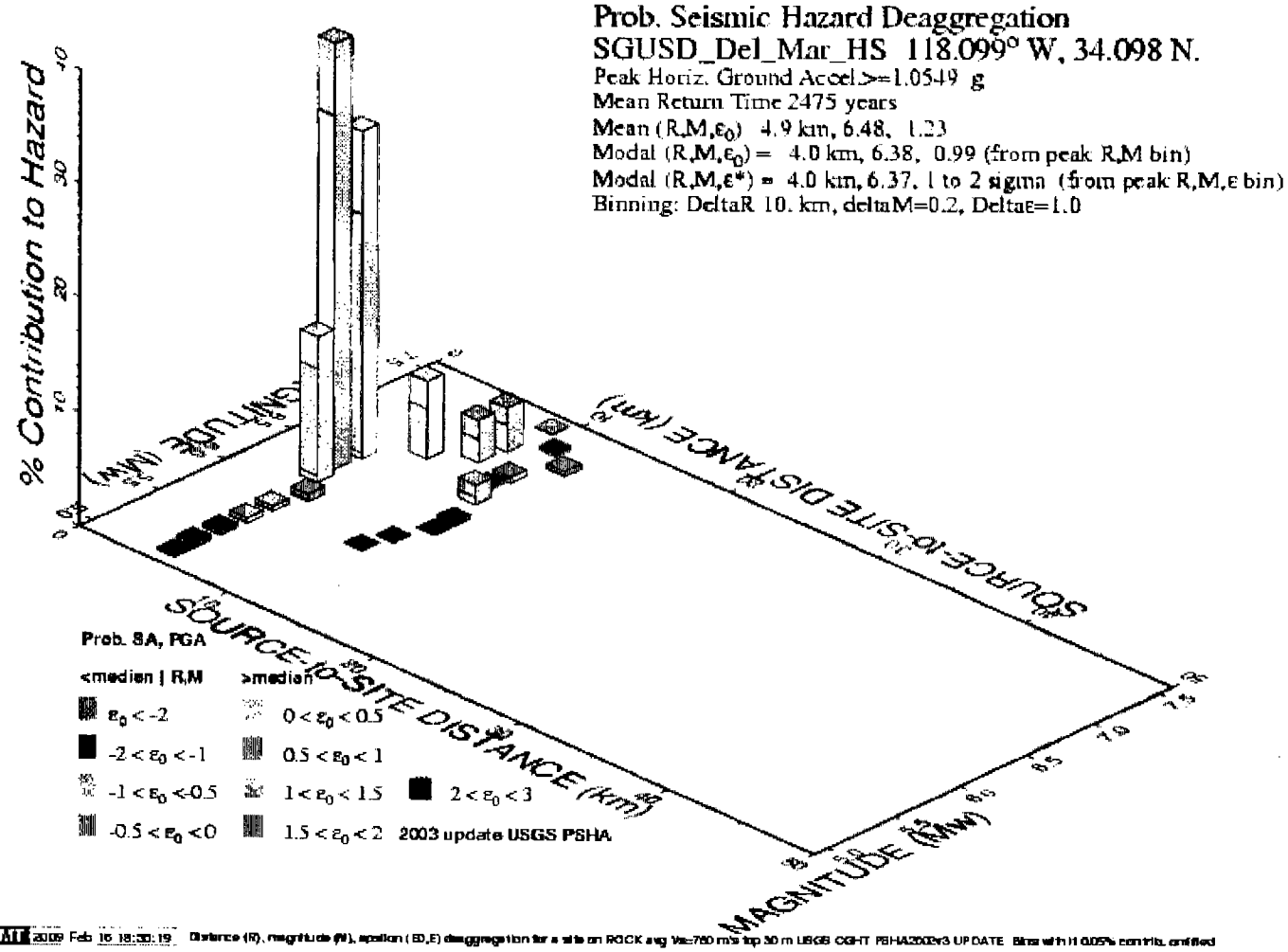
Period (sec)	Sa (g)
0.2	1.263 (SDs, Site Class D)
1.0	0.710 (SD1, Site Class D)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Site Modified Response Spectrum for Site Class D
SMs = FaSs and SM1 = FvS1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)	Sd (inches)
0.000	0.758	0.000
0.112	1.894	0.234
0.200	1.894	0.740
0.562	1.894	5.856
0.600	1.776	6.246
0.700	1.522	7.288
0.800	1.332	8.329
0.900	1.184	9.370
1.000	1.066	10.411
1.100	0.969	11.452
1.200	0.888	12.493
1.300	0.820	13.534
1.400	0.761	14.575
1.500	0.710	15.616
1.600	0.666	16.657
1.700	0.627	17.698
1.800	0.592	18.739
1.900	0.561	19.781
2.000	0.533	20.822

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 34.09813
Longitude = -118.09936
Design Response Spectrum for Site Class D
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.0 ,Fv = 1.5

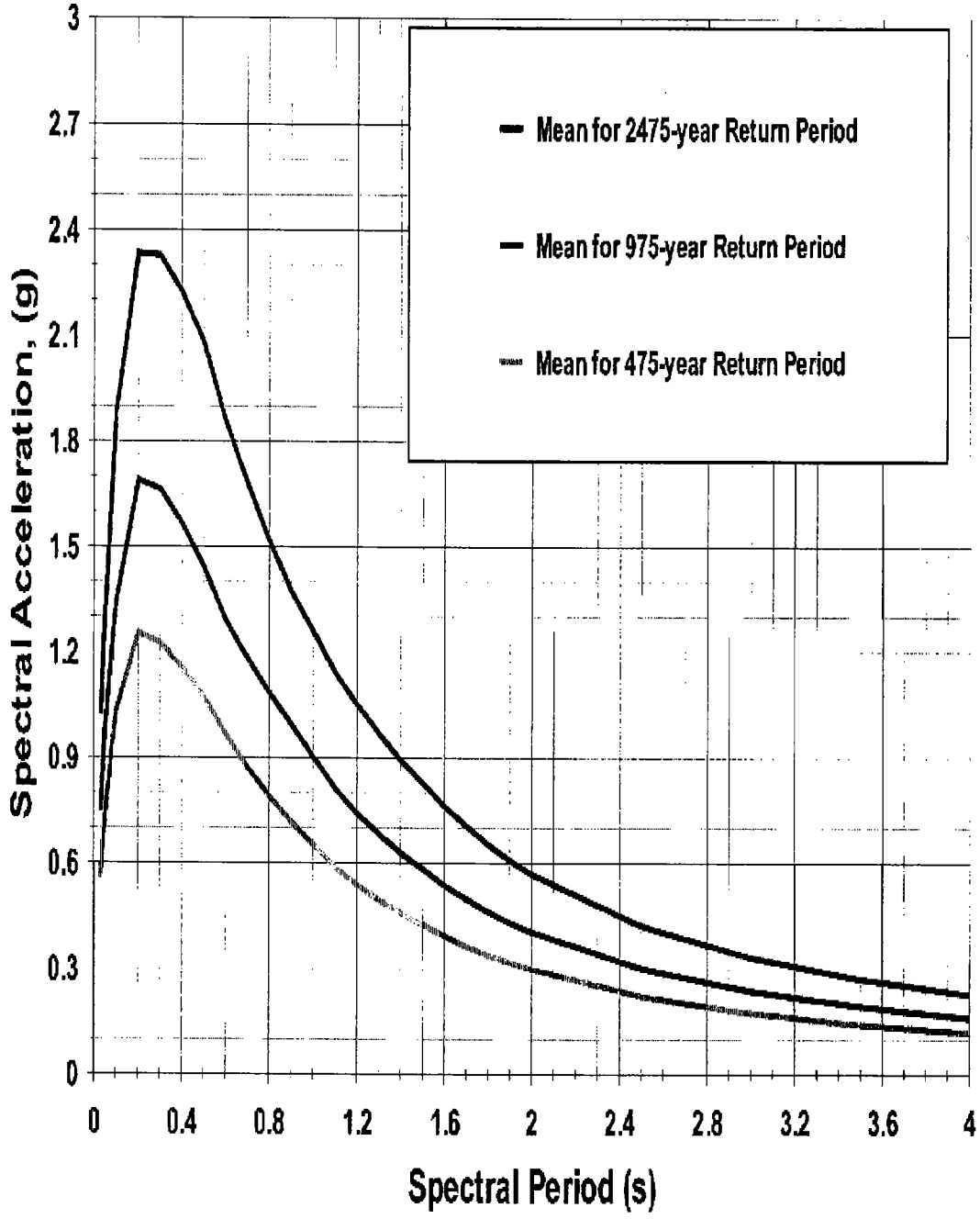
Period (sec)	Sa (g)	Sd (inches)
0.000	0.505	0.000
0.112	1.263	0.156
0.200	1.263	0.494
0.562	1.263	3.904
0.600	1.184	4.164
0.700	1.015	4.858
0.800	0.888	5.552
0.900	0.789	6.246
1.000	0.710	6.941
1.100	0.646	7.635
1.200	0.592	8.329
1.300	0.546	9.023
1.400	0.507	9.717
1.500	0.474	10.411
1.600	0.444	11.105
1.700	0.418	11.799
1.800	0.395	12.493
1.900	0.374	13.187
2.000	0.355	13.881



Prob. Seismic Hazard Deaggregation
SGUSD_Del_Mar_HS 118.099° W, 34.098 N.
Peak Horiz. Ground Accel.>=1.0549 g
Mean Return Time 2475 years
Mean (R,M,ε_0) 4.9 km, 6.48, 1.23
Modal (R,M,ε_0) = 4.0 km, 6.38, 0.99 (from peak R,M bin)
Modal (R,M,ε^*) = 4.0 km, 6.37, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0

CMT 2009 Feb 16 18:30:19 Distance (R), magnitude (M), epsilon (ε0,ε) deaggregation for a site on ROCK avg Vs=760 m/s top 30 m USGS OGHT PSHA2002v3 UPDATE Bins with it 0.05% contrib. omitted

Uniform Hazard Spectra



Probabilistic Spectra results for EZ-FRISK 7.31 Build 004

ANNUAL FREQUENCY OF EXCEEDANCE: 4.041e-004
RETURN PERIOD: 2474.9
PROBABILITY OF EXCEEDENCE: 2.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2007) NGA
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA
Column 5: Acceleration (g) for: Chiou-Youngs (2008) NGA

1	2	3	4	5
PGA	1.028e+000	8.892e-001	8.365e-001	1.226e+000
5.e-002	1.303e+000	1.156e+000	1.064e+000	1.614e+000
8.e-002	1.652e+000	1.505e+000	1.303e+000	2.047e+000
0.1	1.883e+000	1.702e+000	1.457e+000	2.269e+000
0.2	2.334e+000	2.077e+000	1.894e+000	2.874e+000
0.3	2.328e+000	2.022e+000	1.906e+000	2.889e+000
0.4	2.223e+000	1.859e+000	1.895e+000	2.723e+000
0.5	2.082e+000	1.658e+000	1.799e+000	2.528e+000
0.6	1.860e+000	1.473e+000	1.573e+000	2.299e+000
0.7	1.681e+000	1.340e+000	1.418e+000	2.130e+000
0.8	1.519e+000	1.212e+000	1.277e+000	1.963e+000
0.9	1.373e+000	1.092e+000	1.152e+000	1.767e+000
1.	1.260e+000	9.998e-001	1.056e+000	1.618e+000
1.1	1.144e+000	9.044e-001	9.496e-001	1.449e+000
1.2	1.052e+000	8.294e-001	8.549e-001	1.318e+000
1.3	9.706e-001	7.689e-001	7.808e-001	1.214e+000
1.4	8.923e-001	7.190e-001	7.214e-001	1.129e+000
1.5	8.281e-001	6.736e-001	6.674e-001	1.058e+000
1.6	7.617e-001	6.224e-001	6.108e-001	9.775e-001
1.7	7.066e-001	5.795e-001	5.646e-001	8.961e-001
1.8	6.537e-001	5.430e-001	5.263e-001	8.287e-001
1.9	6.082e-001	5.116e-001	4.930e-001	7.721e-001
2.	5.695e-001	4.826e-001	4.614e-001	7.237e-001
2.5	4.234e-001	3.585e-001	3.440e-001	5.351e-001
3.	3.332e-001	2.864e-001	2.730e-001	4.209e-001
3.5	2.704e-001	2.295e-001	2.286e-001	3.396e-001
4.	2.266e-001	1.914e-001	1.983e-001	2.829e-001

ANNUAL FREQUENCY OF EXCEEDANCE: 1.026e-003
RETURN PERIOD: 974.8
PROBABILITY OF EXCEEDENCE: 5.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2007) NGA
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA
Column 5: Acceleration (g) for: Chiou-Youngs (2008) NGA

1	2	3	4	5
PGA	7.548e-001	6.663e-001	6.367e-001	9.386e-001
5.e-002	9.783e-001	8.553e-001	8.076e-001	1.185e+000

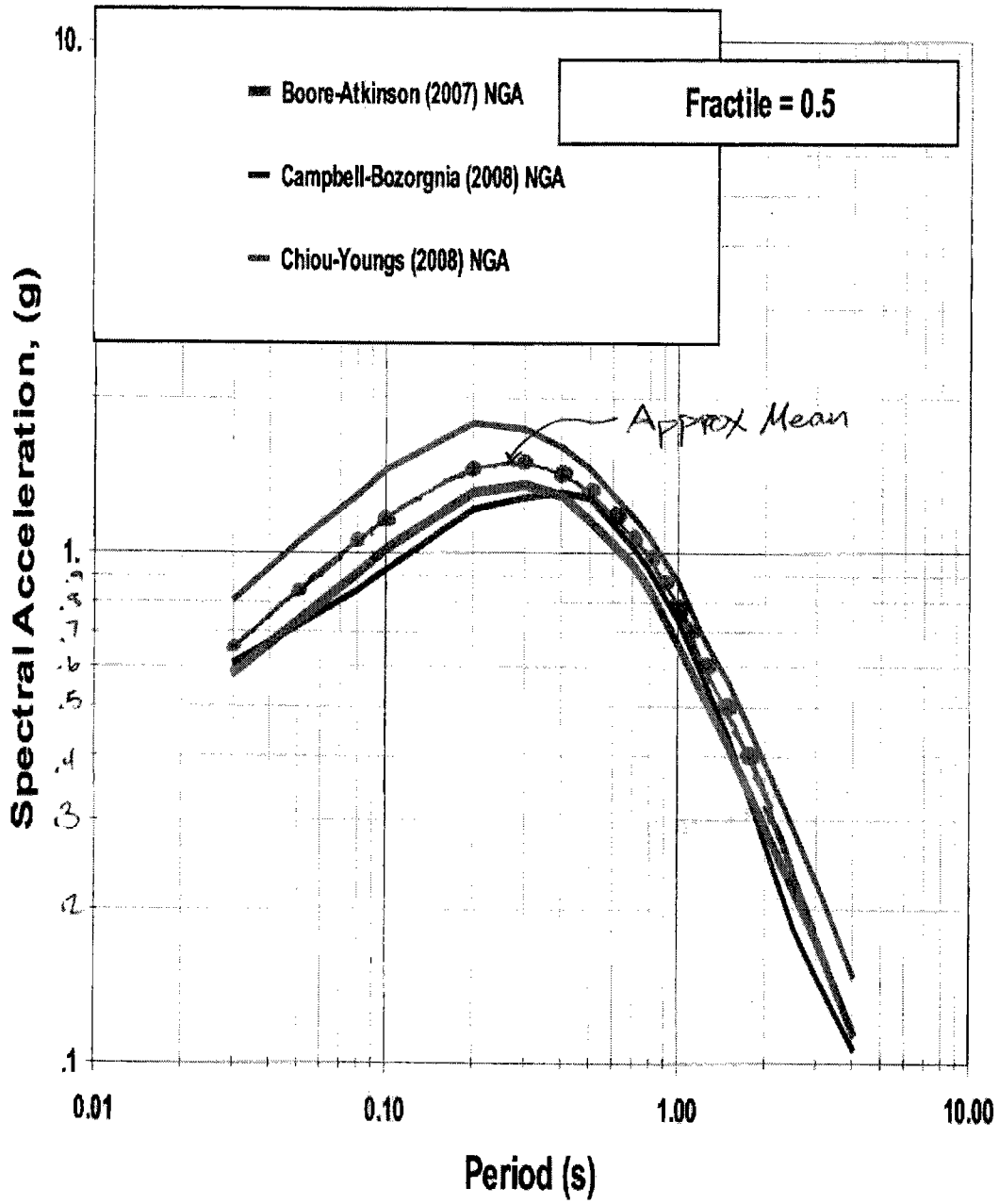
8.e-002	1.201e+000	1.103e+000	1.023e+000	1.455e+000
0.1	1.340e+000	1.223e+000	1.124e+000	1.650e+000
0.2	1.688e+000	1.484e+000	1.390e+000	2.124e+000
0.3	1.664e+000	1.432e+000	1.374e+000	2.119e+000
0.4	1.566e+000	1.322e+000	1.342e+000	2.009e+000
0.5	1.442e+000	1.194e+000	1.272e+000	1.831e+000
0.6	1.292e+000	1.075e+000	1.135e+000	1.630e+000
0.7	1.184e+000	9.850e-001	1.037e+000	1.488e+000
0.8	1.085e+000	8.820e-001	9.324e-001	1.361e+000
0.9	9.945e-001	7.884e-001	8.314e-001	1.247e+000
1.	9.030e-001	7.169e-001	7.557e-001	1.158e+000
1.1	8.126e-001	6.515e-001	6.807e-001	1.057e+000
1.2	7.420e-001	5.978e-001	6.144e-001	9.687e-001
1.3	6.828e-001	5.543e-001	5.623e-001	8.825e-001
1.4	6.287e-001	5.184e-001	5.205e-001	8.133e-001
1.5	5.841e-001	4.869e-001	4.839e-001	7.564e-001
1.6	5.380e-001	4.508e-001	4.451e-001	6.966e-001
1.7	4.996e-001	4.206e-001	4.133e-001	6.379e-001
1.8	4.631e-001	3.942e-001	3.847e-001	5.894e-001
1.9	4.323e-001	3.696e-001	3.591e-001	5.487e-001
2.	4.058e-001	3.484e-001	3.374e-001	5.140e-001
2.5	3.019e-001	2.608e-001	2.522e-001	3.794e-001
3.	2.367e-001	2.100e-001	2.029e-001	2.977e-001
3.5	1.935e-001	1.666e-001	1.666e-001	2.380e-001
4.	1.596e-001	1.379e-001	1.423e-001	1.995e-001

ANNUAL FREQUENCY OF EXCEEDANCE: 2.107e-003
RETURN PERIOD: 474.6
PROBABILITY OF EXCEEDENCE: 10.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2007) NGA
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA
Column 5: Acceleration (g) for: Chiou-Youngs (2008) NGA

1	2	3	4	5
PGA	5.647e-001	5.136e-001	4.898e-001	7.059e-001
5.e-002	7.242e-001	6.450e-001	6.180e-001	9.017e-001
8.e-002	9.165e-001	8.298e-001	7.828e-001	1.108e+000
0.1	1.031e+000	9.309e-001	8.820e-001	1.230e+000
0.2	1.254e+000	1.133e+000	1.095e+000	1.547e+000
0.3	1.227e+000	1.093e+000	1.066e+000	1.532e+000
0.4	1.157e+000	1.016e+000	1.029e+000	1.429e+000
0.5	1.073e+000	9.067e-001	9.636e-001	1.317e+000
0.6	9.662e-001	8.033e-001	8.402e-001	1.194e+000
0.7	8.727e-001	7.295e-001	7.554e-001	1.105e+000
0.8	7.900e-001	6.567e-001	6.809e-001	1.025e+000
0.9	7.168e-001	5.870e-001	6.084e-001	9.342e-001
1.	6.535e-001	5.335e-001	5.535e-001	8.568e-001
1.1	5.891e-001	4.882e-001	5.018e-001	7.725e-001
1.2	5.384e-001	4.489e-001	4.557e-001	7.070e-001
1.3	4.973e-001	4.170e-001	4.188e-001	6.451e-001

1.4	4.596e-001	3.894e-001	3.875e-001	5.940e-001
1.5	4.282e-001	3.648e-001	3.596e-001	5.519e-001
1.6	3.952e-001	3.385e-001	3.324e-001	5.081e-001
1.7	3.650e-001	3.162e-001	3.098e-001	4.674e-001
1.8	3.396e-001	2.968e-001	2.890e-001	4.326e-001
1.9	3.179e-001	2.780e-001	2.697e-001	4.033e-001
2.	2.991e-001	2.617e-001	2.533e-001	3.754e-001
2.5	2.221e-001	1.994e-001	1.923e-001	2.765e-001
3.	1.745e-001	1.562e-001	1.498e-001	2.163e-001
3.5	1.408e-001	1.262e-001	1.260e-001	1.722e-001
4.	1.190e-001	1.070e-001	1.101e-001	1.415e-001

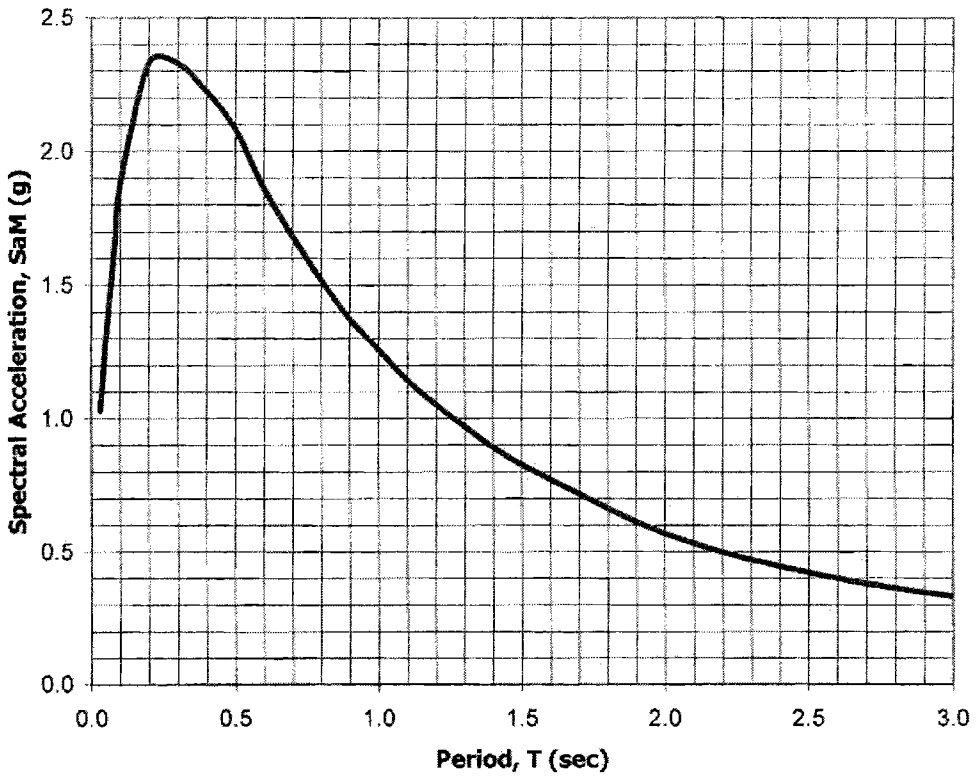
Deterministic Spectra



PROBABILISTIC MCE RESPONSE SPECTRUM (ASCE 7-05, 21.2.1)

Project Name:	SGUSD Del Mar High School	**Project Manager:**	JDH
Project Number:	602488-001	**Engineer:**	MDH
Location:	312 South Del Mar Avenue, San Gabriel, CA, (34.09813°N, 118.09936°W)	**Date:**	February 11, 2009

Probabilistic MCE Spectral Response Accelerations



PROBABILISTIC MCE RESPONSE SPECTRUM	
Period T (s)	Probabilistic MCE Spectral Acceleration S_{aM} (g)
0.03	1.03
0.05	1.30
0.08	1.65
0.10	1.88
0.20	2.33
0.30	2.33
0.40	2.22
0.50	2.08
0.60	1.86
0.70	1.68
0.80	1.52
0.90	1.37
1.00	1.26
1.10	1.14
1.20	1.05
1.30	0.97
1.40	0.89
1.50	0.83
2.00	0.57
2.50	0.42
3.00	0.33
3.50	0.27
4.00	0.23

Analysis Information

EZ-Frisk Analysis

5% Damped

Probability of Exceedence:

2% chance in 50 years

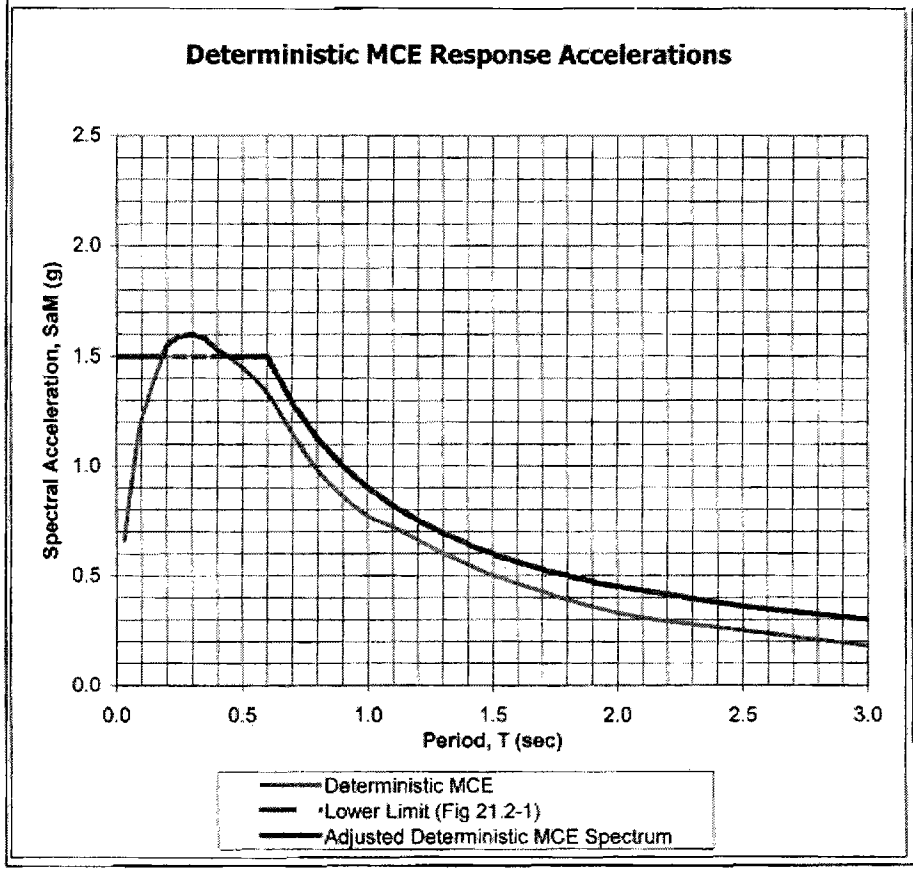
(Return period: 2475 years)

*Probabilistic curve presented in accordance with OSHPD Code Application Notice "Next Generation Attenuation Relations for Use With the 2007 California Building Code," File No. 2-1802A.6.2, effective 9/30/09 (and per DSA Bulletin 09-01, 1/26/09). Probabilistic curve is based on the maximum rotated component of ground motion.

Printed 2/20/2009

DETERMINISTIC MCE RESPONSE SPECTRUM (ASCE 7-05, 21.2.2)

Project Name:	SGUSD Del Mar High School	**Project Manager:**	JDH
Project Number:	602488-001	**Engineer:**	MDH
Location:	312 South Del Mar Avenue, San Gabriel, CA, (34.09813°N, 118.09936°W)	**Date:**	February 11 2009



CALCULATED DETERMINISTIC MCE RESPONSE SPECTRUM			LOWER LIMIT (Fig 21.2-1)	
Period T (s)	Deterministic SaM* (5% damped) (EZ-Frisk) (g)	Deterministic Spectral Acceleration Sa* (g)	Period T (s)	S_{aM} Lower Limit (g)
0.03	0.66	0.66	0.00	1.50
0.05	0.84	0.84	0.60	1.50
0.08	1.10	1.10	0.70	1.29
0.10	1.22	1.22	0.80	1.13
0.20	1.55	1.55	0.90	1.00
0.25	1.59	1.59	1.00	0.90
0.30	1.60	1.60	1.10	0.82
0.35	1.58	1.58	1.20	0.75
0.40	1.53	1.53	1.30	0.69
0.50	1.45	1.45	1.40	0.64
0.60	1.33	1.33	1.50	0.60
0.70	1.15	1.15	1.60	0.56
0.80	0.98	0.98	1.70	0.53
0.90	0.86	0.86	1.80	0.50
1.00	0.77	0.77	1.90	0.47
1.10	0.72	0.72	2.00	0.45
1.20	0.66	0.66	2.50	0.36
1.30	0.60	0.60	3.00	0.30
1.40	0.55	0.55	3.50	0.26
1.50	0.50	0.50	4.00	0.23
2.00	0.33	0.33		
2.50	0.25	0.25		
3.00	0.18	0.18		

CBC 2007 Parameters

F_a =	1.00	
F_v =	1.50	
S_s =	1.890	>= 1.5
S_1 =	0.709	>= 0.6

Deterministic Lower Limit

$S_{aM} = 1.5F_a$

or

$S_{aM} = 0.6F_v/T$

at each period *T*.

Analysis Information

For Deterministic MCE, choose higher of [site-specific MCE S_{aM}] and [SaM lower limit] at each time *T*

Results:

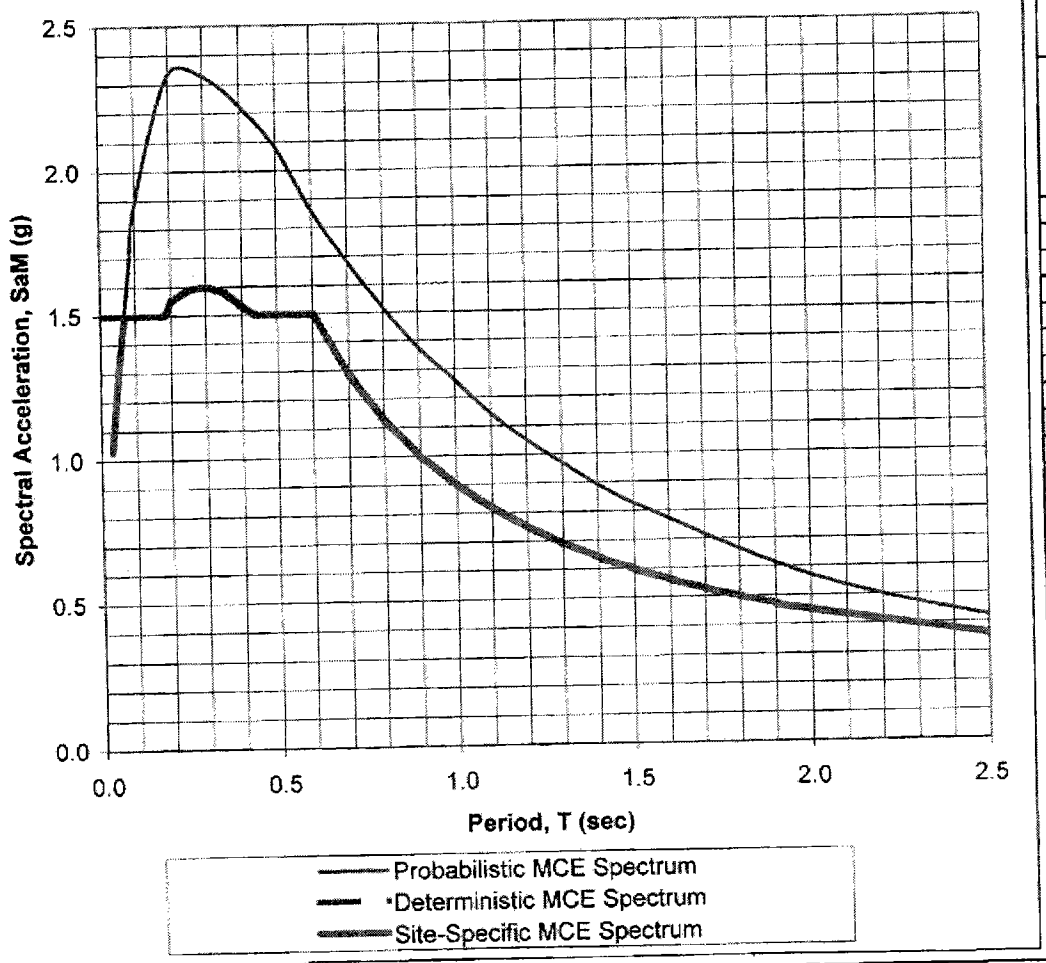
For this case, deterministic lower limit (Fig 21.2-1) controls at all periods, except the range T=0.18 to T=0.42 sec.

*Deterministic curve presented in accordance with OSHPD Code Application Notice "Next Generation Attenuation Relations for Use With the 2007 California Building Code," File No. 2-1802A.6.2. Deterministic curve is based on the 84th percentile of the maximum rotated component of ground motion based on current NGAs. Therefore, the curve is <u>not</u> factored by 150%, as the analysis no longer employs the deterministic median.

SITE-SPECIFIC MCE RESPONSE SPECTRUM (ASCE 7-05, 21.2.3)

Project Name: SGUSD Del Mar High School
Project Number: 602488-001
Location: 312 South Del Mar Avenue, San Gabriel, CA, (34.09813°N, 118.09936°W)

Project Manager: JDH
Engineer: MDH
Date: February 11, 2009



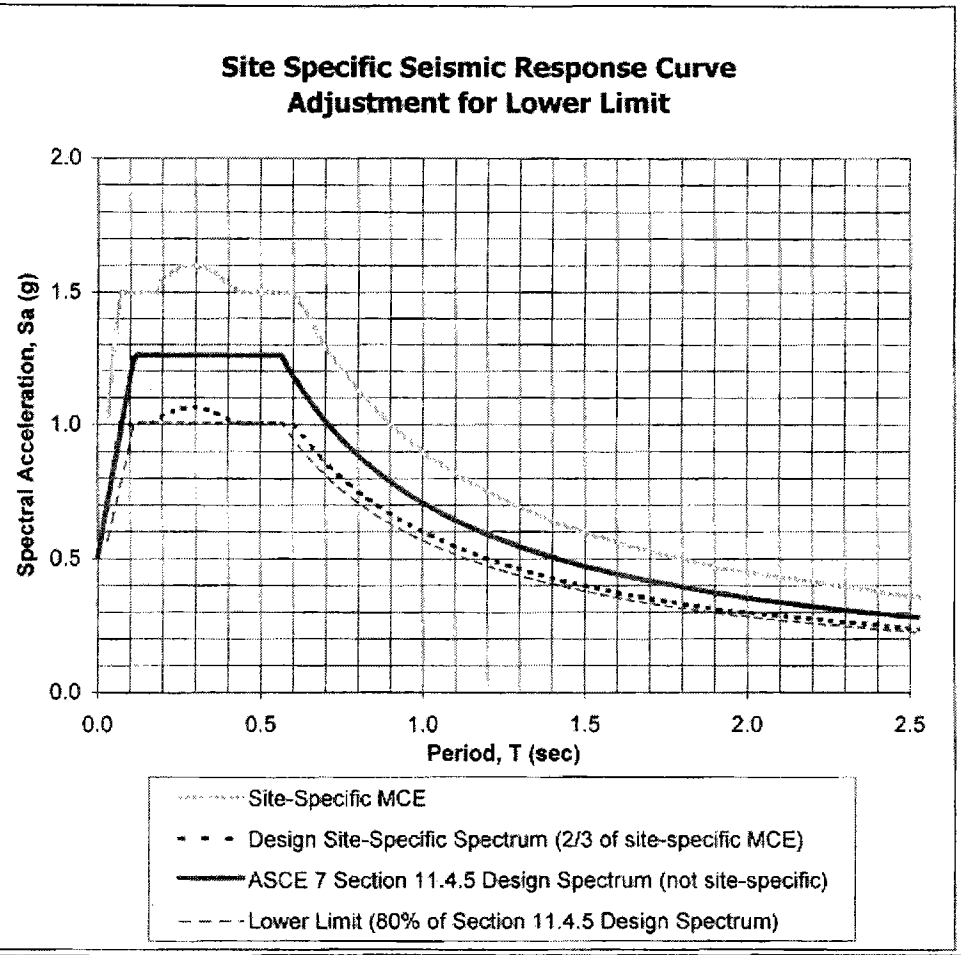
DETERMINISTIC MCE SPECTRUM (Section 21.2.2)		PROBABILISTIC MCE SPECTRUM (Section 21.2.1)		SITE SPECIFIC MCE SPECTRUM	
Period T (s)	S_{aM} (g)	Period T (s)	S_{aM} (g)	Period T (s)	S_{aM} (g)
0.03	1.50	0.03	1.03	0.03	1.03
0.05	1.50	0.05	1.30	0.05	1.30
0.08	1.50	0.08	1.65	0.08	1.50
0.10	1.50	0.10	1.88	0.10	1.50
0.20	1.55	0.20	2.33	0.20	1.55
0.25	1.60	0.30	2.33	0.30	1.60
0.30	1.53	0.40	2.22	0.40	1.53
0.35	1.50	0.50	2.06	0.50	1.50
0.40	1.50	0.60	1.86	0.60	1.50
0.50	1.29	0.70	1.68	0.70	1.29
0.60	1.13	0.80	1.52	0.80	1.13
0.70	1.00	0.90	1.37	0.90	1.00
0.80	0.90	1.00	1.26	1.00	0.90
0.90	0.818	1.10	1.144	1.10	0.818
1.00	0.750	1.20	1.052	1.20	0.750
1.10	0.692	1.30	0.971	1.30	0.692
1.20	0.643	1.40	0.892	1.40	0.643
1.30	0.600	1.50	0.828	1.50	0.600
1.40	0.450	2.00	0.570	2.00	0.450
1.50	0.360	2.50	0.423	2.50	0.360
2.00	0.300	3.00	0.333	3.00	0.300
2.50	0.257	3.50	0.270	3.50	0.257
3.00	0.225	4.00	0.227	4.00	0.225

Analysis Information

For site-specific MCE response spectrum, choose lower of probabilistic MCE and deterministic MCE values at each period *T* (ASCE 7-05, 21.2.3).

SITE SPECIFIC SPECTRUM (ASCE 7-05, 21.3)

Project Name:	SGUSD Del Mar High School	**Project Manager:**	JDH
Project Number:	602488-001	**Engineer:**	MDH
Location:	312 South Del Mar Avenue, San Gabriel, CA, (34.09813°N, 118.09936°W)	**Date:**	February 11, 2009



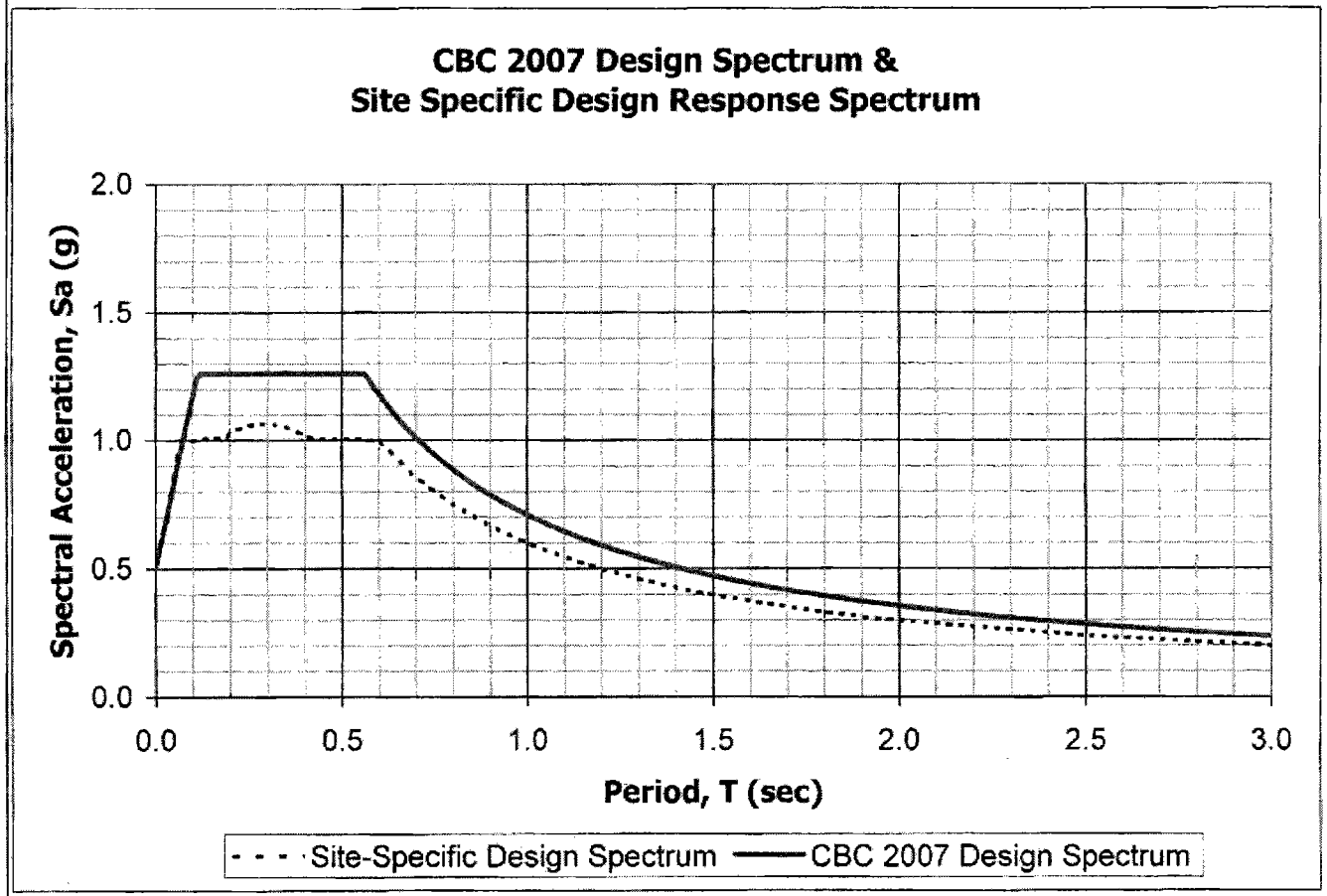
PERIOD T (s)	SITE SPECIFIC MCE S_{aM} (Sec 21.2.3) (g)	DESIGN SITE-SPECIFIC Sa (=2/3 SaM) (g)	DESIGN SPECTRAL ACCEL., Sa (Sec 11.4.5) (g)	LOWER LIMIT (80% OF Sec 11.4.5 Sa) (g)	DESIGN RESPONSE SPECTRUM Sa (g)
0.03	1.03	1.03	0.71	0.56	0.69
0.05	1.30	1.30	0.84	0.67	0.87
0.08	1.50	1.50	1.04	0.83	1.00
0.10	1.50	1.50	1.18	0.94	1.00
0.20	1.55	1.55	1.26	1.01	1.03
0.30	1.60	1.60	1.26	1.01	1.07
0.40	1.53	1.53	1.26	1.01	1.02
0.50	1.50	1.50	1.26	1.01	1.01
0.60	1.50	1.50	1.18	0.94	1.00
0.70	1.29	1.29	1.01	0.81	0.86
0.80	1.13	1.13	0.89	0.71	0.75
0.90	1.00	1.00	0.79	0.63	0.67
1.00	0.90	0.90	0.71	0.57	0.60
1.10	0.82	0.82	0.64	0.52	0.55
1.20	0.75	0.75	0.59	0.47	0.50
1.30	0.69	0.69	0.55	0.44	0.46
1.40	0.64	0.64	0.51	0.40	0.43
1.50	0.60	0.60	0.47	0.38	0.40
2.00	0.45	0.45	0.35	0.28	0.30
2.50	0.36	0.36	0.28	0.23	0.24
3.00	0.30	0.30	0.24	0.19	0.20
3.50	0.26	0.26	0.20	0.16	0.17
4.00	0.23	0.23	0.18	0.14	0.15

Analysis Information

Site-specific spectral accelerations may not fall below 80% of Sa determined in accordance with Section 11.4.5 of ASCE 7-05. Site-specific design spectral response accelerations are 2/3 of site-specific MCE spectral response accelerations.

SITE SPECIFIC SEISMIC RESPONSE ANALYSIS (ASCE 7-05, CH. 21)

Project Name:	SGUSD Del Mar High School	**Project Manager:**	JDH
Project Number:	602488-001	**Engineer:**	MDH
Location:	312 South Del Mar Avenue, San Gabriel, CA, (34.09813°N, 118.09936°W)	**Date:**	February 11, 2009



*Response curve constructed using NGA relationships by Boore-Atkinson (2007), Campbell-Bozorgnia (2008), Chiou-Youngs (2008)

SITE SPECIFIC DESIGN SEISMIC RESPONSE

PERIOD T (s)	DESIGN RESPONSE SPECTRUM Sa* (g)	CBC 2007/ ASCE Sec 11.4.5 DESIGN Sa* (g)
0.03	0.69	0.71
0.05	0.87	0.84
0.08	1.00	1.04
0.10	1.00	1.18
0.20	1.03	1.26
0.30	1.07	1.26
0.40	1.02	1.26
0.50	1.01	1.26
0.60	1.00	1.18
0.70	0.86	1.01
0.80	0.75	0.89
0.90	0.67	0.79
1.00	0.60	0.71
1.10	0.55	0.64
1.20	0.50	0.59
1.30	0.46	0.55
1.40	0.43	0.51
1.50	0.40	0.47
2.00	0.30	0.35
2.50	0.24	0.28
3.00	0.20	0.24
3.50	0.17	0.20
4.00	0.15	0.18

FIGURE D-5

Liquefaction Susceptibility Analysis: SPT Method

Based on Youd and Idriss (2001), Martin and Lew (1999).

Project: SGUSD Del Mar
Project No.: 602488-001

General Boring Information:

Boring No.	Existing GW Depth (ft)	Design GW Depth (ft)	Design Fill Height (ft)
B-1	100	100	
B-2	100	100	

General Parameters:	
a_{max} =	0.80g
M_W =	6.4
MSF eq:	1
MSF =	1.50
C_E =	1.3
C_B =	1
$C_{S(SPT)}$ =	1.2
$C_{S(ring)}$ =	1
Rod Stickup (feet) =	3
Ring sample correction =	0.64

Summary of Liquefaction Susceptibility Analysis: SPT Method

Based on Youd and Idriss (2001), Martin and Lew (1999).

Project: SGUSD Del Mar

Project No.: 602488-001

Leighton

Boring No.	Approx. Layer Depth (ft)	SPT Depth (ft)	Approx Layer Thick-ness (ft)	Chinese Criteria	Estimated Fines Cont (%)	N_m or B (bpf)	Sampler Type (enter 2 if mod CA Ring)	N_m (field SPT) (bpf)	Exist σ_{vo}' (psf)	$(N_1)_{60}$	$(N_1)_{60CS}$	Design σ_{vo}' (psf)	CSR_M	$(N_1)_{60CS}$ (for Settle-ment) (blows/ft)	Dry Sand Strain (%) (Tok/ Seed 87) (%)	Seismic Sett. (in.)	Cummulative Settlement (in.)
B-1	0 to 6	5	6			50	1	50	600	99.5	99.5	600	0.343	99.5	0.017	0.01	0.01
B-1	6 to 9	7.5	3			20	2	13	900	19.0	19.0	900	0.341	19.0	0.716	0.21	0.23
B-1	9 to 13	10	4			52	2	33	1200	48.5	48.5	1200	0.339	48.5	0.051	0.02	0.25
B-1	13 to 18	15	5		6	41	2	26	1800	31.2	31.4	1800	0.336	31.4	0.142	0.09	0.34
B-1	18 to 23	20	5			19	1	19	2400	26.3	26.3	2400	0.332	26.3	0.559	0.34	0.67
B-1	23 to 28	25	5	n	55	31	2	20	3000	20.4	29.5	3000	0.326	29.5	0.000	0.00	0.67
B-1	28 to 33	30	5			29	1	29	3600	34.5	34.5	3600	0.319	34.5	0.146	0.09	0.76
B-1	33 to 38	35	5			20	1	20	4200	22.0	22.0	4200	0.309	22.0	0.547	0.33	1.09
B-1	38 to 43	40	5		10	25	1	25	4800	25.7	27.1	4800	0.295	27.1	0.431	0.26	1.35
B-1	43 to 48	45	5		36	12	1	12	5400	11.6	19.0	5400	0.279	19.0	0.999	0.60	1.94
B-1	48 to 54	50	7			58	1	58	6000	53.4	53.4	6000	0.261	53.4	0.036	0.03	1.97
B-2	0 to 4	2	4			50	1	50	240	99.5	99.5	240	0.346	99.5	0.005	0.00	0.00
B-2	4 to 8	5	4		50	23	2	15	600	24.4	34.3	600	0.343	34.3	0.244	0.12	0.12
B-2	8 to 13	10	5		20	60	2	38	1200	56.0	64.0	1200	0.339	64.0	0.034	0.02	0.14
B-2	13 to 18	15	5		20	22	2	14	1800	16.8	21.7	1800	0.336	21.7	0.429	0.26	0.40
B-2	18 to 24	20	7		50	19	1	19	2400	26.3	36.5	2400	0.332	36.5	0.204	0.16	0.56

APPENDIX E

APPENDIX E

LEIGHTON CONSULTING, INC.

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

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1.0 General

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record: Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The

Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General: Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Safety: The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill: All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.3 Lift Thickness: Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.4 Observation and Testing: The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.